Tom Wiley
Josephine County, Oregon

Dear Co-chairs and members of the Joint Committee on Carbon Reduction:

Because climate change is being used to justify a carbon cap-and-trade system in Oregon, I thought an objective scientific peer review of the underlying science might be useful to you. After a brief review of settled and unsettled climate science, this review looks at Section 1 of the Oregon Global Warming Commission's 2018 Biennial Report to the Legislature (OGWC) titled "Climate Change Comes to Oregon." The Commission's scientific staff should be able to address review comments -- expressed here at the end of relevant paragraphs -- to the satisfaction of every legislator.

I hold a Bachelor of Science Degree in Geology from Humboldt State University (1979) and a Master of Science Degree in Geology from Stanford University (1983). I worked for the U.S. Geological Survey (USGS) from 1983 to 1989 and the Oregon Department of Geology and Mineral Industries (DOGAMI) from 1989 to 2016, retiring in 2016. My work for USGS involved deciphering and summarizing aspects of regional and local geology along the West and Arctic coasts of the United States and the adjacent Eastern Pacific and Arctic Oceans. Work for DOGAMI focused on areas in southern and western Oregon as prioritized by a committee of Oregon Geologists. This work regularly involved scientific disciplines related to past climate including germane fields such as geochemistry, geophysics, temperature proxy data, paleontology, local and global sea level change, radiometric dating, radon, rainfall thresholds for landslides, soils, plate tectonics, and glaciations.

Although the public debate about climate change is highly polarized and politicized, the scientific debate is generally less so.

Scientists almost universally agree on the following points:

1. Climate has changed in the past.

2. Climate will change in the future

3. The world's oceans and atmosphere are linked in many ways.

4. Atmospheric CO2 levels have increased since record keeping began.

5. Recent increases in atmospheric CO2 are, at least in part, due to burning fossil fuels

6. Recent increases in atmospheric CO2 may impact climate

7. Global sea level rose "quickly" (tens of meters in thousands of years) following the most

recent ice age but changes in sea level have since slowed.

8. The carbon cycle is complex.

The scientific community is vigorously debating the following points:

1. Whether increases in man-made CO2 have resulted in the past or will result in the future in **significant** climate change (global warming).

2. How much climate change should be considered "significant".

3. How feedback amplifies or dampens the effects of man-made CO2, solar irradiance, clouds, volcanoes, etc.

4. Current climate models are accurate predictors of future climate.

5. All significant mechanisms of climate change are understood and incorporated into climate models.

6. Temperature records have been properly curated and adjusted and whether trends in **estimated** data sets are consistent with trends in rigorously **measured/observed** data sets.

7. Climate changes are good or bad; they result in more or less severe storms, hurricanes, tornados, droughts (wildfires); they melt or enlarge ice sheets, sea ice, and glaciers; they raise or lower sea level; they help or hinder polar bears, plants (including crop yields), and other species.

8. Model errors that increase warming if corrected are far more commonly looked for, found, corrected, and cited than errors that decrease warming. Funding is more readily available for studies that purport to find or understand warming than to refute warming. Publication is more likely and quicker for warming related papers than for papers with contrary findings. Scientists in general are less likely to voice contrary opinions than supporting opinions. Young scientists risk their careers if they report observations that run counter to warming dogma.

Many aspects of climate change are hotly debated because the atmospheric energy retained by a potential doubling of CO2 (anticipated mid-21st century) appears to be of the same order of magnitude attributed to uncertainties in many other factors in the atmospheric energy balance. For example, the ~3 watts per square meter of atmospheric energy retained by doubling the amount of CO2 in climate models is similar to the amount of energy change associated with something as trivial as raising or lowering the modeled altitudes of certain cirrus clouds by 500 meters (1640 feet) or by changing the area those clouds cover by 10% (Lindzen, 2014). Solar influences (Shaviv, 2008) are typically not modeled even though history shows they resulted in significant past temperature changes (e.g. Medieval Warm Period, Little Ice Age).

To date, uncertainties have resulted in the inability of climate models to accurately predict subsequently **measured** temperature trends (**Figure 1**). Almost all models treat CO2 as **the** controlling climate variable. And almost all such models employed by the International Panel on Climate Change (IPCC) have historically over predicted temperature relative to what was later measured. The models have been running too hot. They have been adjusted repeatedly to reflect new measured data; but whether or not adjustments are accurate is not determined until subsequent observations are predicted. Heller (2019) has studied climate data sets and he reports that **estimated** temperatures used to supplement the record of **observed** data have been adjusted independently of measured temperature data from weather stations. **Questions for OGWC**: 1) How does the slope of the mean IPCC temperature prediction (of their models) compare to the slope of the **means** of weather balloon, satellite, and **measured** weather station temperatures? 2) How much warming of the troposphere is predicted by IPCC models; how much has been measured?

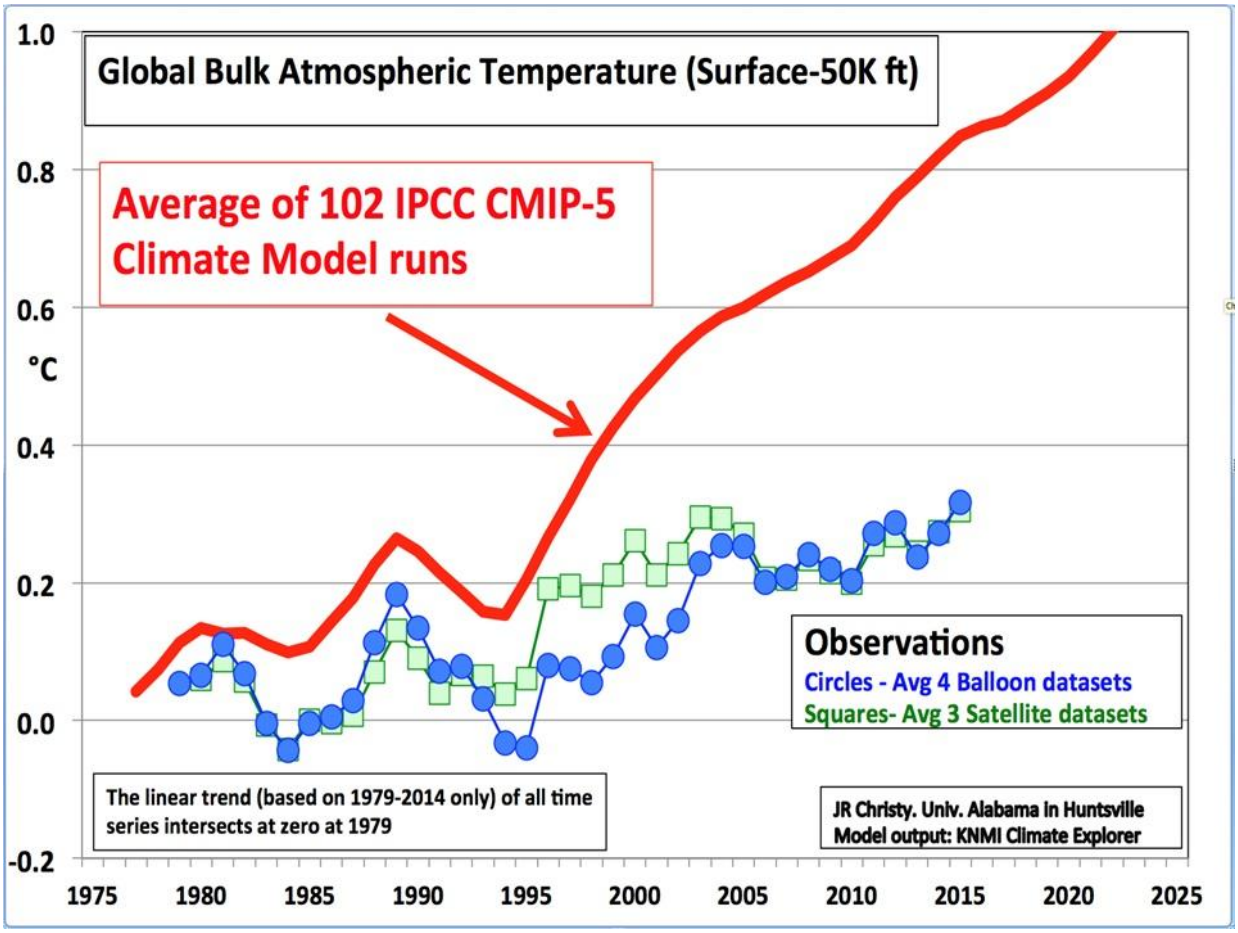

Figure 1. Models vs. measurements (John Christy testimony to Senate Subcommittee on Space, Science, and Competitiveness, December 8, 2015)

Man-made CO2's role in climate change has **not** been an historically dominant role. Almost all historically **observed** near surface temperature series have shown that: 1) while man-made increases in CO2 rose significantly from 1945 to 1977, the earth **cooled**, 2) while man-made increases in CO2 rose significantly from 1998 to 2012, temperature showed **no trend**, 3) more recent increases in temperature accompanied anomalous warm water in the northeastern Pacific, upwind of most United States Historic Climate Network stations, 4) at times **before** man-made increases in CO2 were significant, most recently from 1920 to 1945, temperature increased rapidly, at essentially the same rate as the period 1977 to 1998 that is touted as so extreme that it must reflect man-made CO2-induced warming. So there were undeniably one or more factors, other than CO2, that exerted significant control on temperature during all but possibly twenty-one years of the period 1920 to present. These contradictory trends are also visible in proxy data such as ice cores, tree rings, tide gauges, and sea ice extent. Since climate models were first generated in the 1980s, no models predicted periods of cooling or no change; rather the IPCC models have always predicted warming. The models missed the post-1998 episode of stasis/cooling and would have missed the pre-1980 episode of cooling (However, one older model from the 1800's that relates the number of sunspots to the price of wheat appears to be more reliable.). Some scientists claim that it must be CO2 that controls the climate because it can't be anything else; this is not science and the temperature trends cited above show that any similar statement is false. **Questions for OGWC**: 3) Why were there recent episodes of observed global cooling (1960s-1970s) or stable observed temperatures (1998-2013) if man-made CO2 is the controlling factor and it forces the climate to warm? 4) Why did the earth warm significantly before man-made CO2 concentrations became significant (before World War II)? 5) Did atmospheric CO2 increases slow when fossil fuel use fell during the recession that started in 2008?

Significant scientific uncertainty remains regarding the amount of temperature increase associated with an eventual doubling of CO2 (a climate yardstick is known as Climate Sensitivity). Estimates presently range from less than 1 to 13 degrees Celsius; with the mean **declining** from about 3 degrees in older studies to 2 degrees or less in more recent studies. Climate models use this value to estimate the likelyhood of long term temperature increases and the magnitude of atmospheric feedback **amplifying** CO2-induced temperature trends. Using values of 2 or less, most models suggest that CO2-induced global warming will not affect climate very much (less than a couple of degrees Celsius). Using values of 3 or more, most models agree that CO2-induced global warming could be very significant. Obviously, the proper determination of climate sensitivity is critical to having a meaningful understanding of the impact of man-induced CO2 before cost/benefit analysis of climate investment can be performed. The sensitivity of the climate to volcanic eruptions can be used as a proxy for the sensitivity to man-made CO2. Lindzen (2014) suggests that climate sensitivity is closer to 0.75 than to 2 or 3 based on climate response to volcanic eruptions. Satellite, balloon, and measured land-based surface temperature records similarly suggest that sensitivity is less than currently modeled by IPCC. **Questions for OGWC**: 6) Would reducing Climate Sensitivity in the

models give a better match to measured ground, balloon, and satellite temperature data? 7) If so, what value for Climate Sensitivity gives the best match?

There is general agreement that if man-made CO2-induced global warming is occurring, melting ice sheets in Greenland and Antarctica (Rignot and others, 2019) along with thermal expansion of the oceans should result in an **increase in the rate** at which sea level is rising. Modern sea-level rise rates should reflect the sum of the ongoing historic pre-industrial rate plus the man-made CO2-induced warming rate. While some graphs of global sea level purport to show this, tide gauge data (NOAA, 2019), arguably the only good data set for this measurement, show little or no change in multi-decadal rates. Rates over shorter time periods are well correlated to variations in solar irradiance and ocean events such as El Nino (Shaviv, 2008). Graphs of sea-level change recorded at long established tide gauges in geologically stable areas have not deviated from pre-industrial rates (**Figure 2**). These graphs should steepen after World War II if CO2-induced sea level rise is significant. They don't. **Questions for OGWC** 8) How can NOAA fit **straight** lines to tidal-gauge graphs depicting long-term sea-level change in geologically stable areas with >95% confidence? 9) Why don't these graphs curve upward to show increasing rates as man-made CO2 levels increase?

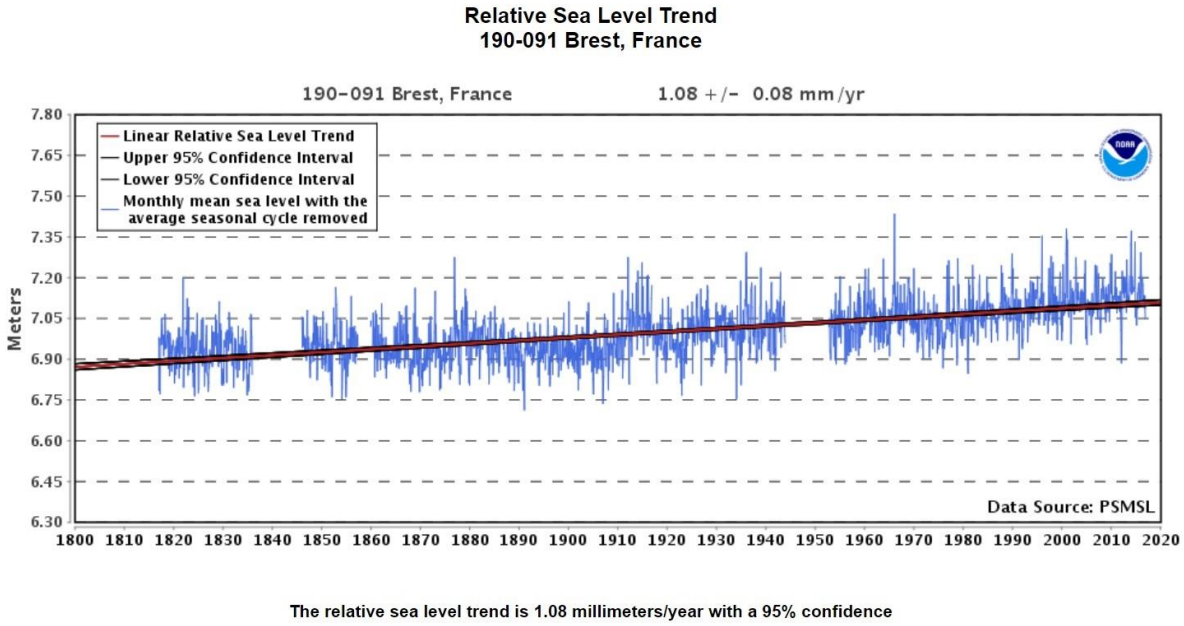

Figure 2. Sea-level rise at Brest, France, since ~1815. Does not show post-WWII acceleration due to industrial climate change. May show end of Little Ice Age between 1815 and 1900. Note that an increase of 2 mm per year after 1990 would triple the slope of the line; however, no increase is seen in the graph.
From NOAA Sea Level Trends website, Global Sites, France, Brest:
https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=190-091

Climatologists largely agree that global warming should be more pronounced in polar regions and less so near the equator. Most climatologists agree that such a reduction in temperature

contrast between the equator and poles would generally reduce the magnitude of planetary winds, storms, and related weather extremes everywhere on earth. This is generally born out by data sets showing decreases in various types of extreme weather events versus time. Nevertheless, some alarmists insist on relating scary weather events to climate change. Such "scientists" would attribute modern equivalents of Oregon's 1861, 1955, or 1964 floods or the 1962 Columbus Day Storm to climate change just as surely as they imply that "The Blob" of warm Pacific Ocean water and its effects are results of CO2-related climate change. **Questions for OGWC:** 10) Should a reduction in temperature contrast between the poles and the equator result in more extreme weather events? 11) How do you distinguish between recent extreme weather events that are statistically expected (because the historical record is short) and extreme weather events that will be the new normal because of climate change?

There are a surprising number of "corrections" made to datasets used in climate studies. Data is routinely adjusted to benefit certain arguments. Historically observed (raw) temperature series curated by government agencies are not used in many models, instead **adjusted** data sets have been manufactured with supplements to the observed data for use in the models. Such corrections have included "fixing" the global cooling trend from the 1940s to the 1970s. Some scientists allege that the adjustments have made the supplemental temperature data increasingly proportional to atmospheric CO2 concentrations and that the mean of estimated temperatures is rising faster than the mean of observed temperatures (**Figure 3**, Heller, 2019).

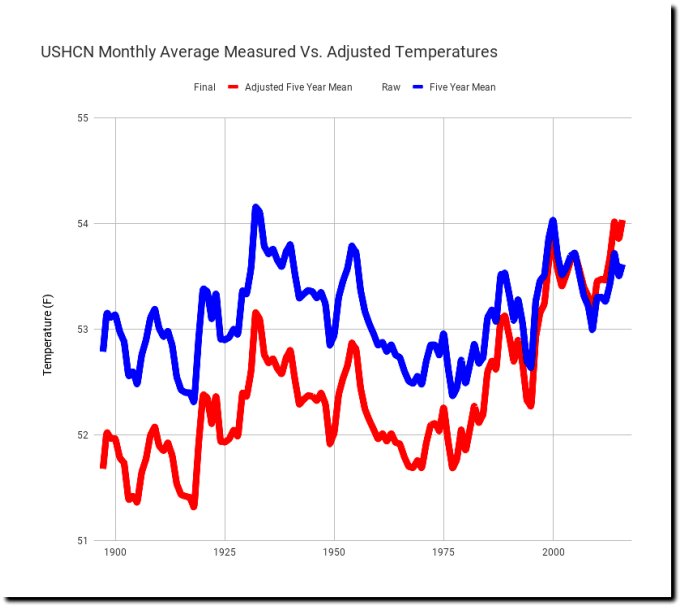

Figure 3. Measured versus adjusted monthly average temperatures 1895-2018. The blue line shows the five-year mean of the average annual temperature **measured** at all NOAA United States Historical Climatology Network (USHCN) stations. The red line is the **adjusted** graph NOAA releases to the public showing ~1.5 F. degrees more warming. (From Heller, 2019)

By adjusting the data, rather than adjusting factors in the model algorithms the models can be made to forecast more extreme climate change. There are at least two ways to improve climate models that overestimate warming: 1) adjust records in the temperature data or 2) reduce the Climate Sensitivity. Adjusting the temperature data is not appropriate but reducing Climate Sensitivity decreases the impact of man-made CO2 now and in the future. Many models have not been released and so cannot be subjected to rigourous tests for accuracy and repeatablity; testing for repeatability by other scientists is the gold standard in scientific inquiry. **Questions for OGWC**: 12) How are "corrections" made to measured/observed Oregon data? 13) Are estimated data used and, if so, do they show different trends than measured/observed data? 14) Are models and related computer code used by OGWC available for testing by other scientists?

For calculations to be meaningful, the errors, uncertainties, and degrees of freedom must be carried through calculations and models to indicate its thier overall accuracy. Even though the models are often not released to be tested by other scientists, uncertainty has clearly not been well handled because newly collected data often fall outside reported 95% error bars. One example of uncertainty relates to climate sensitivity. IPCC values for climate sensitivity have a mean of 3 degrees +/-1.5 degrees Celsius, resulting in a possible range of 1.5 to 4.5 degrees. The high value is three times the low value. The recognized errors are of the same magnitude as the result; so when measured data subsequently fall outside the calculated error range it suggests serious deficiencies in the models. In another example, a set of satellite-measured temperature data appears to have been adjusted by defining the measured temperature as the temperature of the upper bound of the uncertainty and simply dropping the mean and lower bounds of the measurements. Measurements have inherent accuracy limits. Early analog thermometers, for example, had to be read as intended and, even then, were probably only accurate to +/-0.5 degrees. Calibration of such thermometers to properly measured boiling and freezing points of distilled water assumes that proper corrections were made for elevation above sea level at the factory, but were they? Proper models must carry and consider such accuracy limits and their mathematical consequences (significant figures) through calculations to determine if results are significant or not. An error of 0.5 degrees is important in a world where recorded global temperature change may be about one degree. **Questions for OGWC**: 15) What are the magnitude of the errors and uncertainties resulting from measurement techniques and values carried through model calculations to predict changes in Oregon climate? 16) How are carbonate sediment sinks measured; what are the errors associated with estimating carbonate sinks from smear slides?

Many "summary" documents present results in misleading ways, often focusing on or exaggerating climate extremes or talking about weather rather than climate. For example, graphs such as Summer Sea Ice Extent versus time in the most recent IPCC science summary, have been truncated in a way that places recent changes entirely outside the larger scientific context (by starting the graph at the recent 1979 maximum of sea-ice extent and showing only the subsequent decline in summer sea ice, the pre-1979 part of the graph that showed more extreme high and low values--before man-made climate change--was cut off). **Questions for OGWC**: 17) Are data sets truncated or selected to show trends that begin at short term minima

or maxima? 18) How was 1993 selected as a break in sea-level rate changes.

CLIMATE CHANGE IN OREGON

The Oregon Global Warming Commission's 2018 Biennial Report to the Legislature (OGWC, 2018) asserts that we're witnessing the effects of anthropogenic climate change already ("climate change not brought under control" p. 16). The report then catalogs numerous so-called effects of presumably controllable climate change in Section 1: Climate Change Comes to Oregon 2018. However, this is done without establishing a relationship between man-made CO2 emissions and the listed effects.

Let's start with the **Ocean Conditions** section of the report. Implying that "The Blob", an area of anomalous warm water in the eastern Pacific off the Oregon Coast, resulted from man-made increases in atmospheric CO2 is problematic. Ocean current features ebb and flow in cycles that may take millenia to complete. Is it speculation to suggest that a pause in upwelling or strengthening of the North Pacific Current reflect changing climate. Perhaps the feature was related to abnormally clear weather. . . the NOAA website states that it formed due to a persistent zone of high pressure over the northeast Pacific Ocean; they do not say it is the result of climate change. **Questions for OGWC**: 19) Do we know if "The Blob" was something that should properly be considered an ocean current or weather effect or is it a more permanent feature associated with long-term global climate change not brought under control? 20) Is ocean productivity lower in areas elsewhere on the globe at pH values estimated for future Pacific waters along Oregon's coast? 21) How does phytoplankton productivity respond to increased dissolved CO2?

Let's look at the **Heat** section of the report. During 2014 to 2018 ocean surface waters west of (upwind of) Oregon were several degrees warmer than normal (and known as "The Blob"). At that same time the Global Warming Commission reports that Oregon had a drought (2015), Oregon had less snow (2015), Oregon was hotter (2015), and Oregon had more/bigger fires. Without discussion, the report blames this suite of synchronous effects on man-made CO2-caused warming rather than consider a relationship to the widespread sheet of abnormally warm water lying just upwind in the Pacific Ocean (that they describe just a few pages away and that NOAA scientists say would have a major impact on the atmosphere and weather a couple of hundred miles inland of the West Coast). **Questions for OGWC**: 22)Would the lack of snow, high measured temperatures, and drought during 2015 be better characterized as short lived ocean current or weather effects of "The Blob" or as permanent features of climate change? 23) How were changes in fire size due to accumulated fuels, changes in forest management, and more restrictive fire fighting rules differentiated from expected fire hazards due to CO2-related climate change? 24) Were there more fires or more acreage burned in the western U.S. during the early 20th century than recently?

It is not clear if the 2 degree C. rise in temperature cited for Oregon takes into account the reduction in the number of high elevation weather stations since 1933. Removing high (cold) stations increases the average recorded temperature. The 250-foot mean elevation reduction due to station closures increases the apparent mean temperature by about 1 degree Celsius. So station closures might account for half of Oregon warming. It is not clear if the 2 degree Celsius rise in temperature cited for Oregon treats "Blob"-related temperature rise in recent years as if it were CO2 related. If so, it may account for the remainder of Oregon temperature rise, suggesting that perhaps none of the temperature change is due to man-made CO2. Estimated temperature data inserted into the U.S. Historical Climate Network records have different historical trends than temperatures that were actually measured (**Figures 3, 4**). **Questions for OGWC**: 25) Were Oregon measured station temperatures corrected for station elevation? 26) Does the Oregon data set contain estimated data that is inconsistent with measured/observed data? 27) Could recent warm years relate to "The Blob" of warm water offshore rather than the result of global changes in mean temperatures?

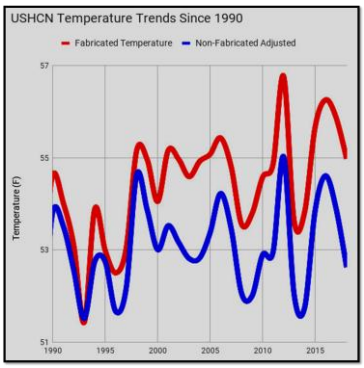

Figure 4. Two degree F. warming since 1990? From Heller, 2019

Let's look at the **Sea Level Rise** section of the report. The report attempts to scare coastal residents with various numbers for anthropogenic sea-level rise including "> 1.0-meter sea level rise by 2100" (p. 25),"2.5-foot global sea-level rise by 2050" (p. 26-27), and "2-4 feet of sea-level (sic) by 2100" (Infrastructure section, p. 29). These translate into annual rates of sea-level rise ranging from 7.4 to 24.6 mm per year (NOAA cites rates up to 8.2 feet by 2100, more than 30 mm per year). This range does not demonstrate a meaningful hazard, instead it demonstrates that the science is inexact, the report alarmist, and that when compared with measured data the forecasts are off by an order of magnitude. All this is reinforced by the report's use of remarkably round numbers. Such uncertainty is not discussed, rather Oregonians are told "this is happening now." These alarmist rates exceed the rates actually cited on page 26 of the report by 130% to 670%. The current rate is cited in the report as "Sea-level rise has been accelerating to (at least) 3.2 millimeters per year since 1993 (up from 1.2 millimeters per year between 1901 and 1990)." This "current rate" cited in the report exceeds the measured rate at the six Oregon tidal gauges listed on the NOAA sea-level website by another 450% (average 0.7 mm/year, range -1.22 to 2.6 mm/year). The scary rate cited in the report is 35 times the

average measured rate! **Questions for OGWC**: 28) What is the basis for citing scary rates that greatly exceed the highest cited measured rates? 29) Why aren't peer reviewed papers that revise the satellite-measured rate downward (e.g. Watson and others, 2015) reported, used, or cited by OGWC.

Measured long-term sea-level changes observed at NOAA tide gauges are depicted on graphical x-y plots of time (x axis) versus sea level (y axis) for Oregon tide gauges and for tide gauges worldwide (**Figures 2, 5**). Where long records are available, the plots show long-term (~100 years) **linear** rates of sea-level change with deviations (discussed in the next paragraph) either side of the mean; they do not show **steepening curves** or line segments with the **steeper slopes** predicted by modeled changes in global CO2 concentration (OGWC; cited in the paragraph above). These plots show unequivocally that **sea level rise has not accelerated** since man-made concentrations of CO2 became significant following World War II. Nor do they show an acceleration in sea level rise of 2.0 millimeters per year beginning between 1990 and 1993 as cited in OGWC. If such an acceleration had taken place, every tide gauge plot worldwide would show two line segments intersecting around 1992, with the post-1993 line segment having a slope 2.0 mm/year steeper than the pre-1990 segment. No Oregon tide gauge plot has such a pattern. A 2.0 mm/year increase in slope would nearly double the slope of the steepest plot for Oregon. I have not seen any tide gauge plot with such a pattern. Attempts to integrate satellite-based sea level data with tide gauge records could create such a pattern if post-1993 satellite data was not properly calibrated. **Questions for OGWC**: 30) Do graphs of sea-level rise for Oregon tide gauges steepen since World War II or do sea-level rise rates remain constant/linear since before CO2 increases were significant? 31) Do graphs of sea-level rise at Oregon tide gauges steepen by 2 mm per year between 1990 and 1993 as indicated in the report? 32) Do graphs of sea-level rise for geologically stable (off the ring of fire) tide gauges in the Atlantic Ocean steepen as CO2 increases, steepen by 2 mm per year beginning between 1990 and 1993, or are rates constant/linear? 33) How can NOAA describe graphs of sea-level rise as linear, with calculated rise rates and 95% confidence limits, if rates are increasing (curved) with CO2?

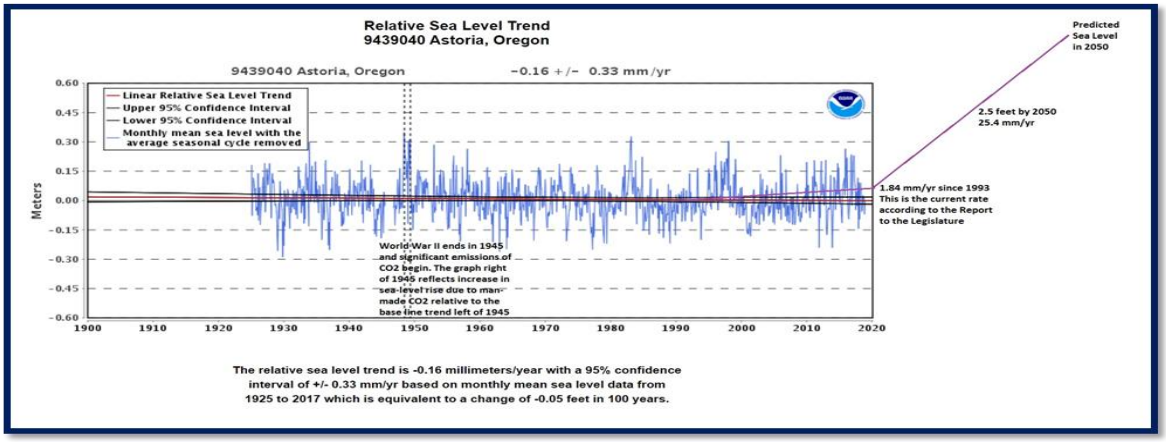

Figure 5. NOAA's Astoria sea level with OGWC rates superimposed.

In 2008, Nir Shaviv showed (**Figure 6**) that shorter term (~11 years) fluctuations of sea surface temperature, ocean heat content, and sea-level change rates (as measured by Douglas, 1997) correlated to changes in solar irradiance (the sunspot cycle) as measured by Lean (2000). These results show the existence of a feedback mechanism influencing sea level and temperature at least as much and possibly more than man-made CO2. Solar irradiance changes have been dismissed as trivial by climate modelers. They are clearly not trivial, tied to some kind of positive feedback, and the related feedback mechanisms must be understood to model climate change. Proportional changes in solar irradiance accompanied the Roman Warm Period, the Dark Ages, the Medieval Warm Period (when the Vikings named Greenland and Vinland), the Little Ice Age (Viking Greenland settlements died out), the Dust Bowl, and the Global Cooling Scare of the 1970s. **Questions for OGWC**: 34) Do climate models used by OGWC include the effects of solar irradiance and related feedback mechanisms? 35) How is the ongoing natural release of CO2 from the oceans and melting permafrost associated with the end of the Little Ice Age differentiated from changes in man-made CO2? 36) What percentage of the CO2 increase is man-made? 37) Does preservation of limestone, dolomite, and siderite increase as the oceans respond to temperature related CO2/CO3 solubility changes associated with the end of the Little Ice Age? 38) Does a corresponding sediment carbon sink reduce or amplify the impact of man-made CO2? 39) How much?

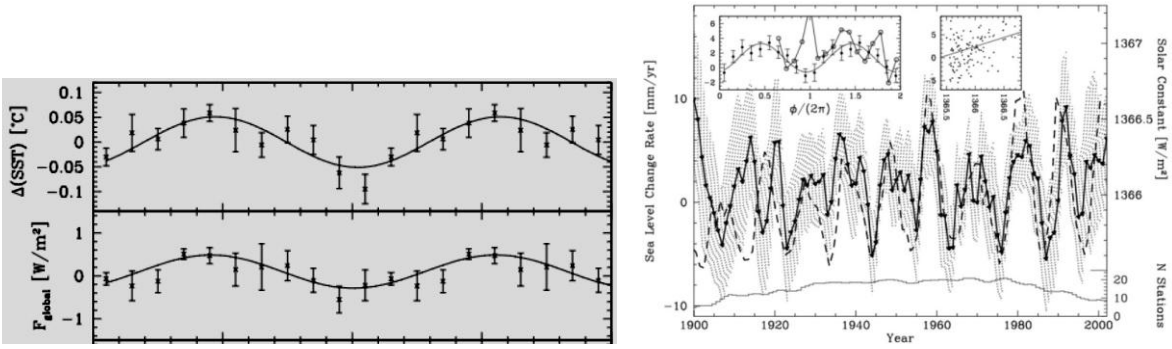

Figure 6. Left image shows correlation of sea surface temperatures (vertical bars in top part of image) and global ocean heat content (vertical bars in lower part of image) with an eleven-year cycle of solar irradiance (wavy lines; shown as two cycles to emphasize fit). Right image shows correlation between sea-level-change rate from tide gauges (dark solid line) and solar irradiance (dashed line). Compare detailed fit between these data sets to poor fit between man-made CO2 increases and sea-level change rates from tide gauges, including no signal from the dramatic rate increase of 2 mm per year that OGWC reports occurred between 1990 and 1993 (see right sides of Figures 2 and 5). From Shaviv, 2008

REFERENCES

Heller, Tony, 2019, https://realclimatescience.com/61-fake-data/

NOAA, 2019, Tides and Currents Website, https://tidesandcurrents.noaa.gov/sltrends/sltrends_us.html

Lindzen, Richard, 2014, What is the climate sensitivity?: European Institute for Climate and Energy Conference Lecture, Mannheim, Germany

Rignot, Eric, Mouginot, Jeremie, Scheuchl, Bernd, van den Broeke, Michiel, van Wessen, M.J., and Morlighem, Mathieu, 2019, Four decades of Antarctic Ice Sheet mass balance from 1979-2017; Proceedings of the National Academy of Science, https://doi.org/10.1073/pnas.1812883116

Shaviv, Nir, 2008, Using the oceans as a calorimeter to quantify the solar radiative forcing: Journal of Geophysical Research, v. 113, A11101, 13 p.

Watson, C.S., White, N.J., Church, J.A., King, M.A., Brgette, R.J., and Legresy, Benoit, 2015, Unabated global mean sea-level rise over the satellite altimeter era: Nature Climate Change, v. 5, p. 565-568.

MY OPINION; IMPACTS OF AN OREGON CARBON TAX

The best-case scenario is that climate impacts of an Oregon carbon tax or cap and trade system will be symbolic only. There will be no measurable reduction in global temperature, stabilization of sea level change, or change in severe weather or wildfire as a result of an Oregon carbon tax. Increases in agricultural yields due to increased atmospheric CO2 will not be adversely affected by an Oregon carbon tax. A carbon tax will not dim the sun or stop natural CO2 release.

Impacts on Oregonians are real. The tax is designed to hurt poor and rural Oregonians the most. Living standards will be reduced. Areas hard hit by reductions in natural resource use will be hit again. Increasing energy costs will make Oregon less competitive. The likely outcomes are greater cost of living and reduced environmental quality (notably wood smoke). A carbon tax is, among other things, a tax on gasoline and should be treated as such.

MESSAGE TO THE LEGISLATURE

WAIT. The legislature should wait to see some sucess in climate modeling before believing modeling that has always been wrong in the past. The legislature should demand accurate, independent science emphasizing numerical means, numerical uncertainties, and numerical error ranges from its scientists. It should demand peer review by the most qualified, least biased independent scientists in the field. The legislature should admonish its staff to refrain from

emphasizing alarmist outliers in the scientific data and instead report outliers appropriately as means with errors and uncertainties. Claims and inferences made in summary reports should be reviewed for consistency with scientific reports. Legislators should work to understand: 1) the difference between model-based predictions and measured observations, 2) how models and measurments each inform scientific inquiry, and 3) how a properly understood set of observations is gospel and a model with too many degrees of freedom is just a fancy guess. Ask what percentage of recorded United States (USHCN, 2019) weather station data is "estimated" and what percentage is actually measured. Ask to see how the interpolated data trends compare to the measured trends. Ask why some modelers have "adjusted" measured observations when better results could be easily obtained by tuning variables (such as climate sensitivity) in the models. Don't conflate weather events with climate. WAIT.

Richard Lindzen (MIT atmospheric physicist, emeritus) provided an apt assessment of the climate debate a decade ago saying that we shouldn't be "using normalcy to frighten people."