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POLICY BRIEF

# Sharpening the Focus on Climate Change in the Northwest

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## Introduction

Recently, the general public has been barraged with a series of threatening stories about the dire consequences of climate change in the Northwest. Many of these concerns relate to the apparent loss of snowpack during the last 50 years and the risk of temperature increases as high as 10 degrees Fahrenheit during the next century. Despite the fact that there is a good deal of uncertainty involved in forecasting future climate changes, we are being conditioned by the media to expect the more onerous conditions to hit in the near future (for example, "Effects of Climate Change Bode Ill for Northwest" in *The Seattle Post-Intelligencer*).[1]

Further the public is being misled to believe that local and regional greenhouse gas (GHG) reduction strategies will help mitigate future global and local impacts. In many instances the proposals call for very simple changes, such as switching to more efficient light bulbs.

This short paper addresses three key questions, which require some focused attention and should temper the current public concern, as well as GHG reduction policy decisions.

To be clear, this paper is not arguing whether or not climate change is occurring in the Northwest, nor whether manmade carbon and greenhouse gas emissions are responsible for such changes.

The focus of this discussion is whether the current portrayal of the issue is balanced from a scientific perspective and whether the dire future impact predictions are at all realistic. Understanding the nature and scope of the challenge facing us is the key to charting an appropriate response; one that addresses the issue without taking steps that are counterproductive or lead to significant economic shocks that outweigh any potential benefits. Our response to climate change will not only affect the economy, but spending on education, health care and many other competing priorities.

[1] "Our Warming World: Effects of Climate Bode Ill for Northwest," *Seattle Post-Intelligencer*, November 13, 2003.

The following assumptions form the baseline for this discussion.

1. Northwest temperatures have increased over the last 100 years.
2. Increased $CO_2$ levels are for the most part responsible for this increase.
3. Temperatures are predicted to increase over the 21st century based on $CO_2$ driven models.

**Discussion**

I believe that there are at least three questions that require some focused reanalysis. They are as follows.

Question: Is the apparent loss of snow pack, i.e. 25% or more, in the Cascades from 1950 to 1997 reported by the University of Washington Climate Impacts Group (CIG) biased by the data selected for their trends analyses?

Answer: This apparent trend is cited in virtually all contemporary documents on impacts to the Northwest from climate change.[2] To avoid confusion, we examined the same data as the CIG study. A more expansive look, however, at the data used by the CIG tells another story. Using an expanded time series analysis with all of the available snow pack data for several representative monitoring sites show several important considerations (see Figures 1a, 1b, and 1c).

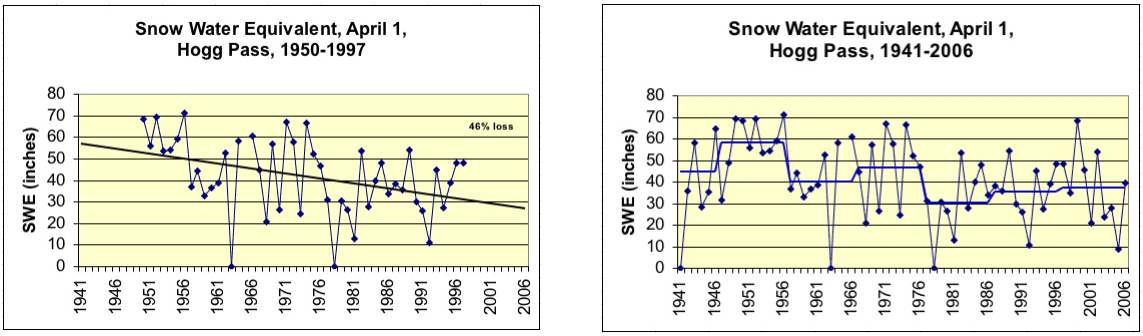
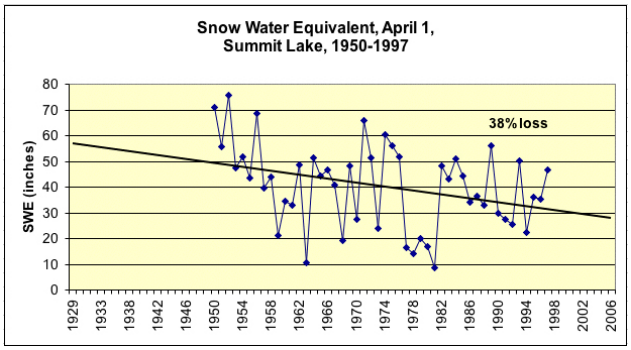



Figure 1a

[2] "...exceeded 25% or more," in Snover, A. K., P. W. Mote, L. Whitely Binder, A.F. Hamlet, and N. J. Mantua, 2005. Uncertain Future: Climate Change and its Effects on Puget Sound. A report for the Puget Sound Action Team by the Climate Impacts Group (Center for Science in the Earth System, Joint Institute for the Study of the Atmosphere and Oceans, University of Washington, Seattle), p 16 ; "by approximately 50%," Executive Summary of Roadmap for Climate Protection, PSCAA, December 29, 2004.



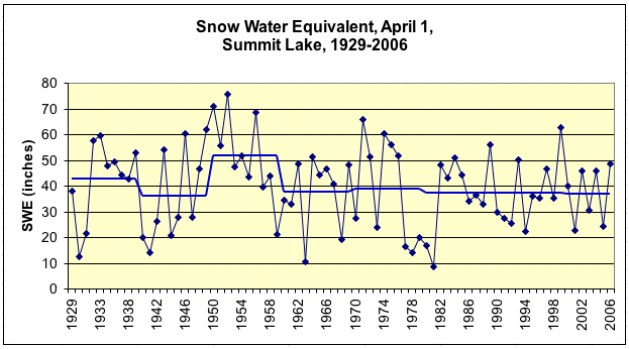
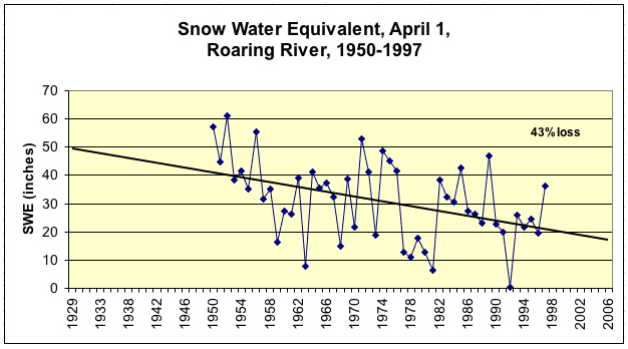




Figure 1b



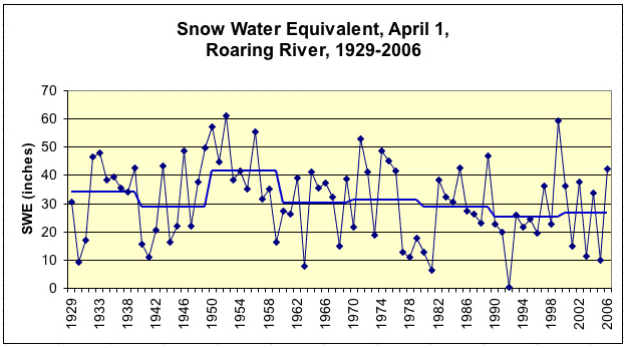




Figure 1c[3]

The use of 1950 as the starting point for the CIG trends analysis has biased the results, because 1950 had the highest snow pack in the 20th century. Looking at data from before to 1950 and after 1997 shows that the year to year variation has not actually changed over the last century. Except for the decade of the 1950s, there has been no discernible downward trend in the decadal averaged snow pack in the Cascades over the last century.

There have been two similar trends analyses regarding the snow pack levels in the Washington Cascades. Mark Albright, the Washington State Associate State Climatologist, reported that the average snow pack loss between 1943 and 2004 was only 9%.[4]

Officials at the National Water and Climate Center at the USDA in Portland conducted a provisional trends analysis very similar to the ones conducted for this paper. Their analysis was the first step in developing a quality assured data base for trends analysis purposes. There are several factors which can influence the measured snow pack over time, for example vegetative growth, human activity, changes in measurement methods, etc. The limited time frame trend, 1950-2004, is shown in Figure 2a, while the

[3] Oregon Climate Service.
[4] Author's personal communication with Washington State Associate Climatologist Mark Albright, February 13, 2007.

entire monitoring record trend is shown in Figure 2b. The bias that is introduced by using shorter time intervals is clearly evident.

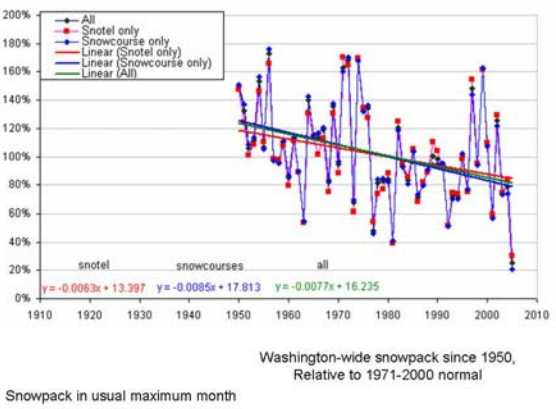



Figure 2a[5]

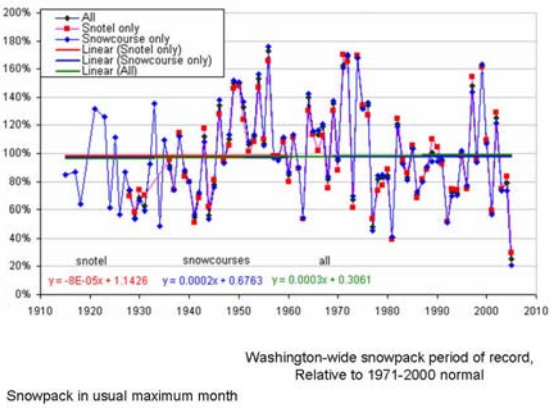



Figure 2b

Question: Are all of the predicted future temperature increases from 1.2 to 5.9 degrees Celsius equally likely?

Answer: The CIG forecasts of potential future Northwest temperature increases range from 1.2 to 5.9 degrees Celsius, with an average increase of 3.5 degrees Celsius, by the year 2100. The CIG forecasts are based on a subset of 10 models used by officials at the United Nations Intergovernmental Panel on Climate Change (IPCC) in their forecasts. The results from both sets of results are essentially the same. All of CIG reports imply that all of the various model temperature projections are equally likely.[6] Many of the subsequent CIG impact scenarios, in particular impacts on river flow, are dependent on the apparent strong connection between snow pack loss and the increase in temperature during the last fifty years. As a result, those conclusions are likely weakened by this finding.

This implication is highly misleading and unnecessarily alarmist. The following factors were not considered in the current projections presented by the IPCC and the CIG.

a. Projections are based on a rate of increase in greenhouse gasses that has not been borne out. Global $CO_2$ levels in the atmosphere have not been increasing at the rates assumed in the IPCC group of models (which includes the CIG subset). Based on the trend since 1970, the rate of increase is 0.4% per year. Although CIG officials mention this

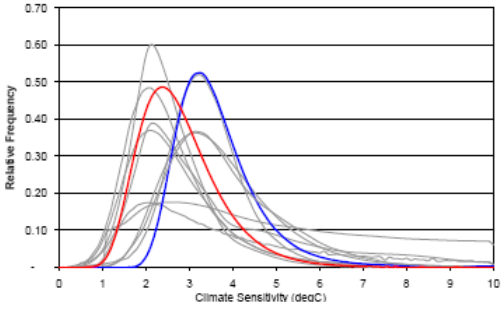



Figure 3

[5] National Water and Climate Center, U.S. Department of Agriculture.
[6] "Climate Scenarios and Models Used for Development of the 2005 PNW Climate Change Scenarios," University of Washington Climate Impacts Group website.

difference, they fail to highlight adequately the effect it has on their temperature forecasts.[7]

b. The distribution of the individual IPCC model results are not normally distributed, but skewed toward lower temperature projections as shown in Figure 3.[8] In other words, the likeliest temperature projections fall in the lower end of the range, with higher temperature increases proving much less likely. This oversight reduces the "average" future temperature forecasts by 39% in order to properly represent the "most likely" model forecast.

c. The IPCC economic growth model used has a high bias.[9] This bias relates to how future greenhouse gas emissions are tied to economic growth. Projections of high levels of economic growth would lead to projections of significant increases in greenhouse gases. Even under the lowest $CO_2$ emissions scenario, the IPCC economic model projects that 19 countries will have a GNP greater than the U.S., including North Korea, Libya, Algeria and Malaysia. When a more appropriate index is used, the future greenhouse gas emissions forecasts translate into forecasts that are 15% below current projections.

d. When the IPCC climate models are run retrospectively, average results are linear over the 1970-2000 time frame and match the observed data (see Figure 4).[10]

Both the corrected and linear fit projections agree showing only a modest expected temperature increase over the next century of 1.7 to 2.1degrees Celsius, in comparison to the much higher range projected by the CIG (see Figure 5).

As previously stated, the documentation used by CIG officials casually mentions that when the 0.4% per year $CO_2$ growth factor is used in their modeling exercise, the projected temperatures fall below the lower bound of the range they forecast. This essentially matches the same result as the linear and corrected graph shown in Figure 5.[11] As the graph shows, the most likely temperature increases fall in the low end of the projections, but the long tails of the projections make the mean of the potential temperature increase higher, leaving a false impression of the likely amount of temperature increase.

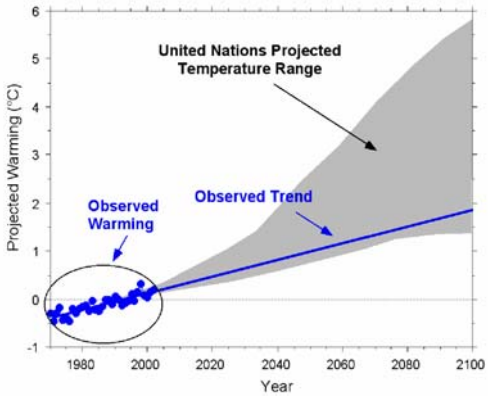


Figure 4

[7] Snover et al., p 8.
[8] Nicholas Stern, "Stern Review on the Economics of Climate Change," Cambridge University Press 2006; also Schneider, *Nature*, May 3rd, 2001, as discussed on pp. 24-26 in Patrick Michaels, "Meltdown," CATO Institute, 2004.
[9] Castles and Henderson, *The Economist*, February 2003, as discussed in Michaels, 2004.
[10] Michaels, 2004.
[11] Snover et al.

Although planners should consider uncertainty when evaluating the potential impacts of future climate, change they should focus on the most likely outcome, not the consequences of the extreme high temperature impact scenario.

Question: Will local GHG reduction plans and policies have meaningful benefits in reducing future global temperature increases?

Answer: The underlying rationale for proposed local GHG mitigation strategies is that every local effort can be multiplied into regional, national and global initiatives. This is the rationale for meeting the Kyoto protocol reduction goal locally even if the U.S., Canada, Australia and other countries do not. This is an "every little bit counts" approach to trying to solve a complex systems engineering problem which is global in scale.

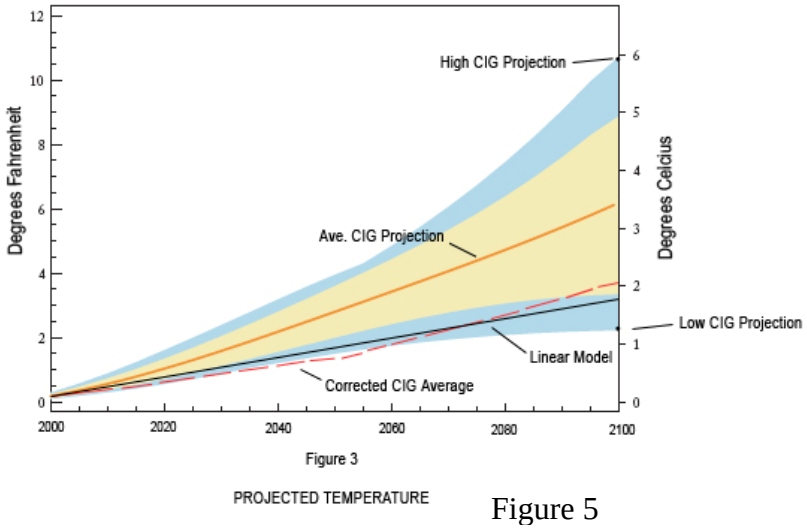



Figure 5

All of the local reduction goals are a mirror image of the Kyoto goal, which is not much more than an assumed growth offset of 1% per year compounded. A noted participating scientist in the United Nations IPCC effort, Dr. Tom Wigley, published a peer reviewed paper regarding the effect of full compliance (including the U.S.) with the Kyoto protocol on global temperature and sea levels over the next 100 years.[12]

The following analyses are based on the "average" IPCC temperature forecast, which do not address the previous issues and as a result, all of the results reported here are on the high side. Table 1 shows the temperature and sea level reduction benefits in 2050 based on the level of compliance with Kyoto, i.e. meeting the initial pre-1990 goal in 2012, plus a 1% per year compounded reduction thereafter until 2050. Let's call this strategy Kyoto Plus. This strategy essentially amounts to an 80% $CO_2$ emissions reduction below the 1990 baseline.

Table 1

| Case | Temperature Change | Sea Level Rise |
|---|---|---|
| Ave. IPCC Projected Increase | + 1.0 °C | +7.9 in |
| Kyoto Plus Benefit | -0.17 °C | -0.6 in |
| **Contributions to the total projected benefit:** | | |
| US Reduction Benefit | -0.066 °C | -0.24 in |
| Puget Sound Reduction Benefit | < -0.00066 °C | -0.0024 in |
| Eliminate All Puget Sound GHG Em. | < -0.00083 °C | -0.003 in |

[12] Wigley T. Geophysics Research Letters, Volume 25, No. 13, pp. 2285-2288, July 1st, 1998.

It is clear that the "every little local effort can produce meaningful benefits" approach is not a rational strategy. The flip side of this argument might be that these data only illustrate that we have a lot to do beyond Kyoto Plus. This piecemeal option does not fit the mold of a systematic approach to environmental problem solving. One must clearly recognize the global domain of the problem in the development of well reasoned and scientifically based solutions. This is a "top down" problem which is not solvable by "bottom up" strategies.

What future $CO_2$ level is acceptable to prevent adverse impacts? I would like to draw an analogy. Let's say that we want to build a new Tacoma Narrows bridge without any knowledge of how far it is across the Narrows, how deep Puget Sound is at the Narrows, or how many cars will use the bridge 100 years from now. Using the same "we have got to start now" approach that is used to argue for Kyoto Plus – that is, without having the requisite design information – we would remove a tablespoon of dirt from the foundation site on the Tacoma side of the Narrows and claim the project is well under way.

This discussion is not meant to imply that local cost effective energy conservation policies should not be pursued, but they cannot be rationally coupled to a yet-to-be-defined global climate change mitigation strategy.

**Conclusion**

Since there will always be uncertainty in projecting future potential climate change, it is important to quantify such uncertainty in so far as it is possible. We have yet to define clearly the scope of the problem, that is, the actual manmade contribution to the problem and, most importantly, the overall goal we want to achieve.

The current portrayal of the present and future impacts of climate change in the Northwest is not in clear focus. There is a pressing need for a more open process that translates scientific research results to more focused policy discussions. It is also clear that our policymakers have blurred the true connection, or lack thereof, between proposed local energy conservation policies and global climate change mitigation.

## About the Author

Dr. Kay H. Jones has more than 45 years of experience in the environmental management field. He has served in government, worked in the consulting arena and taught in academia. Dr. Jones is a retired U.S. Public health Service Officer. He served as a senior advisor at the President's Council on Environmental Quality under both the Ford and Carter Administrations. He is an expert on the Clean Air Act, environmental risk assessment and legislative policy analysis.

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