

# Hillerbrand and Taylor: On Lenny Smith's "Model Error, Real World Risk"

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Professor Lenny Smith's presentation was entitled: "Model Error, Real World Risk: Probabilistic Pathways but Probably not Probabilities". The meaning of this riddle of a title became clear very quickly in his talk on 24 January.

Illustrating from a wide range of real life problems, Smith showed that models rarely represent reality adequately and, worse, we prefer to remain deluded by the apparent knowledge provided by the model. To quote Alfred North Whitehead's phrase, we are subject to "The Fallacy of Misplaced Concreteness".

Smith argued that predictability depended on the decision context and illustrated this with "The George" pub in Botley Road, Oxford, which decided, despite last summer's floods which reached into the bar, to build new decking for customers below the flood line. Would you have predicted this if you hadn't known that a smoking ban was introduced in England in July?

A further key insight from the talk was the distinction between models where new data are used to check the model (so-called "out-of-sample" tests) and those which only use extant ("in-sample") data. Inference from in-sample data is notoriously unreliable and can lead to a belief in predictability when there may be none. This distinction applies to weather forecasts, which are "out-of-sample", and climate models, which are "in-sample".

Mean global temperature graphs offer further potential to mislead, as the fuzziness shown for the past refers to quite different variability to that for the future. The historic fuzziness is the difference between the actual and the various calculations (often calibrated to fit the data). In the graph that Smith showed, the future shows a predicted mean global temperature rising with a shaded area of uncertainty around it. What this represents is not a set of predictions all showing a uniformly increasing temperature but instead the ensemble effect of many pathways where any one pathway model run might have several years of decreasing global mean temperature. The danger of misinterpreting this graph is clear if we do then have a series of years with reducing global temperature.

Present climate models give us a lot of information, but not nearly as much as the public debate seems to suggest they do. Smith raised the question as to how the shortcomings of our present climate models can be communicated to decision makers who naturally stand outside the scientific community. Smith ended his survey with perhaps the most worrying thought of all - whether these models are structurally robust; that is, were their results converging at all?

He concluded with the warning: "If we mortgage our foundation on the laws of physics too deeply, we are likely to be interpreted as having no firmer foundation than 2050 economic forecasts."