

There is a public expectation that science needs absolute proof to be trustable, but in the legal system, “beyond a reasonable doubt” is the standard used in the heaviest convictions, and less life-altering decisions are made with even less certainty in law, as in civil cases. Under this system, science can acknowledge its uncertainty but still be taken under consideration about policies as part of the “preponderance of evidence” that levels the playing field and gives everyone the most information available. |

A shared vocabulary among scientists for presenting their work to nonscientists is important, since inconsistencies and contradictions can erode public faith in science and in climate change, as has already been demonstrated.

With science being an ever-changing topic with no guarantee of truth due to the nature of science itself, using the framework of a familiar scale allows an understanding of probability of ‘truths’. The middle of the scale (no. 5) is labeled as the ‘preponderance of proof’ or in lay terms, the proposed fact is more likely true than false, allows debate while still acknowledging the likelihood of accuracy to the presented data. |

With regards to Climate Change policy, there is understood science in support of the existence of Man-made climate change in which would meet the criteria of at least ‘probable cause’ (no. 3) |

I think that the benefits intended by the author of this framework are to reduce ambiguity on the authority of scientists when they present findings in a legal setting, to make it easier for decision makers to assess science, and to give some metric to judge good science from bad science. I think that from a lawmaker's or judge's standpoint, applying these criteria would do just that. One could systematically judge science against these standards, and you would remove the ambiguity, assign a number to the relevance of the science, and make it so higher numbered findings beat out lower ones, thus allowing "better" science to prevail.

**So, in the ideal case, I can see climate change science getting a rating of 8 or 9 on the Table 1 scale, thus giving it legal strength to affect change.**

**would like to end on the note that I would like to work towards a government that could implement these criteria in a fair and objective way, which would likely lead to saner and rational policy.**

Language and uncertainty have been weaponized against the scientific establishment. Scientists are trained to never speak in absolutes. Whereas the political actors they tend to be up against are perfectly willing to speak in rock solid language. To the average person two people in suits with one saying they have a theory that describes something like climate change and the other saying they have proven it false without any doubt can lead to less than optimal outcomes. The establishment of rigid descriptions of how much doubt exists within some scientific discussion could help alleviate some of that problem.

Fundamentally I think part of the problem just comes from the language used. Specifically the word theory. Where as in common parlance the word theory is used to just express a belief that is yet unproven and in tested. Whereas when scientists speak of theory they indicate something which can have huge amounts of evidence backing it up. This and a scientist's general unwillingness to speak in black and whites has led to a misunderstanding from the general public as to what science means when it speaks. Ask any scientist what flaws they could see in their ideas and compare that to a politician.

The idea that a list of certainties could help out with this issue. Being told how likely something is to be true could be helpful but I have my doubts. For one we are still not speaking in absolutes. Those that advocate against science informed policy will still tell you that their idea is 100% proven. Additionally we haven't thus far succeeded in teaching the general public how to understand scientific language. Why is this new language so much better? Current scientific language is not hard to understand. People just argue against it to stir up confusion. How will this be any different?



As such, framing scientific certainty (or rather uncertainty) from the point of view of already established legal terminology might provide a better way for non-scientists in Congress to assess validity when discussing science in policy. In particular, the scale allows for degrees of “certainty” which allow for some doubt while still requiring action. For example, the “preponderance of evidence” would indicate that a scientific assertion is likelier than not (which is probably why it’s in the middle of the scale). A policy that requires validity only at this level (5) or above might be something that has a corresponding limited effect on the public (such as a specific, limited regulatory change to established policy). In this sense, a framework such as this might allow for properly assessing the degree of certainty required to act that is commensurate with the effect of the policy. Additionally, and with respect to climate

change, this framework would allow for more nuanced discussion of different sublevels of knowledge regarding a wide field. For example, one could discuss the effect of ocean acidification on coral reefs separately than say the effect of CO2 on global temperature as a whole since the two claims are both related to climate change (i.e. via CO2) but each might have separate amounts of evidence within this scale.

This framework will work best if the scientists are independently responsible for the defining of certainty. This framework would be effective insofar as it is distinguished from civil courts. Perhaps scientists require their own sort of judicial structure that can leverage policy makers into action. Real reform would take a lot. This framework attempts to not only clarify the urgency of climate change but also to facilitate a transition of science into a political arena. Politics should be legally obligated to accommodate scientific certainties yet science as an enterprise should remain autonomous from politics

First, the author mentions that categorizing levels of uncertainty with respect to terms in the law could help policymakers prioritize what policy needs to be done when, according to the certainty of the issue. For example, if there is one study that has a lot of precise research and the scientists are convinced it shows something is an issue “beyond a reasonable doubt”, and there is another study where the scientists say it is an issue due to a “probable cause” outlined in their paper, the policymakers could prioritize the former, so that the latter has more time to gather evidence and get more research about the topic done.

The second way this system could produce better public policy is by improving the communication between policymakers and scientists. Since usually most policy makers do not have a background in science, there can be misunderstandings when scientists who advise those policymakers don't have the precise language to express the degree to which there is uncertainty in a scientific study.

Which is the most likely descriptor for climate change/policy?

**Probable Cause** (i.e. humans)

**Clear Indication** (is there any one thing besides CO2 build up that is a clear indication?)

**Preponderance of Evidence** (are scientists even good at construction this argument → wave-particle duality, dark matter, etc)

**Substantial and Credible Evidence** (what does substantial mean in science? Credible meaning having low uncertainty or many sources/reproducibility? Aristotle can be proven wrong on this basis.

**Clear and convincing evidence** (never for complex systems)

**Beyond a reasonable doubt** (can science ever achieve this?)



