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Transparency Requirements of Global Climate Change Technical Information

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Abstract

The International Panel on Global Climate Change (IPCC) has provided several reports addressing technical elements of global climate change as well as recommendations for the decision makers to implement the findings of IPCC. Currently, the global community including government agencies rely upon IPCC information in relevant actions. A key element of regulatory science is the requirement for transparency in science used in societal decisions. The implementation of transparency requirements is addressed in Best Available Regulatory Science and Metrics for Evaluation of Regulatory Science Claims (BARS/MERSC). This paper provides information on key elements of BATRS/MERSC including ethical rule, and exclusion of non-scientific issues such as ideology-related processes in regulatory science.as well as translation of science in a language that is comprehensible by knowledgeable individuals.

Keywords: Exaggerate; Jeffersonian Principle; Consensus Processes; Mitigating Actions

Abbreviations: The International Panel on Global Climate Change (IPCC); Best Available Regulatory Science (BARS); Metrics for Evaluation of Regulatory Science Claims (MERSC); Global Climate Change (GCC)

Introduction

One of the environmental issues that the global community is facing is the evaluation of Global Climate Change (GCC) as performed by Intergovernmental Panel on Global Climate Change (IPCC). The IPCC has operated since 1988 and has increasingly become more vocal on the need for quick actions. The most recent assessment – the 6th – [1] report consists of three parts:

i. The Physical Science Basis

ii. Impacts, Adaption, and Vulnerability

iii. Mitigation of Climate Change

The IPCC Assessment report is intended not only as a technical foundation to regulate the emission of carbon dioxide (CO_2) and other relevant gases, but also for global policy and regulatory decisions. Therefore, regulatory science including regulatory engineering applies to implementation of the process. The decisions and recommendations are largely based on mathematical models that attempt to establish relationships among various atmospheric parameters. The process is exceptionally complex and requires the application of assumptions and their verification. The complexity of the subject has caused limitation of understanding of the process primarily by specialists. Based on the complexity of the technical process, IPCC provides recommendations for policy makers for mitigation of the problem.

The coverage of details of regulatory science and regulatory engineering are beyond the scope of this paper. Both subjects are described in detail in a paper by Moghissi et al. [2] and a manual by Moghissi & Feldman [3]. Science as used in this paper covers all branches of basic sciences such as physics chemistry and biology but also other branches such as engineering, medicine, and ecology.

Assessment Process

Both this paper and the manual for regulatory science and regulatory engineering [3] include five Principles and two Pillars of Best Available Regulatory Science and Engineering. The relevant principle in both manuals is the Ethical Rule Principle. The relevant pillars are Classification of science or engineering, and the Pilar on Areas Outside the Purview of Science and Engineering. The Principles and Pillars are:

Principles

a) Open-Mindedness

b) Skepticism

c) Ethical Rule

d) Outside the Purview of Science

e) Reproducibility

Pillars

i. Classification of Engineering Claims

ii. Assessment of the Reliability of Engineering Claim

Much of the following wording is adopted from the manuals and several publications that cover regulatory science including regulatory engineering Figure 1.

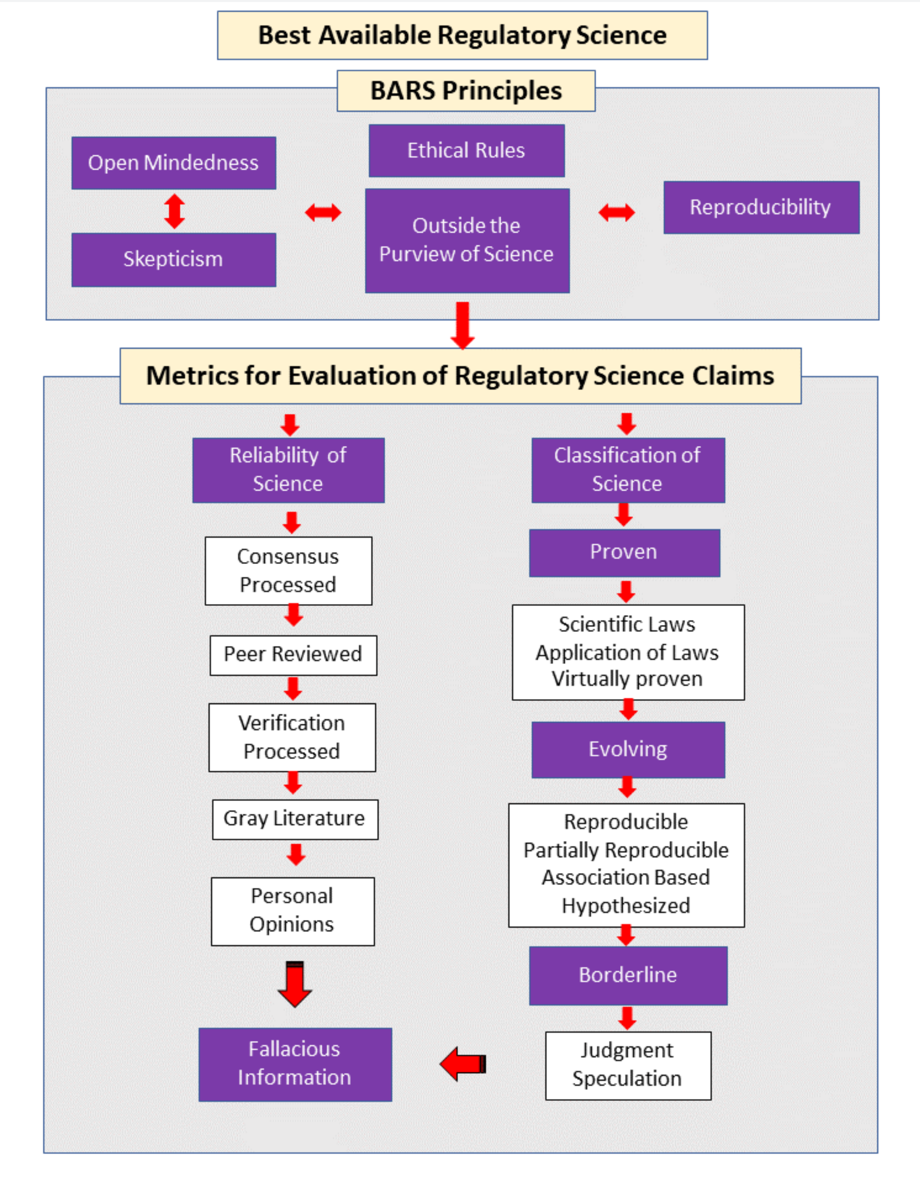

Figure 1: BARS/MERSC.

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Ethical Rule

Scientific, including engineering, and medical communities have developed ethical requirements to be met by their respective members, however, there are key regulatory science and engineering ethical requirements Moghissi et al. [4] applicable not only to those who deal with regulatory decisions but also to those who apply science and engineering processes used in preparing those documents. Key elements of the Ethical Rules Principle are:

Truthfulness

This element of Ethical Rule is universally accepted. It implies that in communicating scientific or engineering information, the relevant community or an individual (scientist or engineer) may not exaggerate or minimize beneficial or adverse effects of an agent, a situation, a condition, or any other relevant issue.

Communicability

This element requires that relevant scientific or engineering issues be translated into a language that is understandable to the affected communities. Jeffersonian Principle and its implementation provide the process to address this element of Ethical Rule.

Transparency

As science used in the regulatory process is predictive in nature, it includes various levels of uncertainty. The Transparency element requires that any assumptions, judgments, inclusion of default data, or any other issue that led to a conclusion must be provided to the affected community and ideally to the public.

Science Versus Policy

Another BARS Principle is Outside the Area of Science implying that societal objectives, ideology, beliefs, and similar areas may not be included in regulatory science or engineering. This principle is traceable to William Ruckelshaus, the first Administrator of the EPA who returned to the EPA during the Reagan Administration, to save the EPA. According to Ruckelshaus "…all scientists must make it clear when they are speaking as scientists – ex cathedra - and when they are recommending policy, they believe should flow from scientific information…. What we need to hear more of from scientists is science." On more than one occasion Ruckelshaus emphasized that citizen scientists (or engineers) are entitled to their opinion as is anyone else in the society, but they should not think that their opinion is somehow more worthy that the opinion of any other citizen because they are a scientist. That distinction makes it clear whether they are speaking as a scientist or as a citizen. An issue that was often addressed by Ruckelshaus was that being protective is not a part of science but policy.

A related issue is the structure of many science panels that advise regulatory agencies. The composition of these panels is complex, and their members are often not scientists or engineers but also others. These panels often provide policy makers with policy options. Ideally panels should provide the status of science and engineering but if the regulators want to have advice on how to use science in the specific regulatory process, a separate panel should be formed.

Pillar on Classification of Scientific Claims

a) This Pillar classifies scientific information in four categories based on the level of maturity. Each class has several items.

b) **Scientific laws and their engineering counterparts:** Included in the group are Scientific laws and reproducible technical principles that are derived from them.

c) **Evolving science and engineering:** Included in this group are Associated Based materials such as epidemiological information and mathematical models.

d) Borderline Technical Information consisting of Judgement and Speculation.

e) Junk science is often used by advocacy organizations and individuals who are promoting their political vision.

Pillar on Reliability of Scientific Claims

This pillar covers the level of reliability of a scientific claim ranging from personal opinion to consensus processed by evaluating a claim that consists of several claims including contradictory claims. The consensus process is used by IPCC in their decision process.

Regulatory Science Transparency and Communication

Transparency is a key element of Ethical Rule by requiring that the technical assessments or any other relevant information be provided to the affected community and ideally the public in language that can be understood by all. Ruckelshaus [5] popularized an old statement by Thomas Jefferson. According to Thomas Jefferson: "I know no safe depository of the ultimate power of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it away from them but to inform their discretion by education." As predicted by Ruckelshaus the introduction of Jeffersonian Principle caused disagreements between two groups. The proponents of Jeffersonian Principle believed that regulators and other decision makers must provide relevant information, particularly scientific including engineering aspects of the decision in a manner that is understandable not only to the affected community but also to the public. In contrast, the Opponents of Jeffersonian Principle claimed that the public does not necessarily need to be involved in major decisions for the following reasons:

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i. If the relevant science is beyond the ability of the recipient to comprehend

ii. If the public is unable to comprehend its needs.

iii. The release of the information would delay or eliminate the completion of a decision that to the judgment of proponents of the decision would be vital.

iv. The regulator claims lack of knowledge and familiarity with the relevant science or other key elements of the regulation. The true reason for such a claim is that the regulator is afraid to disclose the details of science used in the regulation. However, the regulatory is likely to have access to competent scientists who could explain the details of the relevant science.

As described above transparency constitutes the foundation of acceptability of the scientific including engineering part of the regulatory process. It requires that the regulators describe any scientific information that falls in one of the following categories in a language that is understandable to the affected community:

a) Any assumption

b) Any Judgment

c) Application of any default data

d) Inclusion of Areas outside the Purview of Science

e) Any other information that cannot be reproduced by an individual with sufficient and relevant knowledge, and access to relevant equipment and facilities.

Mathematical Models

Mathematical models are one of the most widely applied tools in regulatory science. The evolution of mathematics in conjunction with the availability of powerful computers has provided a unique opportunity for mathematical modelers to significantly expand their activities. Many regulatory and related decisions include mathematical models that provide the opportunity to quantify the impact of a proposed action. A reasonable definition of mathematical models is as follows: A mathematical model consists of identification of key relevant parameters, establishment of interaction between and among them, and using the resulting information to develop a mathematical equation that responds to regulatory needs. The reliability of mathematical models ranges from Evolving Science to Borderline Science. The development of models consists of multiple steps:

i. In the first step, the parameters are identified.

ii. During the next step, a mathematical equation is developed using assumptions in their relationships.

iii. In the final step, the model is verified by many approaches.

iv. In most cases the process must be repeated.

The most valuable models are weather prediction for specific areas of the world. Although the weather predictions are not always reproducible, they provide a reasonable approach for many societal decisions. These models have served the global community well by attempting to predict adverse weather conditions.

Application of Regulatory Science to Global Climate Change

i. As described above, the reports of IPCC consist of three parts. However, IPCC uses predictive and mathematical models to evaluate the existing conditions, make predictions, and recommend mitigating actions. The authors of this paper recognize the services that the members of IPCC, including their predecessors, have provided to the global community. Similarly, many environmental regulations and policy decisions are based on technical information with uncertainties. However, not only the US but the global community would greatly benefit from the availability of relevant key and complex information translated into a language that can be comprehended by educated people. Hopefully, qualified organizations without conflict of interest would be funded to perform the translation. Ideally, agencies such as the National Science Foundation, Department of Energy, and Environmental Protection Agency should be provided with funds to support translation of GCC information by universities and research organizations. Such an approach would have additional benefit by enlarging the community with in- depth knowledge of GCC science.

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