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Caveat Emptor: Make Sure of the Facts on Climate Change

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The two largest purchases most people make today are houses and cars. Because of the amount of money involved, prudent consumers do thorough research before buying. When buying a car, the purchaser looks at the manual and test-drives the vehicle, but also talks to owners of the same model and reads reviews in car and consumer magazines and websites. The prospective homebuyer walks around the neighborhood and looks at the house in person, but also gets reliable information on area home prices, crime statistics, local schools, and of course, a home inspection by a qualified expert. In the legal field, this is called performing due diligence and as a popular business motto has it, "an informed consumer is our best customer." If an individual buyer is willing to put hours of work into researching a purchase of tens or hundreds of thousands of dollars, how much effort should the nation put into investigating a proposal which will cost the nation trillions? That is the estimated cost of the climate legislation before Congress. Much of the information relevant to houses and cars is easily understood by the general public – safety statistics or the presence or absence of radon and termites – but in the case of climate science, the way in which relevant information is developed and synthesized is far more complex and opaque. Enough errors and misstatements by reputable climate researchers and organizations have come out recently to provoke a reaction in the public and this provides a good starting point for a discussion of how scientific data is generated, analyzed, stored and used. Our understanding of the physical world will always be imperfect, but we still have a responsibility to test, validate and revalidate, to be as certain as we can be about the climate data on which our future well-being depends.

Since the late 1980s, there has been growing concern among climate scientists that the earth's temperature is increasing, which they determined from the study of ancient climate proxies and from modern temperature records. The cause of this warming has been attributed by some to human emissions of greenhouse gases, chiefly carbon dioxide (CO_2), although other causes such as natural climate variability have been suggested. The United Nations' International Panel on Climate Change (IPCC)'s reports, which are meant to be the most accurate and up-to-date summary of the state of climate change research, include warnings about the potential for significant increases in temperature and the catastrophic consequences which they will produce. Because of their involvement in this international group, many governments have agreed to greatly reduce CO_2 emissions, in spite of the economic and social costs which will result from such a rapid shift in energy use. (It is the abruptness of the change in energy generation and use and the lack of cost-competitive alternatives to fossil energy which are likely to cause economic disruption. Decarbonization, which is the gradual shift from higher-carbon, less efficient energy sources to lower-carbon, more efficient ones, has been going on for centuries and is the default "business as usual" evolution of energy use.[1])

To reduce greenhouse gas emissions, the United States House of Representatives passed the American Clean Energy and Security Act in July 2009, also known as the Waxman-Markey bill after its sponsors. Estimates of the bill's costs vary considerably. According to the Congressional Budget Office, the legislation would cost the average household only $175 a year by 2020, although this estimate represented only the net cost. The gross compliance cost would actually be $890 per family and no estimate was given of the cost of slower GDP and wage and employment growth.[2] A more pessimistic Heritage Foundation analysis found that the Waxman-Markey legislation would drive up energy costs and cut consumption and that a family of four will see its direct energy costs rise by over $1,500 per year by 2035, not including the indirect costs of higher commodity prices and lower standards of living.[3] The director of the Congressional Budget Office also warned that employment would decline as the economy is forced to shift to low-carbon fuels.[4] After months of delay, Senator Majority Leader Reid has charged Senator Kerry to produce a climate and energy bill for the Senate's consideration before the 2010 elections.[5]

The Waxman-Markey bill and its Senate analog are responses to the alarming reports of the IPCC. But how reliable is the data on which the IPCC's conclusions are based? Researchers have found numerous problems with the placement of temperature measuring stations, whose records may be compromised by heat from encroaching development,[6] with the deterioration in the number and quality of stations across the world,[7] and with the methods of processing and analyzing the data.[8] Dr. John Christy of the University of Alabama-Huntsville, a former IPCC lead author, went so far as to say, "The temperature records cannot be relied on as indicators of global change."[9] In response to increasing public criticism, the British climate office recently announced plans to re-examine 160 years of temperature data.[10] Since their records are a main source of temperature data analysis for the IPCC, the admission that they may be less than reliable raises important questions about the IPCC's conclusions.

Corrections and even retractions of research findings are a normal part of the scientific method. For example, a prediction made last year in *Nature* magazine of future sea-level rise of up to 32 inches by 2100 was retracted recently by the authors due to mistakes they detected in their modeling.[11] Unfortunately, this kind of transparency is not as common as it should be. Leading climatology researchers at the Climate Research Unit (CRU) at the University of East Anglia and the University of Pennsylvania have also contributed substantially to the IPCC's reports. These centers and the scientists affiliated with them have been buffeted by charges of improper and unprofessional conduct in their research and analysis, particularly after a mass of their hacked email correspondence was released online in November 2009. The petty and vindictive tone of many of the messages is not surprising to anyone who has worked in academia, but it shocked and disappointed many people who supposed that scientists were exempt from human prejudice and error. Professor Susan Dudley described the deference usually given to the scientific community as a "cultification of science," complete with unimpeachable high priests.[12] Wallace Sayre of Columbia University once quipped, "The politics of the university are so intense because the stakes are so low," but the stakes here are of great consequence.

Some of the errors which have been reported so far are simple to correct. The 2007 IPCC report stated that 55 per cent of the Netherlands is below sea level, when the actual figure is 26 percent.[13] The same report claimed that it was "very likely" (meaning a greater than 90 percent chance) that Himalayan glaciers would disappear by 2035 if current warming trends continued. It was later found that this was simply an opinion expressed by one climate scientist a decade before.[14] Another claim in the

2007 report was that by 2020 global warming could reduce crop yields in some African nations by half; further investigation showed that the claim was wholly groundless.[15] Errors of this type might be expected in a high-school research paper, but they are indefensible at the level of the IPCC.

More serious, systemic problems have emerged from the hacked emails. Some messages suggest that the writers intended to keep contrary views from being published in scientific journals.[16] Such actions would seriously endanger intellectual freedom and the scientific method. Others show that scientists at the University of East Anglia's Climate Research Unit repeatedly ignored Freedom of Information requests for climate data and discussed erasing email messages to avoid having them exposed.[17] Professor Philip Jones of the CRU, whose work figures prominently in the IPCC's reports, has admitted that he had not organized his data well and his refusal to release the data behind his findings to outside researchers was based, at least in part, on his inability to document his sources.[18] Jones' colleagues have suggested that actually he may have lost the original data.[19]

Poor organization is a fact of life and the loss or corruption of scientific data can usually be dealt with on the university department level. But when that data is used as the foundation for national and international economic policy, the standards of generating, organizing and maintaining it must be as high as humanly possible. If Professor Jones' original data can be retrieved or reconstructed and if it confirms his conclusions, then it can be used in further study. If it cannot be recovered and therefore is not falsifiable, then his conclusions and anything based on them have no scientific validity. As Karl Popper said, "The criterion of the scientific status of a theory is its falsifiability, or refutability, or testability." Scientific principles require that an experiment, process or observation be testable and repeatable in order to be validated and without the original data, this is impossible. For that reason, transparency of both method and data is vital for progress in understanding climate.

Equally important, climate data must be reliable, or robust, as scientists say, which means that it must be thoroughly and repeatedly examined for flaws before it becomes the basis for analysis and public policy. No matter how sophisticated our climate modeling is, if the inputs are unreliable, the outcome is of no value. One solution would be to require that data and analytical methodologies used in governmental and intergovernmental reports be made public for review by both experts and the interested public. This, together with independent external auditing and validation, would go a long way toward guaranteeing the quality of the data and the conclusions drawn from it.[20]

If the scandals arising from the released climate emails and clumsy mistakes in the IPCC reports have any positive result, it will be a demand for greater transparency and corroboration of the scientific data which forms the basis of our public policy. We cannot guarantee that our politicians will always make the right decision even with the best possible information, but without it, making the right decision is almost impossible.

Notes

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