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Climate Change and Science, Politics, and Faith

Young people are both fascinated and puzzled by the information surrounding “climate change”. Many are also fearful for their own future based on statements emanating from various quarters, whether the United Nations, various national governments or the media.

(Dean Rohrer) *National Catholic Reporter*, May 20, 2014 <https://www.ncronline.org/blogs/opinion/eco-catholic/editorial-climate-change-churches-no-1-pro-life-issue>

The topic of “climate change” presents thorny problems right off the bat. There is disagreement on the definition of terms and on the conflicting evidence used to buttress the opposing points of views. There is a plethora of arguments on each side. The image on this page even suggests that time is really running out.

This edition of *The Interim Plus* curriculum resource makes an attempt to offer an objective approach to assessing the claims of the competing sides of the argument. Hopefully, students through their teachers can better understand the issue and its broad ramifications without getting over-anxious about the prospects for them and their planet.

If one consults these simple sites (<https://skepticalscience.com/argument.php>) and also (<https://grist.org/series/skeptics/>) one will see rebuttals of what “deniers and skeptics” say about climate change, even of those who may agree that there is climate change but who question whether human activities are the major or most important causal factor.

Some defenders of climate change view any criticism as an attack on reality. Some climate change proponents act and speak like religious believers, demanding strict adherence to the religion of climate change with a list of basic dogmas or tenets that cannot be questioned in any way.

Does the truth, perhaps, rest somewhere in between this “absolute certitude of the climatologists” and the healthy skepticism of the unconvinced? Is the evidence convincing and irrefutable or is it merely stated and quite underwhelming?

The students could be assigned a handful of these statements for research and assessment. See further below for suggestion on dividing up the task.

At <https://skepticalscience.com/argument.php> the author lists more than 190 statements/claims/arguments of skeptics or “deniers” of climate change. The climate change apologist purports to refute each argument or statement with a brief statement of his own, backed up by citations of scientific evidence, and often accompanied by short videos on the same evidence.

An alternative site (<https://climatechange.procon.org>) offers a more balanced approach because it presents both the pro and the con of an argument side by side, and it does not take a declared position, leaving the reader to draw their own conclusions.

Here is a small sample of what the pro-climate change site presents as “Climate Myth vs What the Science Says”. In red is the “myth”, in blue is the rebuttal, and in black is what a skeptic might further question about the evidence in blue. Students should be able to assess the claims and counter claims by comparing and contrasting the evidence in the varied sources, not just blindly accepting one version. It is worthwhile for the student group to also explore the many 5-8 minute videos linked to the individual statements of Climate Myth vs What the Science Says.

Climate Myth vs What the Science Says

1. “Climate’s changed before”

Climate reacts to whatever forces it to change at the time; humans are now the dominant forcing.

But what evidence is presented to make the case that human beings are now the dominant agents forcing the change in the climate of the earth?



In the last 35 years of global warming, sun and climate have been going in opposite directions.

2. "It's the sun"

But the video does not present actual evidence. The fellow just keeps saying that it is human activity, without identifying any of these activities. He just keeps saying "our fingerprints" are all over these changes.

Negative impacts of global warming on agriculture, health & environment far outweigh any positives.

3. "It's not bad"

Again, this is another contentious statement. Who can declare that a warmer Canada and warmer Siberia is bad for the planet? How does one measure the weight of benefits versus the negative impact?

97% of climate experts agree humans are causing global warming.

4. "There is no consensus"

Yes, but 99% thought that the earth was flat at one time. This does not provide scientific evidence, merely that a lot of climatologists point to this possibility or probability, but it does not include astrophysicists, geologists and other scientists that do not agree with this point of view.

The last decade 2000-2009 was the hottest on record.

5. "It's cooling"

In truth, a decade means little in the multi-billion year history of the planet. The cycles of climate change may last for thousands of years and for decades within those long cycles.

Individual science study research/projects shed interesting light on how the scientists conduct field research. Here is an example of Arctic Ocean studies:

<https://skepticalscience.com/scientists-plan-year-locked-in-ice.html>

How to Conduct the Study/Discussion

Rather than students investigating all the pro and con arguments, it would be more efficient to have individual students and/or groups of students (4-5 in a group) research and then report on a limited number of arguments for and against climate change (taken to mean that there is a definite and inescapable link between harmful global warming and enhanced human activities on the planet). Once the groups have given an oral report and provided a written copy of the report on their select arguments, the whole class will have a summary and can then debate or discuss accordingly.

Another approach could be that of simply dividing the class into two groups, with one group assigned the pro-climate arguments and the second group assigned the con arguments. Then hold a debate with representatives of the two groups giving their reasoned arguments supporting their position.



Last updated on: 5/13/2019 | Author: ProCon.org



Temperatures on earth have increased approximately 1.8°F since the early 20th century. Over this time period, atmospheric levels of greenhouse gases such as carbon dioxide (CO₂) and methane (CH₄) have notably increased. Both sides in the debate surrounding global climate change agree on these points.

The pro side argues rising levels of atmospheric greenhouse gases are the anthropogenic effects or direct result of human activities such as burning fossil fuels, and that these increases are causing significant and increasingly severe climate changes including global warming, loss of sea ice, sea level rise, stronger storms, and more droughts. They contend that immediate international action to reduce greenhouse gas emissions is necessary to prevent dire climate changes.

The con side argues human-generated greenhouse gas emissions are too small to substantially change the earth's climate and that the planet is capable of absorbing those increases. They contend that warming over the 20th century resulted primarily from natural processes such as fluctuations in the sun's heat and ocean currents. They say the theory of human-caused global climate change is based on questionable measurements, faulty climate models, and misleading science.

Pro & Con Arguments

Pro 1

Overwhelming scientific consensus says human activity is primarily responsible for global climate change.

The 2010 Anderegg study found that 97-98% of climate researchers publishing most actively in their field agree that human activity is primarily responsible for global climate change. The study also found that the expertise of researchers unconvinced of

human-caused climate change is “substantially below” that of researchers who agree that human activity is primarily responsible for climate change. [7] The 2013 Cook review of 11,944 peer-reviewed studies on climate change found that only 78 studies (0.7%) explicitly rejected the position that humans are responsible for global warming. [1] A separate review of 13,950 peer-reviewed studies on climate change found only 24 that rejected human-caused global warming. [5] A survey by German Scientists Bray and Von Storch found that 83.5% of climate scientists believe human activity is causing “most of recent” global climate change. [172] A separate survey in 2011 also found that 84% of earth, space, atmospheric, oceanic, and hydrological scientists surveyed said that human-induced global warming is occurring. [6]

Pro 2

Rising levels of human-produced gases released into the atmosphere create a greenhouse effect that traps heat and causes global warming.

As sunlight hits the earth, some of the warmth is absorbed by greenhouse gases in the atmosphere such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (NO₂). These gases trap heat and cause the planet to warm through a process called the greenhouse effect. [8] Since 1751 about 337 billion metric tons of CO₂ have been released into the atmosphere from the burning of fossil fuels and cement production, [9] increasing atmospheric CO₂ from the pre-industrial level of about 280 ppm (parts per million), to a high of 400 ppm in 2013. [10] Methane, which is increasing in the atmosphere due to agriculture and fossil fuel production, traps 84 times as much heat as CO₂ for the first 20 years it is in the atmosphere, [11] and is responsible for about one-fifth of global warming since 1750. [12] Nitrous oxide, primarily released through agricultural practices, traps 300 times as much heat as CO₂. [13] Over the 20th century, as the concentrations of CO₂, CH₄, and NO₂ increased in the atmosphere, [13] [14] the earth warmed by approximately 1.4°F. [99]



Pro 3

The rise in atmospheric CO₂ over the last century was clearly caused by human activity, as it occurred at a rate much faster than natural climate changes could produce.

Over the past 650,000 years, atmospheric CO₂ levels did not rise above 300 ppm until the mid-20th century. [100] Atmospheric levels of CO₂ have risen from about 317 ppm in 1958 to 415 ppm in 2019. [10] [194] CO₂ levels are estimated to reach 450 ppm by the year 2040. [15] According to the Scripps Institution of Oceanology, the “extreme speed at which carbon dioxide concentrations are increasing is unprecedented. An increase of 10 parts per million might have needed 1,000 years or more to come to pass during ancient climate change events.” [17] Some climate models predict that by the end of the 21st century an additional 5°F-10°F of warming will occur. [16]

Pro 4

The specific type of CO₂ that is increasing in earth’s atmosphere can be directly connected to human activity.



CO₂ produced by burning fossil fuels such as oil and coal [18] can be differentiated in the atmosphere from natural CO₂ due to its specific isotopic ratio. [101] According to the Intergovernmental Panel on Climate Change (IPCC), 20th century measurements of CO₂ isotope ratios in the atmosphere confirm that rising CO₂ levels are the result of human activity, not natural processes such as ocean outgassing, volcanic activity, or release from other “carbon sinks.” [102] US greenhouse gas emissions from human activities in 2012 totaled 6.5 million metric tons, [19] which is equivalent to about 78.3 billion shipping containers filled with greenhouse gases. [20]

Pro 5

Average temperatures on earth have increased at a rate far faster than can be explained by natural climate changes.

A 2008 study compared data from tree rings, ice cores, and corals over the past millennium with recent temperature records. The study created the famous “hockey stick” graph, showing that the rise in earth’s temperature over the preceding decade had occurred at a rate faster than any warming period over the last 1,700 years. [23] In 2012 the Berkeley scientists found that the average temperature of the earth’s land increased 2.5°F over 250 years (1750-2000), with 1.5°F of that increase in the last 50 years. [21] Lead researcher Richard A. Muller, PhD, said “it appears likely that essentially all of this increase [in temperature] results from the human emission of greenhouse gases.” [22] In 2013, a surface temperature study published in Science found that global warming over the past 100 years has proceeded at a rate faster than at any time in the past 11,300 years. [3] According to the IPCC’s 2014 Synthesis Report, human actions are “extremely likely” (95-100% confidence) to have been the main cause of 20th century global warming, and the surface temperature warming since the 1950s is “unprecedented over decades to millennia.” [24]

Pro 6

Natural changes in the sun's activity cannot explain 20th century global warming.

According to a Dec. 2013 study in Nature Geoscience, the sun has had only a “minor effect” on the Northern Hemisphere climate over the past 1,000 years, and global warming from human-produced greenhouse gases has been the primary cause of climate change since 1900. [26] Another 2013 study found that solar activity could not have contributed to more than 10% of the observed global warming over the 20th century. [27] Measurements in the upper atmosphere from 1979-2009 show the sun's energy has gone up and down in cycles, with no net increase. [28] According to a 2013 IPCC report, there is “high confidence” (8 out of 10 chance) that changes in the sun's radiation could not have caused the increase in the earth's surface temperature from 1986-2008. [29] Although warming is occurring in the lower atmosphere (troposphere), the upper atmosphere (stratosphere) is actually cooling. If the sun were driving global warming, there would be warming in the stratosphere also, not cooling. [103]

Pro 7

Global warming caused by human-produced greenhouse gases is causing the Arctic ice cap to melt at an increasing rate.

From 1953–2006, Arctic sea ice declined 7.8% per decade. Between 1979 and 2006, the decline was 9.1% each decade. [105] As of 2014, Arctic sea ice was being lost at a rate of 13.3% per decade. [163] As the Arctic ice cover continues to decrease, the amount of the sun's heat reflected by the ice back into space also decreases. This positive-feedback loop amplifies global warming at a rate even faster than previous climate models had predicted. [30] Some studies predict the Arctic could become nearly ice free sometime between 2020-2060. [164]

Pro 8

Sea levels are rising at an unprecedented rate due to global warming.

As human-produced greenhouse gases warm the planet, sea levels are rising due to thermal expansion of warming ocean waters as well as melt water from receding glaciers and the polar ice cap. [165] According to the IPCC, there has been a “substantial” human contribution to the global mean sea-level rise since the 1970s, and there is “high confidence” (8 out of 10 chance) that the rate of sea-level rise over the last half century has accelerated faster than it has over the previous 2,000 years. [29] A 2006 study found that “significant acceleration” of sea-level rise occurred from 1870 to 2004. [106] Between 1961 and 2003 global sea levels rose 8 inches. [102] An Oct. 2014 study published in the Proceedings of the National Academy of Sciences concluded that the rate of sea level rise over the past century is unprecedented over the last 6,000 years. [32] [33] A separate Oct. 2014 study said that the global sea level is likely to rise 31 inches by 2100, with a worst case scenario rise of 6 feet. [34] Climate Central predicts that 147 to 216 million people live in areas that will be below sea level or regular flood areas by the end of the century if human-produced greenhouse gas emissions continue at their current rate. [35]

Pro 9

Ocean acidity levels are increasing at an unprecedented rate that can only be explained by human activity.

As excess human-produced CO₂ in the atmosphere is absorbed by the oceans, the acidity level of the water increases. Acidity levels in the oceans are 25-30% higher than prior to human fossil fuel use. [107] According to a 2014 US Government Accountability Office (GAO) report, oceans have absorbed about 30% of the CO₂ emitted by humans over the past 200 years, and ocean acidity could rise approximately 100-200 percent above preindustrial levels by 2100. [36] According to a 2013 report from the World Meteorological Organization, the current acceleration in the rate of ocean acidification “appears unprecedented” over the last 300 million years. [37] High ocean acidity levels threaten marine species, [16] and slows the growth of coral reefs. [38] According to a 2014 report by the Convention on Biological Diversity, “it is now nearly inevitable” that within 50-100 years continued human produced CO₂ emissions will increase ocean acidity to levels that “will have widespread impacts, mostly deleterious, on marine organisms and ecosystems.” [39]

Pro 10

Ocean temperatures are rising at an unprecedented rate due to global warming, and are causing additional climate changes.

The IPCC stated in a 2013 report that due to human-caused global warming, it is “virtually certain” (99-100% probability) that the upper ocean warmed between 1971 and 2010. [29] An Oct. 2014 Nature Climate Change study said that the oceans are the “dominant reservoir of heat uptake in the climate system.” [40] A separate Oct. 2014 study found that the oceans absorb more than 90% of the heat generated by human-caused global warming. [41] Since 1970 the upper ocean (above 700 meters) has been warming 24-55% faster than previous studies had predicted. [41] A May 2013 study published in Geophysical Research Letters found that between 1958-2009 the rates of warming in the lower ocean (below 700m) “appear to be unprecedented.” [42] According to an Oct. 2013 study, the middle depths of the Pacific Ocean have warmed “15 times faster in the last 60 years than they did during apparent natural warming cycles in the previous 10,000.” [43] Warmer ocean waters can harm coral reefs and impact many species including krill, which are vital to the marine food chain and which reproduce significantly less in warmer water. [166] Warming oceans also contribute to sea level rise due to thermal expansion, and warmer ocean waters can add to the intensity of storm systems. [167]

Pro 11

Glaciers are melting at unprecedented rates due to global warming, causing additional climate changes.

About a quarter of the globe's glacial loss from 1851-2010, and approximately two thirds of glacial loss between 1991-2010, is attributable directly to global warming caused by human-produced greenhouse gases. [45] According to the National Snow and Ice Data Center, global warming from human-produced greenhouse gases is a primary cause of the "unprecedented" retreat of glaciers around the world since the early 20th century. [44] Since 1980 glaciers worldwide have lost nearly 40 feet (12 meters) in average thickness. [110] According to a 2013 IPCC report, "glaciers have continued to shrink almost worldwide" over the prior two decades, and there is "high confidence" (about an 8 out of 10 chance) that Northern Hemisphere spring snow continues to decrease. [29] If the glaciers forming the Greenland ice sheet were to melt entirely, global sea levels could increase by up to 20 feet. [168] Melting glaciers also change the climate of the surrounding region. With the loss of summer glacial melt water, the temperatures in rivers and lakes increase. According to the US Geological Service, this disruption can include the "extinction of temperature sensitive aquatic species." [169]



Pro 12

Human-caused global warming is changing weather systems and making heat waves and droughts more intense and more frequent.

The May 2014 National Climate Assessment report said human-caused climate changes, such as increased heat waves and drought, "are visible in every state." [16] A Sep. 2014 American Meteorological Society study found that human-caused climate change "greatly increased" (up to 10 times) the risk for extreme heat waves in 2013. [46] According to an Aug. 2012 study published in the Proceedings of the National Academy of Sciences, there is a "high degree of confidence" that the Texas and Oklahoma heat waves and drought of 2011, and heat waves and drought in Moscow in 2010, "were a consequence of global warming" and that "extreme anomalies" in weather are becoming more common as a direct consequence of human-caused climate change. [47] A 2015 study found that globally, 75% of extremely hot days are attributable to warming caused by human activity. [174]

Pro 13

Dramatic changes in precipitation, such as heavier storms and less snow, are another sign that humans are causing global climate change.



As human-produced greenhouse gases heat the planet, increased humidity (water vapor in the atmosphere) results. Water vapor is itself a greenhouse gas. [112] In a process known as a positive feedback loop, more warming causes more humidity which causes even more warming. [113] Higher humidity levels also cause changes in precipitation. According to a 2013 report published in the Proceedings of the National Academy of Sciences, the recorded changes in precipitation over land and oceans "are unlikely to arise purely due to natural climate variability." [48] Higher temperatures from global warming are also causing some mountainous areas to receive rain rather than snow. According to researchers at the Scripps Institution of Oceanography, up to 60% of the changes in river flow, winter air temperature, and snow pack in the western United States (1950-1999) were human-induced. [111] Since 1991, heavy precipitation events have been

30% above the 1901-1960 average in the Northeast, Midwest, and upper Great Plains regions. [16] A 2015 study found that global warming caused by human actions has increased extreme precipitation events by 18% across the globe, and that if temperatures continue to rise an increase of 40% can be expected. [174]

Pro 14

Permafrost is melting at unprecedented rates due to global warming, causing further climate changes.

According to a 2013 IPCC report there is "high confidence" (about an 8 out of 10 chance) that anthropogenic global warming is causing permafrost, a subsurface layer of frozen soil, to melt in high-latitude regions and in high-elevation regions. [49] As permafrost melts it releases methane, a greenhouse gas that absorbs 84 times more heat than CO₂ for the first 20 years it is in the atmosphere, creating even more global warming in a positive feedback loop. [50][51] By the end of the 21st century, warming temperatures in the Arctic will cause a 30%-70% decline in permafrost. [52] According to a 2012 report, as human-caused global warming continues, Arctic air temperatures are expected to increase at twice the global rate, increasing the rate of permafrost

melt, changing the local hydrology, and impacting critical habitat for native species and migratory birds. [53] According to the 2014 National Climate Assessment, some climate models suggest that near-surface permafrost will be “lost entirely” from large parts of Alaska by the end of the 21st century. [16] (a recent update on this topic is that the melting permafrost will release ancient microbes that humanity is not accustomed to <https://www.breitbart.com/environment/2020/02/16/the-guardian-warns-of-ancient-microbes-to-emerge-from-melting-permafrost/>)

Con 1

More than one thousand scientists disagree that human activity is primarily responsible for global climate change.

In 2010 Climate Depot released a report featuring more than 1,000 scientists, several of them former UN IPCC scientists, who disagreed that humans are primarily responsible for global climate change. [55] The Cook review [1] of 11,944 peer-reviewed studies found 66.4% of the studies had no stated position on anthropogenic global warming, and while 32.6% of the studies implied or stated that humans are contributing to climate change, only 65 papers (0.5%) explicitly stated “that humans are the primary cause of recent global warming.” [54] A 2012 Purdue University survey found that 47% of climatologists challenge the idea that humans are primarily responsible for climate change and instead believe that climate change is caused by an equal combination of humans and the environment (37%), mostly by the environment (5%), or that there’s not enough information to say (5%). [173] In 2014 a group of 15 scientists dismissed the US National Climate Assessment as a “masterpiece of marketing,” that was “grossly flawed,” and called the NCA’s assertion of human-caused climate change “NOT true.” [56] (see also <https://www.forbes.com/sites/uhenergy/2016/12/14/fact-checking-the-97-consensus-on-anthropogenic-climate-change/#750792751157>)

Con 2

Earth’s climate has always warmed and cooled, and the 20th century rise in global temperature is within the bounds of natural temperature fluctuations over the past 3,000 years.

Although the planet has warmed 1-1.4°F over the 20th century, it is within the +/- 5°F range of the past 3,000 years. [114] A 2003 study by researchers at the Harvard-Smithsonian Center for Astrophysics found that “many records reveal that the 20th century is probably not the warmest nor a uniquely extreme climatic period of the last millennium.” [115] A 2005 study published in *Nature* found that “high temperatures - similar to those observed in the twentieth century before 1990 - occurred around AD 1000 to 1100” in the Northern Hemisphere. [116] A 2013 study published in *Boreas* found that summer temperatures during the Roman Empire and Medieval periods were “consistently higher” than temperatures during the 20th century. [59] According to a 2010 study in the *Chinese Science Bulletin*, the recent global warming period of the 20th century is the result of a natural 21-year temperature oscillation, and will give way to a “new cool period in the 2030s.” [74]



Con 3

Rising levels of atmospheric CO2 do not necessarily cause global warming, which contradicts the core thesis of human-caused climate change.



Earth’s climate record shows that warming has preceded, not followed, a rise in CO2. According to a 2003 study published in *Science*, measurements of ice core samples show that over the last four climactic cycles (past 240,000 years), periods of natural global warming preceded global increases in CO2. [117] In 2010 the *Proceedings of the National Academy of Sciences* published a study of the earth’s climate 460-445 million years ago which found that an intense period of glaciation, not warming, occurred when CO2 levels were 5 times higher than they are today. [4] According to ecologist and former Director of Greenpeace International Patrick Moore, PhD, “there is some correlation, but little evidence, to support a direct causal relationship between CO2 and global temperature through the millennia.” [60] (see also <https://www.zmescience.com/science/physics/ice-age-earth-crust-09022015/> and

this explanation of ice ages <https://www.pbs.org/wgbh/nova/article/cause-ice-age/>)

Con 4

Human-produced CO2 is re-absorbed by oceans, forests, and other “carbon sinks,” negating any climate changes.

According to a 2011 study published in the *Asia-Pacific Journal of Atmospheric Science*, many climate models that predict additional global warming to occur from CO2 emissions “exaggerate positive feedbacks and even show positive feedbacks when actual feedbacks are negative.” [75] About 50% of the CO2 released by the burning of fossil fuels and other human activities has already been re-absorbed by the earth’s carbon sinks. [118] From 2002-2011, 26% of human-caused CO2 emissions were absorbed specifically by the world’s oceans. [61] A 2010 study published in the *Proceedings of the National Academy of Sciences* found evidence that forests are increasing their growth rates in response to elevated levels of CO2, [62] which will in turn, lower atmospheric CO2 levels in a negative feedback. According to an Aug. 2012 study in *Nature*, the rate of global carbon uptake by the earth’s carbon sinks, such as its forests and oceans, doubled from 1960-2010 and continues to increase. [64]

Con 5

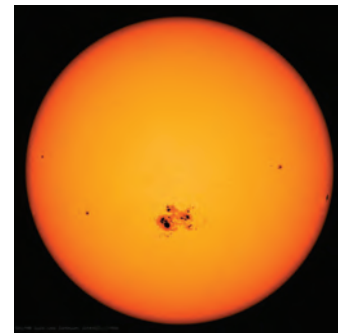
CO2 is already saturated in earth's atmosphere, and more CO2, manmade or natural, will have little impact on climate.

As CO2 levels in the atmosphere rise, the amount of additional warming caused by the increased concentration becomes less and less pronounced. [65] According to Senate testimony by William Happer, PhD, Professor of Physics at Princeton University, "[a]dditional increments of CO2 will cause relatively less direct warming because we already have so much CO2 in the atmosphere that it has blocked most of the infrared radiation that it can. The technical jargon for this is that the CO2 absorption band is nearly 'saturated' at current CO2 levels." [66] According to the Heartland Institute's 2013 Nongovernmental International Panel on Climate Change (NIPCC) report, "it is likely rising atmospheric CO2 concentrations will have little impact on future climate." [67]

Con 6

Global warming and cooling are primarily caused by fluctuations in the sun's heat (solar forcing), not by human activity.

Over the past 10,000 years, solar minima (reduced sun spot activity) have been "accompanied by sharp climate changes." [68] Between 1900 and 2000 solar irradiance increased 0.19%, and correlated with the rise in US surface temperatures over the 20th century. [114] According to a 2007 study published in *Energy & Environment*, "variations in solar activity and not the burning of fossil fuels are the direct cause of the observed multiyear variations in climatic responses." [69] In a 2012 study by Willie Soon, PhD, Physicist at the Harvard-Smithsonian Center for Astrophysics, a strong correlation between solar radiation and temperatures in the Arctic over the past 130 years was identified. [70] According to a 2012 study published in the *Journal of Atmospheric and Solar-Terrestrial Physics*, "up to 70% of the observed post-1850 climate change and warming could be associated to multiple solar cycles." [71]



Con 7

The rate of global warming has slowed over the last decade even though atmospheric CO2 continues to increase.

The Intergovernmental Panel on Climate Change (IPCC) recognized a slowdown in global warming over the past 15 years in its 2013 report. [29] According to the Heartland Institute's 2013 NIPCC report, the earth "has not warmed significantly for the past 16 years despite an 8% increase in atmospheric CO2." [67] In Aug. 2014 a study in the Open Journal of Statistics analyzed surface temperature records and satellite measurements of the lower atmosphere and confirmed that this slowdown in global warming has occurred. [72] According to Emeritus Professor of Meteorology at the Massachusetts Institute of Technology Richard Lindzen, PhD, the IPCC's "excuse for the absence of warming over the past 17 years is that the heat is hiding in the deep ocean. However, this is simply an admission that the [climate] models fail to simulate the exchanges of heat between the surface layers and the deeper oceans" [73]

Con 8

Sea levels have been steadily rising for thousands of years, and the increase has nothing to do with humans.

A 2014 report by the Global Warming Policy Foundation found that a slow global sea level rise has been ongoing for the last 10,000 years. [79] When the earth began coming out of the Pleistocene Ice Age 18,000 years ago, sea levels were about 400 feet lower than they are today and have been steadily rising ever since. [60] According to Professor of Earth and Atmospheric Sciences at the Georgia Institute of Technology, Judith Curry, PhD "it is clear that natural variability has dominated sea level rise during the 20th century, with changes in ocean heat content and changes in precipitation patterns." [80] Freeman Dyson, Emeritus Professor of Mathematical Physics and Astrophysics at the Institute for Advanced Study at Princeton University, has stated that there is "no evidence" that rising sea levels are due to anthropogenic climate change. [81]

Con 9

The acidity levels of the oceans are within past natural levels, and the current rise in acidity is a natural fluctuation, not the result of human caused climate change.

[120] The pH of average ocean surface water is 8.1 and has only decreased 0.1 since the beginning of the industrial revolution (neutral is pH 7, acid is below pH 7). [121] In 2010 Science published a study of ocean acidity levels over the past 15 million years, finding that the "samples record surface seawater pH values that are within the range observed in the oceans today." [82] Increased atmospheric CO2 absorbed by the oceans results in higher rates of photosynthesis and faster growth of ocean plants and phytoplankton, which increases pH levels keeping the water alkaline, not acidic. [60] According to a 2010 paper by the Science and Public Policy Institute, "our harmless emissions of trifling quantities of carbon dioxide cannot possibly acidify the oceans." [63]



Con 10

Predictions of accelerating human-caused climate change are based upon computerized climate models that are inadequate and incorrect.

Climate models have been unable to simulate major known features of past climate such as the ice ages or the very warm climates of the Miocene, Eocene, and Cretaceous periods. If models cannot replicate past climate changes they should not be trusted to predict future climate changes. [58] A 2011 *Asia-Pacific Journal of Atmospheric Science* study using observational data rather than computer climate models concluded that “the models are exaggerating climate sensitivity” and overestimate how fast the earth will warm as CO2 levels increase. [75] Two other studies using observational data found that IPCC projections of future global warming are too high. [76] [97] In a 2014 article, climatologist and former NASA scientist Roy Spencer, PhD, concluded that 95% of climate models have “over-forecast the warming trend since 1979.” [77] According to Emeritus Professor of Geography at the University of Winnipeg, Tim Ball, PhD, “IPCC computer climate models are the vehicles of deception... [T]hey create the results they are designed to produce.” [78]

Con 11

Glaciers have been growing and receding for thousands of years due to natural causes, not human activity.

The IPCC predicted that Himalayan glaciers would likely melt away by 2035, a prediction they disavowed in 2010. [83] In 2014 a study of study of 2,181 Himalayan glaciers from 2000-2011 showed that 86.6% of the glaciers were not receding. [84] According to a 2013 study of ice cores published in *Nature Geoscience*, the current melting of glaciers in Western Antarctica is due to “atmospheric circulation changes” that have “caused rapid warming over the West Antarctic Ice Sheet” and cannot be directly attributed to human caused climate change. [85] According to one of the study authors, “[i]f we could look back at this region of Antarctica in the 1940s and 1830s, we would find that the regional climate would look a lot like it does today, and I think we also would find the glaciers retreating much as they are today.” [86] According to Christian Schlüchter, Professor of Geology at the University of Bern, 4,000 year old tree remains have been found beneath retreating glaciers in the Swiss Alps, indicating that they were previously glacier-free. According to Schlüchter, the current retreat of glaciers in the Alps began in the mid-19th century, before large amounts of human caused CO2 had entered the atmosphere. [87]

Con 12

Deep ocean currents, not human activity, are a primary driver of natural climate warming and cooling cycles.

Changes in ocean currents are primarily responsible for the melting Greenland ice sheet, Arctic sea ice, and Arctic permafrost. Over the 20th century there have been two Arctic warming periods with a cooling period (1940-1970) in between. According to a 2009 study in *Geophysical Research Letters*, natural shifts in the ocean currents are the major cause of these climate changes, not human-generated greenhouse gases. [124] According to William Gray, PhD, Emeritus Professor of Atmospheric Science at Colorado State University, most of the climate changes over the last century are natural and “due to multi-decadal and multi-century changes in deep global ocean currents.” [122] Global cooling from 1940 to the 1970s, and warming from the 1970s to 2008, coincided with fluctuations in ocean currents and cloud cover driven by the Pacific Decadal Oscillation (PDO) - a naturally occurring rearrangement in atmospheric and oceanic circulation patterns. [123] According to a 2014 article by Don Easterbrook, PhD, Professor Emeritus of Geology at Western Washington University, the “PDO cool mode has replaced the warm mode in the Pacific Ocean, virtually assuring us of about 30 years of global cooling, perhaps much deeper than the global cooling from about 1945 to 1977.” [88]

Con 13

Increased hurricane activity and other extreme weather events are a result of natural weather patterns, not human-caused climate change.



According to a 2013 report from the Tropical Meteorology Project at Colorado State University, the increase in human-produced CO2 over the past century has had “little or no significant effect” on global tropical cyclone activity. The report further states that specific hurricanes, including Sandy, Ivan, Katrina, Rita, Wilma, and Ike, were not a direct consequence of human-caused global warming. [89] Between 1995-2015 increased hurricane activity (including Katrina) was recorded, however, according to the NOAA, it was not the result of human-induced climate change; it was the result of cyclical tropical cyclone patterns, driven primarily by natural ocean currents. [125] Many types of recorded extreme weather events over the past half-century have actually become less frequent and less severe. [93] Professor of Earth and Atmospheric

Sciences at the Georgia Institute of Technology, Judith Curry, PhD, states that she is “unconvinced by any of the arguments that I have seen that attributes a single extreme weather event, a cluster of extreme weather events, or statistics of extreme weather events” to human-caused climate change. [90] Richard Lindzen, PhD, Emeritus Professor of Meteorology at the Massachusetts Institute of Technology, also states that there is a lack of evidence connecting extreme weather events such as hurricanes, tornadoes, droughts, or floods, to human-caused global warming. [92]

Questions to guide the reading of the pros and cons

1. After studying and reading all the arguments what do the two sides agree upon?
2. Even if the two sides generally agree on this point, is it a conclusive fact?
3. Is this warming a dangerous development?
4. What general evidence is there for this conclusion?

5. In the caption for the PRO-CON one finds a caveat from journalist H.L. Mencken, is there truth in his warning if applied to the climate change controversy?
6. For each pro and corresponding con argument make the case as to which argument is more persuasive and explain why.
7. What could the rise and fall of water levels in our own Great Lakes demonstrate about climate change in the past 10,000-30,000 years? (see <https://museum.mtu.edu/about-us/education-research/great-lakes-geology> and http://academic.emporia.edu/aberjame/student/damery1/gl_form.html)



Role of Media in the Climate Change Debate

As in all debates involving conflicting points of view, the media can and does play an important role in highlighting/promoting a particular point of view or ignoring/suppressing another point of view. *Wikipedia* offers an overall report on how media cover the issue of environment and climate change. According to the report, not all that well, with shortcomings and bias present in the various media.

https://en.wikipedia.org/wiki/Media_coverage_of_global_warming

Here are a few excerpts regarding their findings:

1. **Media coverage is not constant**, which poses the question on whether this climate emergency, almost like a trend, will die down as the media moves onto something else. The media will only ever be interested in what will create the most interest, which is why it is essential that climate change is constantly fought for.
2. **“Children’s protest in relation to the climate emergency:** A qualitative study on a new form of resistance promoting political and social change[15]” can prove to be a useful and insightful resource for those interested in studying media coverage of **climate change activism**. Despite the above point, an interesting source to consider is an academic journal which considers *how children have evolved into prominent actors to create a global impact on our awareness of climate change*. The essay highlights the work of children like Greta Thunberg[16] and the significance of their resistance to passivity of world leaders to climate change.
3. **Alarmism is using inflated language, including an urgent tone and imagery of doom.** In a report produced for the Institute for Public Policy Research, Gill Ereat and Nat Segnit suggested that alarmist language is frequently used in relation to environmental matters by newspapers, popular magazines and in campaign literature put out by the government and environment groups.[35] *It is claimed that when applied to climate change, alarmist language can create a greater sense of urgency.*[36]
4. **The relationship between media and politics is reflexive.** As Feindt & Oels state, “[media] discourse has material and power effects as well as being the effect of material practices and power relations”.[51] *Public support of climate change research ultimately decides whether or not funding for the research is made available to scientists and institutions.*
5. As highlighted above, media coverage in the United States during the Bush Administration *often emphasized and exaggerated scientific uncertainty over climate change*, reflecting the interests of the political elite.[52] Hall et al. suggest that government and corporate officials enjoy privileged access to the media, so their line quickly becomes the ‘primary definer’ of an issue. [53] Furthermore, *media sources and their institutions very often have political leanings which determine their reporting on climate change, mirroring the views of a particular party.*[54] However, media also has the capacity to challenge political norms and expose corrupt behaviour,[55] as demonstrated in 2007 when The *Guardian* revealed that American Enterprise Institute received \$10,000 from petrochemical giant Exxon Mobil to publish articles undermining the IPCC’s 4th assessment report.
6. Ever-strengthening **scientific consensus on climate change means that skepticism is becoming less prevalent in the media** (although the email scandal in the build up to Copenhagen reinvigorated climate skepticism in the media[56]). [a case in point in the Canadian context is the July 11, 2019 edition of *MacLeans* magazine devoted to climate change]
7.Media coverage of climate change (particularly in tabloid journalism but also more generally), is concentrated around extreme weather events and projections of catastrophe, creating “a language of imminent terror”[60] which some commentators argue has instilled policy-paralysis and inhibited response. Moser et al. suggest using solution-orientated frames will help inspire action to solve climate change.[61]
8. Breaking the prevailing notions in society requires discourse that is traditionally appropriate and approachable to common people. For example, Bill McKibben, **an environmental activist, provides one approach to inspiring action: a war-like mobilization, where climate change is the enemy.**[63] This approach would resonate with working Americans who normally find themselves occupied with other news headlines.
9. Additionally, **international movements in developing countries in the Global South are usually excluded in developed nations that assert hegemony over the economies of developing nations.** This especially applies to the people of Latin America, that are battling multinational oil and mineral corporations that seek to cooperate with the ruling class and exploit



fragile ecosystems. There is comparatively little knowledge of the impacts of social media, including message platforms like Twitter, on public attitudes toward climate change.[65]

Questions

1. Can media have a sobering, realistic impact rather than a hostile, or alarmist impact on the public debate? (Consider the phrases deliberately put in bold type)
2. How should media be covering the issue? Can one point to an objective approach on the internet?
3. What about the general research field itself, what do these people start with, an open mind or a predetermined outcome because of a deeply held ideological agenda?
4. What are some of the problems or challenges to media's role in the climate debate?
5. Has media generally handled the Greta Thunberg activism fairly?
6. Is the problem of climate change scientific, economic, political, spiritual or ideological in nature?
7. Does the debate unwittingly place the extreme environmentalist in conflict with the Holy Bible's version of creation and the dominion of man over the earth and its creatures?
8. Does it mean that religious values and beliefs are the enemy of environmentalism?

Media Bias Regarding Climate Change

A legitimate question to ask is whether local and national newspapers cover the topic of climate change in a balanced or objective fashion? Students could be assigned to do a research study of their local newspaper as well as or as an alternative to a national media outlet. They could use the following questions to guide their research:

- a. Are the reports numerous? How frequently do articles dealing with climate change appear in the newspaper? Once a year, twice a year? Monthly? Weekly?
- b. Are the articles written by scientists or reporters assigned to this field? If by reporters, do they cite scientists and scientific sources?
- c. Does the paper have an editorial policy on the topic of climate change?
- d. What aspects of the public issue do the articles address most often – the scientific or the political?
- e. How long are the articles, 150 words or less, or an attempt at investigation and analysis of some development?
- f. What do readers opine in the letters to the editor?

Students can be encouraged to consider other components to arrive at a good understanding of the role of media.

Examples: Excerpts from *The Guardian*

Why the *Guardian* is changing the language it uses about the environment

Damian Carrington *Environment editor*

The Guardian has updated its style guide to introduce terms that more accurately describe the environmental crises facing the world. Instead of “climate change” the preferred terms are “climate emergency, crisis or breakdown” and “global heating” is favoured over “global warming”, although the original terms are not banned.

‘Extraordinary thinning’ of ice sheets revealed deep inside Antarctica

“We want to ensure that we are being scientifically precise, while also communicating clearly with readers on this very important issue,” said the editor-in-chief, Katharine Viner. “The phrase ‘climate change’, for example, sounds rather passive and gentle when what scientists are talking about is a catastrophe for humanity.”

“Increasingly, climate scientists and organisations from the UN to the Met Office are changing their terminology, and using stronger language to describe the situation we’re in,” she said.

The United Nations secretary general, António Guterres, talked of the “climate crisis” in September, adding: “We face a direct existential threat.” The climate scientist Prof Hans Joachim Schellnhuber, a for-



The destruction of Arctic ecosystems forces animals to search for food on land, such as these polar bears in northern Russia.

Photograph: Alexander Grir/AFP/Getty Images

mer adviser to Angela Merkel, the EU and the pope, also uses “climate crisis”.

In December, Prof Richard Betts, who leads the Met Office’s climate research, said “global heating” was a more accurate term than “global warming” to describe the changes taking place to the world’s climate. In the political world, UK MPs recently endorsed the Labour party’s declaration of a “climate emergency”.

The scale of the climate and wildlife crises has been laid bare by two landmark reports from the world’s scientists. In October, they said carbon emissions must halve by 2030 to avoid even greater risks of drought, floods, extreme heat and poverty for hundreds of millions of people. In May, global scientists said human society was in jeopardy from the accelerating annihilation of wildlife and destruction of the ecosystems that support all life on Earth.

Other terms that have been updated, including the use of “wildlife” rather than “biodiversity”, “fish populations” instead of “fish stocks” and “climate science denier” rather than “climate sceptic”. In September, the BBC accepted it gets coverage of climate change “wrong too often” and told staff: “You do not need a ‘denier’ to balance the debate.”

Earlier in May, Greta Thunberg, the Swedish teenager who has inspired school strikes for climate around the globe, said: “It’s 2019. Can we all now call it what it is: climate breakdown, climate crisis, climate emergency, ecological breakdown, ecological crisis and ecological emergency?”

The update to the *Guardian*’s style guide follows the addition of the global carbon dioxide level to the *Guardian*’s daily weather pages. “Levels of CO2 in the atmosphere have risen so dramatically – including a measure of that in our daily weather report is symbolic of what human activity is doing to our climate,” said Viner in April. “People need reminding that the climate crisis is no longer a future problem – we need to tackle it now, and every day matters.”

Climate misinformation is rife... and never more dangerous than now, as the crisis escalates across the world. The *Guardian*’s accurate, authoritative journalism has never been more critical – and we will not stay quiet. This is our pledge: we will continue to give global heating, wildlife extinction and pollution the urgent attention and prominence they demand. We recognise the climate emergency as the defining issue of our lifetimes.

We chose a different approach: to keep *Guardian* journalism open for all. We don’t have a paywall because we believe everyone deserves access to factual information, regardless of where they live or what they can afford to pay.

Our editorial independence means we are free to investigate and challenge inaction by those in power. We will inform our readers about threats to the environment based on scientific facts, not driven by commercial or political interests. And we have made several important changes to our style guide to ensure the language we use accurately reflects the environmental emergency.

The *Guardian* believes that the problems we face on the climate crisis are systemic and that fundamental societal change is needed. We will keep reporting on the efforts of individuals and communities around the world who are fearlessly taking a stand for future generations and the preservation of human life on earth. We want their stories to inspire hope. We will also report back on our own progress as an organisation, as we take important steps to address our impact on the environment.

<https://www.theguardian.com/environment/2019/may/17/why-the-guardian-is-changing-the-language-it-uses-about-the-environment>

Today we pledge to give the climate crisis the attention it demands

Katharine Viner, Editor



At the *Guardian* we believe the climate crisis is the most urgent issue of our times. And we know that *Guardian* readers are equally passionate about the need for governments, businesses and individuals to take immediate action to avoid a catastrophe for humanity and for the natural world.

Today the *Guardian* is making a pledge to our readers that we will play our part, both in our journalism and in our own organisation, to address the climate emergency. We hope this underlines to you the *Guardian*’s deep commitment to quality environmental journalism, rooted in scientific fact.

We have always led the way in environmental reporting, whether it’s covering air pollution or wildlife extinction, threats to the oceans or the human and social costs that rising temperatures bring.

But now more than ever, we believe the *Guardian*’s specialist team of reporters, editors and writers has a vital role to play in working with our readers to understand the unfolding climate crisis and all its ramifications.

We now have dedicated reporters around the world, including in the US, the biggest carbon polluter on the globe; Australia, the biggest exporter of coal and liquid natural gas; and Brazil, where President Jair Bolsonaro has disputed that climate is a factor as fires rage in the Amazon.

As an organisation we will take steps to address the *Guardian*’s own impact on the environment. Today we commit to achieving net zero emissions by 2030, and we are currently undertaking a full audit of our emissions to assess how we will achieve this challenging goal. Through our recently acquired B Corp status, which commits us to reducing our environmental impact as well as to high standards of governance and social impact, we will be transparent and accountable.



At the *Guardian* we believe it is vital to give people open access to factual, independent reporting on the climate crisis. For this reason, and thanks to generous financial support from readers in more than 180 countries, we can keep all *Guardian* journalism free of a paywall.

Thank you. This support allows us to focus on delivering powerful reporting on the climate emergency, and its impact on people and the planet.

Just last week we published a global investigative series, *The Polluters*, examining how just 20 companies are responsible for more than a third of all global emissions. This reporting, by our environmental team and network of correspondents around the world with their wealth of specialist knowledge, is possible only with the support of *Guardian* readers.

In her speech to Congress in September, Greta Thunberg said: “This is the moment in history when we need to be wide awake.”

I agree. And my pledge today is that the *Guardian* will give the climate crisis the attention it demands – and deliver our open independent reporting to everyone.

<https://www.theguardian.com/environment/2019/oct/16/today-we-pledge-to-give-the-climate-crisis-the-attention-it-demands>

What about bias from the other side: Example of The American Thinker

Global warming, global cooling, climate change, climate emergency, climate catastrophe, climate collapse or existential threat?

December 4, 2019, by Jack Hellner

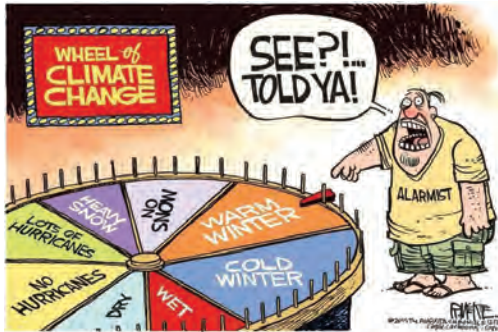
What wets your whistle? It's another day and another dire warning from the UN. Of course, almost 100% of the media repeats these dire warnings in order to indoctrinate the public, especially the young, with no questions asked as the media pretends they are fact checkers.

What is always missing from these articles and warnings is factual historical data. There are no statistics to show how little the temperature has changed the last 140 years, only made up numbers about the future. There are no statistics to show how little the sea levels have changed the last 140 years, only threats about the future. There are also no statistics on hurricanes, tornadoes, blizzards or drought the last 149 years, only made up numbers about the supposed threat.

Somehow, these supposedly educated journalists never point out how wrong previous predictions have been, but the solution is always to transfer freedom and trillions of dollars to bureaucrats and politicians throughout the World.

Today we only have a few years left and the cost has gone up substantially. Is it any wonder that the birth rate is so low when most of the people pushing the climate catastrophe crap also support abortion on demand at any stage of the pregnancy and we are told that humans are destroying the Earth and they are going to die soon anyway so why bring children into the World?

U.N. Chief Warns “Point of No Return” on Climate Change “Is in Sight”



U.N. Secretary-General Antonio Guterres isn't mincing words when it comes to issuing a dire warning about the global climate crisis, saying that the effort to stop climate change has been “utterly inadequate.”

No one should want their children to live in this ‘bleak’ future

In 1989, the UN also warned that we only had a few years left and journalists, like puppets without a brain, just repeated the warnings with no questions asked.

U.N. Predicts Disaster if Global Warming Not Checked

A senior U.N. environmental official says entire nations could be wiped off the face of the Earth by rising sea levels if the global warming trend is not reversed by the year 2000

In 1970, we were all going to die soon from global cooling and journalists, like puppets without a brain, just repeated the garbage with no questions asked.

18 spectacularly wrong predictions made around the time of the first Earth Day in 1970, expect more this year

In January 1970, Life reported, “Scientists have solid experimental and theoretical evidence to support...the following predictions: In a decade, urban dwellers will have to wear gas masks to survive air pollution...by 1985 air pollution will have reduced the amount of sunlight reaching earth by one half....”

The dire warnings to scare the kids and public have been going on for at least 97 years and as always journalists just repeat the fear with no questions asked.

The Global Warming Apocalypses That Didn't Happen

The Arctic Ocean is warming up, icebergs are growing scarcer, and in some places the seals are finding the water too hot. Reports from fishermen, seal hunters, and explorers all point to a radical change in climate conditions and hitherto unheard-of temperatures in the Arctic zone. Exploration expeditions report that scarcely any ice has been met as far north as 81 degrees 29 minutes. Within a few years it is predicted that due to the ice melt the sea will rise and make most coastal cities uninhabitable.”
– from an Associated Press report published in *The Washington Post* on Nov. 2, 1922.

It would be much easier and cheaper if the 1922 article was continually rerun as the predictions and warnings are essentially the same.

Here is an easy question who push the indoctrination on the climate: How did the catastrophic warnings go from global warming in 1922 to global cooling in 1970 if rising CO2, the rapidly increasing population and an exponential rise in fossil fuel use cause warming?

Journalists are worthless if they just push policies with no questions asked. In 1922 it was global warming; in 1970 it was global cooling. In 1989, it was global warming again and then it changed to climate change. Then that wasn't enough, so it has evolved into climate disaster, climate catastrophe and an existential threat greater than terrorism. Politicians are obviously poll testing to see what scares people the most.

Here is a hint to journalists and other Democrats: The protests in Hong Kong, France, Venezuela, Iran and elsewhere have nothing to do with climate change. The cartels in Mexico have nothing to do with climate change. The illegal immigrants seeking to come to the U.S. are not coming because of climate change. The Syrian refugee crisis did not occur because of climate change and the terrorist who stabbed people in London this past weekend did not do it because of climate change.

The climate, through billions of years, has always changed cyclically and naturally yet those of us who truthfully state this are called stupid, anti-science and deniers. The purpose of calling us stupid and deniers is to discourage questions and debate, especially among the young. Not asking questions breeds stupidity. Journalists are major contributors to the breeding of stupidity because they not only won't ask questions, they stifle the speech of those who do.

The purpose of breeding stupidity is to make people willing to hand over money, freedom and power to greedy politicians and make a greater share of people dependent on government for everything and that is the Democrats' goal.

The greater existential threat to our freedom, democracy and prosperity is indoctrination on climate change, not climate change itself.

https://www.americanthinker.com/blog/2019/12/global_warming_global_cooling_climate_change_climate_emergency_climate_catastrophe_climate_collapse_or_existential_threat.html

Questions

1. Given its editorial commitment, should The *Guardian* newspaper be considered as an objective reliable purveyor of science news?
2. Even if it already has taken a position, like so many media have, why would it still be valuable to read its articles?
3. Does your local newspaper reflect the same kind of approach?
4. What rationale did The *Guardian* give for its change of language? Is it justified or is it a betrayal of true objectivity?
5. Do you think that newspapers and other media are hyping the climate change issue unnecessarily?
6. Are the "factual claims made in the following statement true? *We now have dedicated reporters around the world, including in the US, the biggest carbon polluter on the globe; Australia, the biggest exporter of coal and liquid natural gas; and Brazil, where President Jair Bolsonaro has disputed that climate is a factor as fires rage in the Amazon.*
7. Does The *Guardian* in fact offer an independent reporting on the climate issue?
8. Conduct a similar analysis of the article from The American Thinker;
 - a) Ask questions #1 and #2 from above.
 - b) What are the primary concerns expressed by Jack Hellner?
 - c) Does he have a legitimate point? What do the actual statistics say? Do the stats support his point of view?
9. Keep these two different approaches in mind as you address specific arguments listed and cited below.
10. How does the cartoon undermine the alarmist point of view?
11. "The weather has changed dramatically on all continents, from rapidly melting glaciers to more intense hurricanes, typhoons and cyclones - from unimaginable droughts, fires, and flooding to loss of many species of wildlife. Our species is littering the planet, our oceans, our space, our land and destroying rainforests at breakneck speed". This is the usual claim but is it factually correct?
12. How many hurricanes (typhoons, cyclones, tornadoes) have there been in the past 20 years in comparison to other 20 year periods? Where in the world?
13. What about the relative intensity of these natural destructive phenomena?
14. How many droughts have been experienced by areas known for their droughts, like California? Canadian prairies? Parts of Africa? How many, what intensity?
15. Is deforestation going on? Are they being replaced and at what speed? Is the planet in fact greener today than before, say 40 years ago?
16. Are species really disappearing? How do we know? How do we count them if they are believed to be in the hundreds of thousands if not millions?
17. Are questions #12-#16 legitimate to ask? Do we have answers to them?

Specific Arguments and Sites Helpful in Understanding Them

<http://sealevel.colorado.edu/content/detection-accelerated-sea-level-rise-imminent>

The argument of sea level rise is actually compromised by its own data, when the researcher uses terms like “estimated” and then the effect of the volcanic eruption on the data. The rise is not proceeding as predicted because of these unplanned for or unforeseen natural activities on the planet.

<https://climate.nasa.gov/news/2865/a-degree-of-concern-why-global-temperatures-matter/>

“The degree of these risks depends on many factors, such as the rate, duration and magnitude of warming; geographic location; levels of development and vulnerability; and on how humans respond through adaptation and mitigation options..... Temperature change is not uniform across the globe.”

https://interactive.carbonbrief.org/impacts-climate-change-one-point-five-degrees-two-degrees/?utm_source=web&utm_campaign=Redirect

Allows for the viewer to look at different components (rainfall, droughts, crops, flooding, cyclones etc) as by change in average temperature of 1.5 C and 2.0 C. It supports the view that the climate warming affects different locations in different ways.

<https://grist.org/climate/climate-change-fueled-the-australia-fires-now-those-fires-are-fueling-climate-change/>

The title or headline of the article is actually not borne out by the information in the article. The effects of the Australian fires on climate is the better headline in terms of truth. It tries to attribute the fires to climate change, but in fact does not do so. The reality is that Australian authorities have arrested more than 150 people for starting such forest fires over the last four months (October to January).

<https://www.investors.com/politics/editorials/another-climate-alarmist-admits-real-motive-behind-warming-scare/>

This site tries to argue against the alarmism of climate change. It comes from a free market investing point of view. Quoting Ottmar Edenhofer who co-chaired the U.N.’s Intergovernmental Panel on Climate Change working group on Mitigation of Climate Change from 2008 to 2015, the international climate policy is not environmental policy. So what is the goal of environmental policy?

“We redistribute de facto the world’s wealth by climate policy,” said Edenhofer, and a little more than five years ago he also said that “the next world climate summit in Cancun is actually an economy summit during which the distribution of the world’s resources will be negotiated.”

Christiana Figueres, executive secretary of U.N.’s Framework Convention on Climate Change, **made a similar statement:** “This is the first time in the history of mankind that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development model that has been reigning for at least 150 years, since the Industrial Revolution,”

The plan is to allow Third World countries to emit as much carbon dioxide as they wish – because, as Edenhofer said, “in order to get rich one has to burn coal, oil or gas” – while at the same time restricting emissions in advanced nations. This will, of course, choke economic growth in developed nations, but they deserve that fate as they “have basically expropriated the atmosphere of the world community,” he said. The fanaticism runs so deep that one professor has even suggested that we need to plunge ourselves into a depression to fight global warming.

<https://www.heritage.org/environment/commentary/climate-alarmists-admit-they-want-dismantle-our-free-enterprise-system>

The argument here is similar to the preceding. This American source asserts that climate change alarmists are simply out to destroy the free enterprise system of capitalism.

<https://www.heritage.org/environment/commentary/promoting-sound-science-not-junk-science>

In this article the author argues in favour of neutral science relative to policy options, The two should not be conflated.

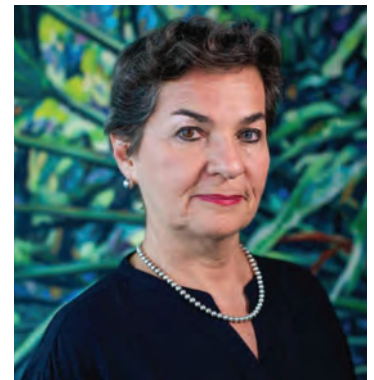
First, agencies should make publicly available the scientific studies used in rule making. This would include making underlying data and assumptions, models, and computer codes available. It also means explaining why some studies were used while other credible studies were excluded. Basically, everything that is required to properly evaluate the science and the scientific process should be made public.

... Then there are claims that academic peer review should be sufficient without public access to the science. This notion completely ignores basic democratic principles of a meaningful public voice in how laws are developed. It also completely ignores the significant problems that pervade academic peer review processes.

Second, agencies should draw clear distinctions between science and policy. Science doesn’t answer policy questions, but informs policy decisions by providing answers to objective questions. As a result, science shouldn’t be used as a cover for pushing policy and ideological agendas.

Real Difficulties in Reaching Basic Agreement

But the problem of reporting gets even worse when there is no agreement as to even how much greenhouse gas emissions are produced by volcanic eruptions in a single year. Look at these disparate reports in which estimates of the carbon dioxide emissions yearly ranges widely, from 200 million to 650 million tonnes; but, in all three cases the figures are dwarfed by the estimated amount emitted by human activities (cars, petroleum products and manufacturing, etc. – but here too there is a wide range – from 24 billion to 34 billion tons. These variations are not insignificant.) However, there is what appears to be a credible outlier, reported by a volcanologist who estimates that the volcanic contribution may be almost 2 billion tons a year.



Christiana Figueres, executive secretary of U.N.’s Framework Convention on Climate Change

<https://www.scientificamerican.com/article/earthtalks-volcanoes-or-humans/>

Are Volcanoes or Humans Harder on the Atmosphere ...

<https://www.forbes.com/sites/startswithabang/2017/06/06/how-much-co2-does-a-single-volcano-emit/#425789135cbf>

How Much CO2 Does A Single Volcano Emit? - *Forbes*

<https://skepticalscience.com/volcanoes-and-global-warming.htm>

Do volcanoes emit more CO2 than humans?

The following two sites offer an estimate of the total carbon on the planet and in its atmosphere, and the relative amounts at different levels and in different forms, as well as carbon balance, volcanic contribution yearly and that caused by human activities. This report is the most recent to be found. (news release 1-oct-2019)

<https://www.livescience.com/40451-volcanic-co2-levels-are-staggering.html>

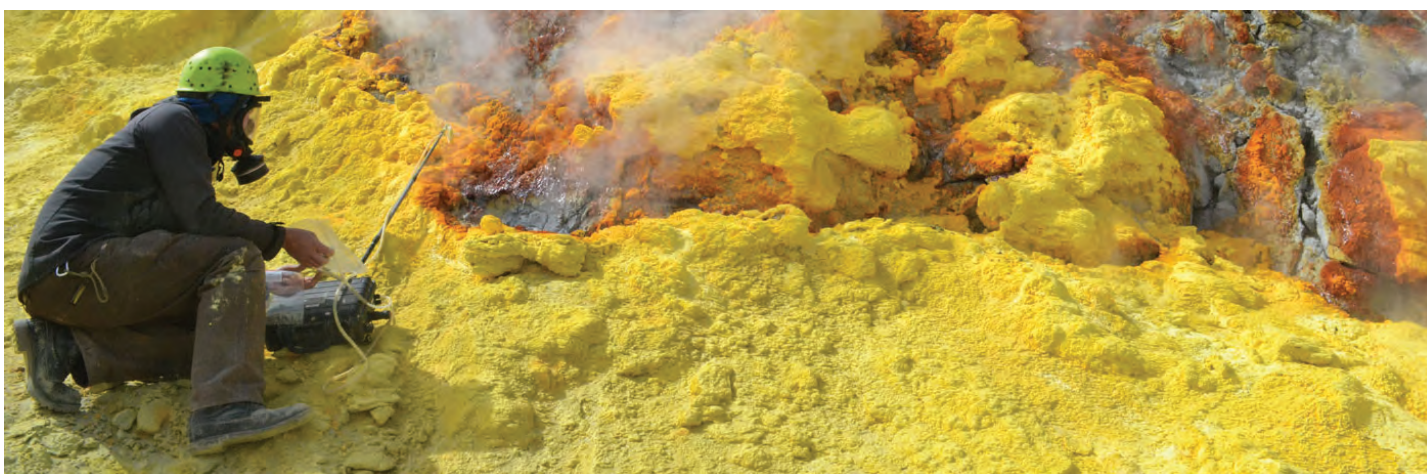
Long Invisible, Research Shows Volcanic CO2 Levels Are Staggering (Op-Ed) By Robin Wylie October 15, 2013

https://www.eurekalert.org/pub_releases/2019-10/tca-sqg092419.php

Scientists quantify global volcanic CO2 venting; estimate total carbon on Earth

There are many wide-ranging findings, outlined and summarized in a series of papers published in the journal *Elements*. It is a very informative article dealing with important components of the carbon cycle and its role in earth's development over time, past and present, and the role of volcanoes as well.

<https://deepcarbon.net/scientists-quantify-global-volcanic-co2-venting-estimate-total-carbon-earth>



Questions

1. Does this information on carbon and volcanic activity support or undercut the claims of climate change proponents? Explain your point of view.

Videos on youtube presenting almost diametrically opposed points of view

This video (<https://www.youtube.com/watch?v=dPWH5RODufe>) deals with carbon capture as a solution to the carbon dioxide emission problem from an economic investment opportunity. The logic here is that potentially the carbon in the atmosphere can be monetized if captured and turned into products commercially made available on world markets. This private enterprise approach is one of several proposals. Is it viable, or is it a boondoggle for private enterprises to take advantage of a problem and only really doable if governments implement heavy carbon taxes? Currently it is being funded at \$100 million a year for R &D, research and development. Bernard David offers examples of innovations that could be commercially viable and that would make a difference climatologically – production of cement responsible currently for 7% of CO2 released into the atmosphere.

At this site (https://www.esrl.noaa.gov/gmd/outreach/behind_the_scenes/gases.html) there is an explanation from the Earth System Research Laboratory, Global Monitoring Division on how and why greenhouse gases are measured.

It's Easy to be Tricked by a Climate Denier by William MacDonald

<https://medium.com/@willardm22/its-easy-to-be-tricked-by-a-climate-denier-a87ba4b4a087>

The author takes exception to the conclusions presented by Gregory Wrightstone in his book *Inconvenient Facts – The Science that Al Gore Doesn't Want You to Know*. Wrightstone makes two basic points: 1) climate change is happening, but it's not human-caused so there's no point in modifying our behavior; and 2) global warming is, in fact, a good thing because historically human societies perform better in warmer climates, crops grow better with more CO2, and because it will help counter the next ice age.

MacDonald says that *Inconvenient Facts* claims, over and over, to be based in science and emphasizes the importance of the scientific method; however, the author does not, himself, use the scientific method in his own analysis. There are no references to any peer-reviewed journal articles by Wrightstone himself. Many of his "inconvenient facts" are non-controversial statements.

In fact, most of them are actually true. It's the conclusions that he draws from the "facts" that are not supported by peer-reviewed journal papers – they're just his own misleading opinions.

MacDonald admits that Wrightstone does ask some important and interesting questions in his book: Are the recent high levels of CO2 anomalous when we look back over the history of the earth? Are rising temperatures correlated with rising CO2 levels in the atmosphere? Is global warming actually a problem for the world? These are all important questions to ask, and legitimate climate scientists have asked them for years. Their findings are backed by data and are subject to the scrupulous peer-review scientific process.

In fairness, one ought to also read or listen to the presentation made by Gregory Wrightstone to the Pennsylvania Environmental Resources & Energy Committee on March 30, 2019. At this site one will find a video of his presentation (<https://www.youtube.com/watch?v=DgO10D3xDrU&t>) while the written paper is found at (<https://inconvenientfacts.xyz/blog/f/statement-to-the-pa-environmental-resources-energy-committee>). Wrightstone asked and answered several important questions to guide them in understanding the controversy over man-made global warming:

"There are some important issues concerning climate change that likely 97% of all scientists can agree to: the atmosphere has warmed about 1.5 degrees F over the last 150 or so years; CO2 has been increasing; increasing CO2 is mainly from combustion of fossil fuels; Increasing CO2 is warming the atmosphere

The three basic questions that differentiate the large and growing community of scientists who are skeptical of catastrophic man-made warming and those who are promoting the "consensus" viewpoint are summarized here:

Concerning the warming over the last 150 years: Is it primarily natural or is it due to increases in greenhouse gases? Are our current temperatures and rate of warming unusual and unprecedented? Is the recent climate change harmful or might it be beneficial?

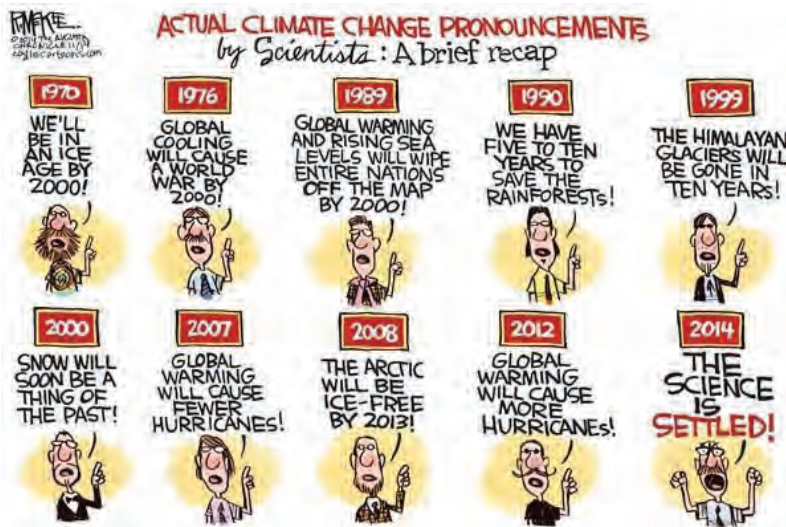
Wrightstone also has a blog (<https://inconvenientfacts.xyz/blog/f/principled-inaction-in-the-face-of-climate-change-extremism>) where he explains his point of view on a regular basis. He goes on to point out that

"But before climate science became politicized, these past warm periods were associated with a thriving, prospering planet, and human civilization benefited in tandem.

The inconvenient facts, at least to the climate catastrophe crowd, is that the bulk of their predictions are errant speculations about what may or may not occur, 50 or 80 years in the future, based on climate models that substantially overestimate temperature rise.

In reality, by nearly every metric, we see that humans are thriving in the changing ecosystem. The current changing climate has led to increasing food production, soil moisture, crop growth, and a "greening" of the Earth. All the while droughts, forest fires, heatwaves and, temperature-related deaths have declined substantially.

Yes, there is such a thing as the greenhouse effect. Yes, there has been some warming. Yes, some of the warming is likely man-made. Yes, some further man-made warming is to be expected. On all these matters, few would disagree; they are all self-evident.



But no, past and future anthropogenic warming do not mean that catastrophe will follow, or that measures to prevent global warming are scientifically and economically justified. Only the radical worldview of environmental catastrophizing could ignore benefits being accrued from atmospheric changes – while embracing harmful economic policies based on fallacious climate models.

What the "crisis narrative" is achieving, however, is extreme regulation and expropriation of profits from the energy sector. For leaders supporting the Paris agreement, the specter of catastrophic warming provides the moral justification for ever-higher taxation, ever-tighter regulation, ever-greater state interference, ever-larger slush funds for big-spending politicians, and ever-diminished individual freedom to use, acquire, and consume at will.

President Trump is bravely taking a stance against environmental extremism. "What we won't do is punish the American people while enriching foreign polluters," President Trump said during a keynote to natural gas executives and employees at the Shale Insight conference in October of 2017. Pointing to the rising U.S. oil and gas production, and his efforts to deregulate the industry in the name of ending the "war on energy," President Trump applauded his audience: "With unmatched skill, grit and devotion, you're making America the greatest energy superpower in the history of the world."

It takes a lot of courage to do nothing ... Thanks to near-total control of the news media by proponents of a pending Thermageddon, critical truths are poorly understood and even derided. The truth that there is no "consensus" among climate scientists and that "consensus" would not matter even if it existed. The truth is that global warming will be small, and a largely beneficial ecological event, and preventing it would be orders of magnitude costlier than adapting to it. The truth that the correct policy is to have the courage to do nothing.

Like it or not, the truth is the truth. Policy should, in the end, be based on objective reality, and not on the back of a lavishly-funded and elaborate international campaign of crafty and lucrative falsehoods promoted by the political, financial, corporate, bureaucratic and media establishments.

This commentary was first published at Human Events 12/2/19

Questions

1. What is MacDonald's main criticism of what Wrightstone has to say?
2. What points is Wrightstone making in his blog and in his presentation to the Pennsylvania Committee?
3. Why and how is Wrightstone critical of media?
4. What does Wrightstone praise President Trump for with regard to energy policy and climate change?
5. How is this climate issue affecting political and economic developments in Canada, where the three major federal political parties do not agree as to the reality of the problem nor to the solutions?
6. How are the provinces of Alberta, Manitoba and Saskatchewan at loggerheads with the federal government over carbon taxes?

Climate Change, A Manufactured Consensus (Follow the money baby)

By Jeff Id, September 1, 2008

A very critical analysis of the climate change is to be found in this blog and article by Jeff Id who was cited often <https://noconsensus.wordpress.com/2008/09/01/climate-change-a-manufactured-consensus-follow-the-money-baby/>.

Jeff Id takes a contrarian view, and calls the climate promoters myth-makers. It prompted the *Skeptical Science* retort at <https://noconsensus.wordpress.com/2008/12/06/ten-global-warming-myths/>. This Jeff Id claims to be an engineer interested in this topic and problem. He is indeed very skeptical about the whole thing. He says it all began in 1986 and the important thing is to examine its origins, growth and source of funding. He virtually makes it a sort of conspiracy to create a problem and then all the scientific and political work groups that are needed to both promote it and to justify its existence. One ought to read his blog with prudence.

I became interested in global warming years ago. I was concerned about its effects and what we could do about it. I am an engineer so I started with the science, reading, studying and understanding numerous scientific papers and reports. It didn't take long before I began to question the conclusions and started looking deeper into the data. I became a Skeptic.

Today after ever more intensive study, I now understand that the scientific conclusion was predetermined back in 1986 and a government structure was put in place which forces a young incomplete science to reach that conclusion. I am going to keep this short so that people can grasp it more easily but the structure is huge.

When was the IPCC formed and for what purpose?

The IPCC or Intergovernmental panel on climate change was formed in 1986. Its mission was to

1 - Identify sources of man made climate change

2 - Assess the impacts

3 - Determine how we can prevent or mitigate climate change

The people who were in charge were some of the first to present that CO2 was going to warm the earth. There was little science to support the conclusions. Separate workgroups were set up for each of the above items.

1 - The IPCC cannot exist without man-made climate change because it has no purpose without man-made climate change to be true. If the IPCC scientists conclude there is no CO2 global warming, everyone has to go home.

2 - The impact of climate change must be severe for the same reasons as 1, everyone would go home and take different jobs.

3 - There must be a possibility of solution. If there isn't then there is no reason for any of this to be done. Also, to maximize the money for the government group they want the solution to be expensive.

How has the IPCC changed over time and what new groups have come into being?

The IPCC needs to appear impartial to the world for maximum effect, so it must not directly fund any research. They instead chose to subdivide further in 1990 by recommending the forming of the UNFCCC (United Nations Framework Convention on Climate Change), which sounds like a convention but actually it is another massive organization which cannot survive without man-made climate change. Again this is before climate change consensus had been reached.

The UNFCCC doesn't control funding of any organizations either. Someone must be paying for this. It turns out that funding moves through several main groups including:

GEF - Global Environment Facility

SCCF - Special Climate Change Fund

LDCF - Least Developed Countries Fund

AF - Adaptation Fund

The GEF alone reported since 1991, the Global Environment Facility has provided \$7.4 billion in grants and generated over \$28 billion in co-financing from other sources to support over 1,950 projects. Much of these funds are distributed under the guidelines of the IPCC recommendations to the UNFCCC to targeted projects. So at the top level of government we have identified a \$35 billion dollar industry whose survival depends absolutely on man-made climate change!

This is just the beginning, in addition to these main groups there are literally thousands of subgroups whose funding and work also depend on man-made climate change being true. The UNFCCC wisely following the IPCC formed even more subdivisions for different areas of climate change, each subgroup depending on man-made climate change just as much as the parent groups.

SBI - subsidiary body for implementation

SBSTA - Subsidiary body for Scientific and Technological Advice

These groups are reported to by individual government agencies lobbying for money for research and other items representing the collection of money for the further development of climate change. Other international organizations which are dependant on man-made climate change include.

LULCF land use land change and forestry

ICSU International council for science

WCRP World Climate Research Programme

IBGP – International Geosphere Biosphere Programme

IHDP – International humnd dimensions programme on Global Environmental Change

DIVERSITAS - Earth System Science Partnership

IAI – Inter America Institute for Global Change Research

APN Asia-Pacific Network for Global Change Research

I have missed dozens of them in this list but I am tired. It doesn't end there. Individual governments have formed hundreds more agencies for the purpose of studying global warming. The US has more than 100 itself. Each of these agencies receive funding from international and local governments based on the recommendations of the IPCC climate reports.

Can this system of research be trusted? How much does it cost?

This is clearly a highly corrupt structure which cannot be trusted to provide good science even when it comes from good scientists. It doesn't take a degree in sociology to see what would happen to a disagreeing scientist working in this structure.

If a scientist reached a conclusion which disagrees with the group (something which happens fairly often) the IPCC will still review it for their recommendations, but it will be discounted and given a minor position. This of course limits name recognition resulting in a lower level of funding. Conversely if someone uncovers science which supports the required consensus their papers often receive preferential treatment for publication, larger funding support and increased name recognition. After twenty years, dissenters are now regarded as minor scientists because of the lack of name recognition. Many have moved on to different fields, or been relegated to minor positions due to not having funding support. This continued pressure has led the overconfident IPCC to make the statements about a scientific Consensus being reached.



Consider the conclusions this corrupt organization has reached from the three groups that report to the IPCC .

1 – Global warming is very real. We may reach a tipping point from where we cannot return.

2 – The results of increased temperature are severe, sea level rise, disease, strong storms, drought , kidney stones, on and on

3 – We can solve it if we get rid of our primary energy source.

In all cases the most extreme possibilities are presented as though they are fact. The true dollars being spent on climate change is much higher than the \$35 billion above, it perhaps exceeds \$100 billion dollars.

When you consider that these dollars disappear if this young incomplete science were to conclude that man is not causing temperature change and thousands of powerful influential jobs would vanish, can we actually trust this source?

I don't think so. It should go down in history as "HOW TO MANUFACTURE A CONSENSUS"

Questions

1. What are the basic problems cited by Jeff Id in his critique of the case for climate change/global warming?
2. Why doe he not trust the work or recommendations of the IPCC?
3. Does his article help in understanding the hotly controversial topic of climate change?

Are there Solutions? A Canadian Answer from *Macleans*

Yes, climate change can be beaten by 2050. Here's how.

A carbon-free world can be a reality. What would that mean for our jobs, homes and lives?

by Alanna Mitchell, July 11, 2019 (a slightly redacted version)

The sun rises in Calgary in 2050. A wind-farm worker rolls out of bed, packs himself a tofurkey sandwich on rye, checks his condo building's geothermal heating system and hops the electric tram to work.

Welcome to the post-carbon world. We've dodged the bullet. The global economy has ditched fossil fuels. Concentrations of carbon dioxide in the atmosphere have stopped rising. Temperatures are stable. We've started harnessing the power of the sun, the wind, the water and even the stray heat lurking in the air or underground.

What does it look like? What does it feel like? Maybe most importantly – is this just science fiction, or a possible reality? “Is it possible to turn things around by 2050? The answer is absolutely yes,” says Kai Chan, a professor at the Institute for Resources, Environment and Sustainability at the University of British Columbia.

There are plenty of scientists tracking what the world will look like if we fail to rein in the carbon beast. But others, like Chan, are also tracking what success might look like. They are not pie-in-the-sky dreamers. They are putting together road maps for how to safely get to the planet envisioned in the 2015 Paris Agreement, where temperatures hold at 1.5 degrees Celsius higher than before we started burning fossil fuels.

... Accomplishing a positive outcome will mean shifting the priorities of consumers, business and government, and rearranging the way economic incentives work. To begin with, according to the International Monetary Fund, it will require rejigging some of the US\$5 trillion spent by governments to prop up the fossil fuel industry. There will undeniably be upfront costs, but those aren't as high as analysts calculated only a year or two ago. And long-term profits could flow from new technologies.

Making these changes won't mean years of being poor, cold and hungry before things get comfortable again. These scientists don't insist we need to build off-the-grid cabins in the woods or overhaul how society provides energy, food and jobs. Instead, these scientists say that if we start right now, we stand a decent chance of transforming society without huge disruption. ...

No question, it will require a massive switch in society's systems of energy use. But quietly, that's already happening with electricity generation as solar panels and offshore wind power plummet in price. Iceland and Paraguay have stripped the carbon from their grids, according to a new energy outlook report from Bloomberg (Paraguay thanks to hydro electricity; Iceland with hydro and geothermal and a dash of wine). Europe is on track to be 90 per cent carbon-free by 2040. And Ottawa says that Canada is already at 81 per cent, thanks to hydro, nuclear, wind and solar....

Still, it's the day-to-day details that are hard to imagine. How will I get to work? How will I heat my cold Canadian home and feed my family? What kinds of jobs will our no-carbon economy support?...

“You'll be living in a city that is quieter and cleaner, where you can actually hear the birds singing on the way to work,” he says. The noisy internal combustion engine will be all but obsolete. Cities will be built for walking and cycling, featuring plentiful electrified public transit. This is not a utopian vision, he says. “Everything I've said is grounded in trends that are happening today.”

It matters, because transportation globally makes up nearly a quarter of energy-related greenhouse gas emissions, according to the latest assessment report of the Intergovernmental Panel on Climate Change (IPCC).

The game-changer will be the collapse in the cost of lithium-ion batteries, which run electric vehicles, says Ajay Gambhir, a senior research fellow at the Grantham Institute in London who assesses the global carbon picture.

.....Other countries are showing us how fast the electrification of public transit vehicles can catch on. China, for example, already has more than 400,000 electric city buses on the roads, a figure that grew by about a third in the last year alone, says the report. Meanwhile, Canada has pledged \$23.5 billion for public transit infrastructure over the next decade in a series of bilateral agreements with provinces and territories.

What about travel by train, plane and ship? Trains can reliably be shifted from diesel to electric, Gambhir says. But aviation and shipping will require more futuristic plans to get to zero carbon. He has hopes that plant-based kerosene fuel for ships and short-range electric planes, now being tested, might be common in 2050. Longer-haul flights may have to rely on electrically generated hydrogen as a fuel.

Gambhir is not ruling out hyperloops, the mass-transit darling of Tesla co-founder Elon Musk, now in development. Hyperloops work by driving pods containing goods and maybe people at high speed through a vacuum tube caught between the push of the electromagnetic field and the pull of the Earth's gravity. If hyperloops can get off the ground, so to speak, they could dramatically reduce the need for carbon-heavy domestic aviation, Gambhir says.



In the post-carbon future, downtown Calgary could boast green tech like hyperloops, wind farms and sustainable architecture

(Photo illustration by Lauren Cattermole and Drew Maynard)

A Canadian winter without a furnace? You bet, says Guido Wimmers, an architectural engineer who is chair of the master of engineering, integrated wood design program at the University of Northern British Columbia in Prince George. He is a specialist in the ultra-energy-efficient building known as the “passive house.”

“There are hundreds of thousands of them built across the planet. You can do it today. There’s no need to wait until 2050,” he says.

A passive house doesn’t use a machine to generate heat, like a traditional oil or gas furnace, or even electric space heaters. Instead, it uses a heat-recovery exchange ventilator to draw waste energy from your body, the sun and even appliances out of the air. Passive-heat buildings work because they are airtight and thickly insulated.



It’s the same principle as dressing for the outdoors during cold weather: a warm layer covered by something to cut the wind, plus a vent in case you get overheated and start to sweat. The buildings typically also make use of solar energy and shade – and triple-glazed windows – to manage temperature and natural daylight inside the building....

.....Passive building construction is catching on in Canada, including in the commercial and industrial sectors, although it costs about 10 per cent more than a conventional structure. The University of Victoria’s new 782-bed student residence and dining hall, with a full commercial kitchen and classrooms, will be one. Canada’s first passive-house daycare opened in Penticton, B.C., two years ago, saving as much as 90 per cent on energy costs every year.

Building codes are under revision across Canada to move the trend along. In B.C., recent changes to voluntary building energy codes aim for new homes to create as much clean energy as they consume by 2032...As these types of heating systems become more common, they become less expensive. Because you don’t need to pay for a furnace or much energy, they pay for themselves over time....

The reality for Canadians is they might not do the job fully in very cold climates, he says, and could require a boost from a micro gas boiler. But heat-pump technology is getting more popular.

By 2050, older homes will be using a lot less energy, too. Jennings, also of the Grantham Institute, sees a future where homes are retrofitted to make them more energy-efficient.[you can read the full article at

<https://www.macleans.ca/news/canada/yes-climate-change-can-be-beaten-by-2050-heres-how/>]

<https://www.macleans.ca/news/canada/enough-with-the-climate-change-half-measures-canada-has-real-solutions-to-consider/>

<https://www.macleans.ca/news/canada/the-climate-crisis-these-are-canadas-worst-case-scenarios/>

Questions

1. In what ways would Canada and the world in 2050 be different from Canada today when it comes to its way of living? (Food and nutrition, People and goods transportation, Type of jobs , Forests and animals, housing and office buildings)
2. Is it an overly optimistic picture or does it offer real hope in being able to meet the climate change challenges?