Post-Copenhagen Climate Ethics: Applying Rule-Based Ethics to Policy Instruments, Technology Choice, Total Investment, and Climate-Related Communication

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Abstract:

Donald Brown of Climateethics.org has described three categories of ethical criteria for climate policy designed to help determine just, equitable, and environmentally sufficient targets for climate policy post COP15. The scope of application of rule-based ethics can be broadened to the selection of means to achieve and the cost parameters for achieving these just, equitable and sufficient ends. A proposal that climate policy deploy only policy instruments, technologies, and real world physical processes that are "appropriate, material, and effective" is ventured. In four examples, government-led infrastructure planning, concentrating solar thermal electric power with thermal energy storage, and building renovations using passive house technology and standards are found to be appropriate, material and effective, while cap and trade is found not to meet these ethical criteria for the purpose of reducing greenhouse gas emissions. Rules for the generation of cost estimates of the global mitigation and adaptation efforts are suggested that include consideration of high-level criteria such as target setting and probability of climate tipping points. Finally a restatement of the ethical rules of scientific discourse is extended as much as possible to the domain of social science, technology, and policy discussion. The deviation from ethical norms of communication of climate "skeptics" is constrasted with those of commonly accepted science and everyday discourse. This yields 6 sets of ethical criteria around which to build climate policy and create a gross structure for organizing climate-related meetings and institutions.

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Introduction: The Tool of Rule-Based Ethics

When faced with the unknown or disorder, people often search for patterns and rules to guide them through the chaos. After Copenhagen, there is an intensified need to discover rules that will guide future policy proposals, negotiations, and meetings. These may be new rules or the rediscovery of versions of older rules.

While ethical standards lie at the heart of what many of us consider our moral or ethical selves, there has been a move away, in academic and political discourse, from secular, post-Enlightenment rule-based ethics for a variety of reasons too diverse to go into here. The embrace of rule-based ethics still lives on in religious culture and in the religion-inspired political sphere, fundamentalist segments of which have in the last half-century generally defined themselves in opposition to scientific and Enlightenment-based value systems. It is unusual to talk about rule-based ethics as a "tool" because among other associations with the word, the most famous and influential rule-based ethicist of the last three centuries, Immanuel Kant, warned against treating other people as merely tools for our own ends. However, looking at human beings anthropologically, rule-based ethics are all around us and we use them as a means to make decisions all the time often in the face of uncertainty (e.g. "do unto others, as you would have done unto you", "Eat food. Mostly plants. Not too much", etc.).

Adherence to a rule-based ethics of some kind, encoded in laws or informal rules, is integral to maintaining social groups and commerce by restraining our less benign and destructive impulses. A public exploration of rule-based ethics has critical relevance specifically to climate policy as, beyond our need for a general morality, without ethical tools we will be unable to restrain ourselves or others from despoiling the planet through fossil fuel use. An ethics based completely on convenience, contingency and post-hoc assessments of net happiness/pain avoidance (consequentialism) will eventually lose sight of the interests of other people whom we do not know, but whose choices increasingly affect us as our choices affect them.

The word "ethics" comes from the Greek word for habit or custom. While the new challenges of climate change require some new habits and customs, determining what those customs will be involves reference to what we already know about the world and about human beings. Totally abandoning existing rules when confronted with new situations is a formula for getting permanently lost.

Also there are formidable economic, political, and technological complexities involved in climate and energy policy which can easily become over-complicated and obscure what is actually going on. The policy tools themselves can create a veil around themselves (a criticism I have made of cap and trade) forming a cult of insiders who risk alienating and disenfranchising the larger population from climate policy as well as losing sight of the purpose of what they are doing or of better alternatives. If there are some rules that will simplify or at least guide policy through its own complexity, that might very well be a "good thing" in itself. Ideally such rules will open actors within policy and technology

choice to the fullness and complexity of the data while keeping the bigger picture in focus.

Donald Brown and the Climate Ethics Center have done great work in keeping our focus on the ethical dimension of climate policy. Too often, the results of conventional economic analyses or conventional environmental economics are used as the final decision making criteria for choices which have vast and far-reaching consequences for all humanity. Meanwhile the economic models upon which those decisions are based are focused mainly on present and very near future concerns. A rule- and duty-based ethics may play an important role in shining a light through or re-structuring the murk of narrowly-focused economic analyses, arcane bureaucratic, technical, and deal-making verbiage.

4th Set of Criteria: Applying Ethical Rules to the Selection of Means to Mitigate GHGs

Applying Ethical Standards to Technology and Policy Choice

In Prof. Brown's analysis of COP15 in Copenhagen, I feel that aspects of the ethics of climate change that concern me and, it seems, many others are not included in this particular analysis. I would like to propose three additional sets of criteria to help guide climate policy discussions and actions going forward. In this piece, Brown has focused on three sets of criteria that should be used to judge the Copenhagen and climate policy in general:

1) **Environmental Sufficiency Criteria – Are emissions reductions targets sufficient to have the desired effect on reducing harm from GHG emissions?**
2) **Equity Criteria – Are benefits and costs equitably distributed throughout the world?**
3) **Just Adaptation Criteria – Are the effected parties from emissions past, present and future being offered sufficient means to adapt to new circumstances and/or compensation for damages**?

If I could make a general characterization of the focus of these three criteria, I would say that they are focused on just and adequate goals for policy but not on the means to achieving those goals. My focus over the past few years has been focusing on HOW we can achieve adequate goals and I believe ethics is a vital tool in choosing these means. Furthermore, applying rule-based ethics to issues of total financial cost will also add clarity to discussions of the amount of investment in these means. Finally, I belief re-stating what are ethically justified rules for communication and representation of fact and intention is important in establishing a framework for future negotiations and analyses of the effectiveness of present and future efforts to mitigate and adapt to climate change.

If we apply ethical principles only to the goals of climate policy, there is the danger that all climate ethics will be treated as a "non-realistic" contribution to the combined

discourse on climate policy and climate action. It is fairly easy to hold other people, especially leaders with a lot of responsibility, to high standards and not provide them with means to achieve those goals, or at least a methodology for discovering those means. Thus the "voice" of climate ethics will be strengthened if we discover what it has to say about the methods of achieving the laudable goals that most people would agree are right and just; differences of opinion tend to emerge when people assess whether these goals are considered realizable or not and if so by what means. Easy virtue is, after all, easy.

Feedback of the Means upon the Ends

There are also dangers in focusing on means alone, which can lead then to trimming short-term and intermediate targets to fit the means available. The means, if present and at hand, are "here and now" and the (ultimate) goals are distant and difficult to visualize. The saying "when you have a hammer, everything starts to look like a nail" expresses some of the difficulty associated with settling on a tool with little regard for ultimate purposes of using it.

One of the downfalls of the current process nationally in the US and internationally may be that the choice of means has been dictating near and middle term goals. Cap and trade seems to offer a seductive way by which one can have a "one-stop" shop where means and ends are neatly wrapped together. As it turns out, as I have written elsewhere, the linkage between target setting and real economic mechanisms for cutting emissions in cap and trade is so loose and easily corrupted that it undermines the effectiveness of the policy. Also, targets with any ambition would only be met by means that are not the central "selling point" of cap and trade, particularly arbitrary and economically-damaging administrative measures.

While the inadequate goal-setting in Copenhagen cannot be entirely blamed on the Kyoto process or the assumption that cap and trade would be the instrument that emerges post-Kyoto, the structure of cap and trade which pretends to be a comprehensive means-ends solution to climate has created a process where assumptions are made that means and ends will come packaged together. Furthermore cap and trade, as has now been documented in so many instances, uses easily corruptible assumptions about how markets will produce optimal outcomes.

Unbundling Means and Ends

As the seemingly neat bundle of means and ends within cap and trade doesn't really work, this opens us up to a climate policy with a structure where multiple means may be applied to achieve the necessary goals and these means will need to be calibrated to achieve those goals. This requires more thought and attention paid by policymakers and politicians. The assessment of means will need to take place within which criteria are used to evaluate those tools. Furthermore, calibrating means (tools) to achieve ends will involve a consciously iterative process by which methods are assessed, applied and their outcomes are measured, starting with the most likely and powerful tools. This entails a

different mental discipline than that associated with devoting oneself to one "portmanteau" tool.

Therefore, if the means (tools) discussion is not foreclosed, formulating ethical rules that can guide that discussion will be of help in selecting tools that can get us closer to distant goals and help achieve near term goals.

4) Deployment of Appropriate, Material and Effective Means Criteria
   a. Policy Tools
   b. Technology and Physical Processes

One of the most puzzling aspects of climate policy and action to date is the degree to which proposals do not rest on a detailed and more or less scientific understanding of the best technological, process management tools, and social science tools available to achieve emissions reduction goals. There has been a confusion or at least a blurring between what is virtual, abstract and speculative and what is concrete, available, and virtually certain to cut emissions. Often conclusions are drawn based on or "triangulated with" what are assumed to be the opinions of peers or of powerful interest groups. If these opinions do not have a substantive basis, then the selected tools are near worthless.

This blurring between high-probability and low-probability solutions with regard to actual policy effectiveness has a substantial political dimension which we can now ill afford. There are many political actors who are only too happy with business as usual, so we arrive at a damaged, half-way understanding of the process of actually achieving climate goals. By accepting at the outset 15 years ago third-best solutions to the climate crisis, there is little wonder that we arrive at unsatisfactory outcomes like that at Copenhagen.

I am proposing to name the ethical criteria for carbon policy and technology "criteria for deployment of appropriate, material and effective means". The word "appropriate" has its usual meaning of "fitting" or "apt". It does not necessarily mean "appropriate" in the sense used by the "appropriate technology" movement, which tends to mean "small" and "local". I am using the unusual word "material" to mean "real, integral and not speculative or arbitrary" and available for deployment within a 5 year timeframe. It is meant to have both the connotation of "concrete" and also, from the legal system and accounting, the connotation of "integral" and "necessary". Other wordings are possible; my intention is to exclude from consideration at this time those policy and technology proposals that are based on low likelihoods of achieving the goals of climate policy, where "low likelihood" is an approximate 50% probability or less. I am applying the word "effective" as well though with some trepidation as it is overused; I would have preferred to use "efficacious" or "effectual" but they sound too fancy.

(Provisional) Statement of Ethical Rules Regarding Means:

1. "Appropriate" - A technology or policy is appropriate if it addresses the domain of action in which it is supposed to have an effect.

   a. The negative "not appropriate" - a technology or policy is not appropriate if it addresses domains other than the one or more in which it was supposed to have an effect.
2. "Material" – A technology or policy is material if it is integral to the reduction of emissions, exists as of the present moment or can be brought with 100% certainty into existence within a 5 year period.
   a. The negative – "not material" – A technology or policy that is not yet in existence in implementation, in prototype or as an example to be studied OR is not integral to the emissions reductions process OR introduces superfluous elements into the emissions reduction process. Predictions that a technology or policy will emerge in 10 or 20 years time make it "not material".
   b. Modifier "Critical" – A technology for which there is no substitute or none of equivalent quality is "critical" for emissions reductions.
3. "Effective" emissions cuts can be defined as those cuts that serve the criteria class #1 "Environmental Sufficiency". In specific contexts, arguments over what "effective" is will be important in choosing between a zero-emissions technology framework or a "low" emissions technology framework.
   a. The negative – "not effective" – A technology or policy that leads to reductions that are not environmentally sufficient.
4. "Deployment" – It is an ethical imperative to seek out and deploy at this point in time with 90% of allotted resources tools that are material and effective.
   a. The negative – "not deployed" or "not in deployment" or "not in consideration for deployment" – the failure to consider, to fully evaluate, and to deploy appropriate, material and effective means to achieve environmentally sufficient and just ends.

A. Examples - Policy Tools

Example 1: Deployment of Appropriate, Material and Effective Means Criteria - Permit Markets for Carbon Price Setting

In a recent piece, I used the word "unserious" to describe the cap and trade instrument because it contained within it too much in the way of scientific (and in most iterations, financial) speculation regarding how one could encourage low- and zero-carbon investment. Another way to describe its unseriousness is by reference to probabilities and the insertion of unnecessary random elements into policy: the policy leaves to setting of the carbon price, the motive force for investment in lower carbon solutions, to chance. The carbon market as proposed in most carbon trading schemes is not directly "material" to investment decision making: the carbon price level is a byproduct of another process (trading and market demand for permits) that is not germane to the process of lowering atmospheric concentrations of GHGs. The outcomes then are dips (or peaks) in the carbon price such as that now experienced in the EU-ETS, which discourage investment at a time where it is needed.

Conclusion: The deployment of a market mechanism via permit trading for the setting of a carbon price is **not an appropriate, material and effective** use of a market mechanism.

Example 2: Deployment of Appropriate, Material and Effective Means Criteria – Infrastructure Planning Mechanisms

Not only can one apply these ethical criteria to errors of commission but also errors of omission. If leaders or thought leaders can be reasonably assumed to know about tools that can help cut emissions but pass them over or do not seriously evaluate them, this can be just as grievous a mistake as botching a policy that has already been chosen.

We know, for instance, that carbon mitigation over the long haul involves either, in the developed world, reconfiguring existing infrastructure or in the developing world, planning for new infrastructure that has a zero-carbon emissions potential. In the history of the building of infrastructure (and Adam Smith is with us on this) government planning and management plays a key role in providing these public goods. To rely on market mechanisms and price signals alone is a form of political "malpractice", despite the importance of getting those policy mechanisms right (see above).

The avoidance of discussions of planning on national scales as well as on a global scale is one element that has had an unfortunate political dimension which inhibits rational approaches to the climate problem. After the collapse of Soviet Communism with its centrally planned economy, it has been assumed that the "best" economic system is a minimally regulated capitalist market economy that eschews planning (in development economics sometimes called "the Washington Consensus"). Planning and markets have been cast as being antithetical to each other. However the mitigation of carbon emissions and adaptation to climate change each involve or imply massive infrastructure change, much of which is impossible without the involvement of government as at least as a planning instance if not the primary funder of these public goods.

The involvement of planning as an aid to carbon mitigation is obvious when we look at events in China over the past few years. While China has by no means the greenest economy, it is safe to say that the rate of change in orientation of that society towards enabling future emissions reductions has been staggeringly quick in the last few years. The building of electric rail, renewable energy facilities and manufacturing capacity all point to the role of the Chinese government in helping plan and invest in infrastructure that pushes China towards lower carbon intensivity in the future. At the same time, unfortunately, China is also pushing ahead with new coal fired power plants which are testament to the energy hunger of the Chinese economy.

I am not holding up China as necessarily an exemplar of climate virtue, only that the greener portions of China's economic development have been planned. China's readiness to use planning in combination with a market economy contrasts sharply with at least the current American economic ideal of a government that does very little

planning in apparent deference to a market that was supposed to obviate the need for planning.

Conclusion: The deployment of government planning to realize mandates to cut emissions is an **appropriate, material and effective** means to enable the reduction of carbon emissions, especially in the area of public goods and infrastructure. These means should become the focus of international cooperation where appropriate. Overlooking or downplaying the importance of planning as a central part of climate policy is a profound ethical lapse for leaders at this time in history, despite facing a political consensus that devalues planning.

B. Technology and Physical Processes

"Appropriate, material and effective" applied to technology or physical processes in the context of climate policy means that:

i) the technology (or process) is available now or will be available within the space of 2 to 3 years. The more distant the availability of the technology, the LESS valuable that technology would be along this dimension.

ii) the technology replaces an emitting or an inefficient energy-using technology or enables the use of such technologies as a direct effect of its deployment.

The point is that all relevant presently available technologies and solutions with substantial effects should be known to policymakers and be at the forefront of their considerations for policy. Some of this has to do with time constraints: we don't have much time to speculate on "maybe" technologies. Another part of this has to do with creating an atmosphere of seriousness: allowing advocates for what might be in the future to claim that their technologies or proposals are about to be realized clouds public discourse about technologies that are now available, though perhaps less glamorous or thrilling in their aspect.

Example 3: Deployment of Appropriate, Material and Effective Means -- Concentrating Solar Thermal Power with Thermal Energy Storage in North America

[Full disclosure: I have provided paid consulting services to a company that develops this technology.]

Concentrating Solar Thermal Power with Thermal Energy Storage (CSP/CSTEP w TES) is a technology with an almost 100 year history of stops and starts in its development, due largely to competition with fossil fuels throughout the 20th Century. CSTEP uses mirrors to concentrate sunlight to heat a fluid which eventually is used to generate steam that turns a conventional steam turbine-generator. Currently there are 5 CSP power plant clusters in operation and one of these clusters (3 power plants) has 7.5 hours of thermal storage; depending on design CSTEP power plants range in size from 5 MW to 250 MW, which in the higher end rivals the size of fossil fuel power plants. In CSTEP power plants designed with a TES system, heat can be stored in a medium like molten salt, rock or concrete to time the generation of electricity according to demand with heat losses of

1% per day and roundtrip losses in efficiency of 10% for stored heat, relative to direct generation from directly captured solar heat.

That I feel the need to explain this technology to a general audience is in part a tribute to the degree to which political leaders and the climate policy community overlook it even in North America where it could most easily serve power markets starting in the US Southwest. On federal and state levels in the US, renewable technologies with better political connections (solar photovoltaic and wind energy), nuclear power, and efforts to capture the emissions of coal power plants and store them underground have distracted from a technology that will cut emissions more quickly and surely than any other technology. Furthermore, we see among proposals generated for environmental uses of California's desert an initiative by US Senator Dianne Feinstein that places this vital solution at a much lower priority than recreation and land preservation. While several CSP projects may get one-time support from the economic stimulus bill of 2009 and there is a commitment to study areas for solar development, the connection between climate policy and solar development, and therefore long-term sustainable development of the latter is not yet on the agenda.

The policy community then seems not to be addressing or fully accounting for the following advantages of CSP with storage.

3) CSP/CSTEP with storage can produce power upon demand (a key advantage in supplying electricity which must be delivered instantaneously upon demand; most renewables must produce "on supply" of the primary energy.)
4) Produces power that is 99% carbon emission free (current designs require natural gas auxiliary turbine warm up)
5) Can replace fossil fueled power plant output on a one-for-one basis (most other renewables with the exception of geothermal and hydroelectric with reservoir require combination with other resources to replace fossil power plant output).
6) Theoretically, CSTEP with TES could within a period of a decade through very rapid build-out reduce total US greenhouse gas emissions as much as 25-30% by reducing carbon emissions from the electric grid by 80%.
7) Can be scaled to meet power demand within limits of what is appropriate for desert conservation. The technology's components are not dependent upon rare materials or highly complex production processes.
8) In a multi-factor analysis of environmental impacts and risks including land use, water use, toxics, net emissions per unit energy, local pollution, Jacobson (2009) found that CSTEP has the second highest environmental benefit to cost ratio of any proposed energy source, only exceeded in Jacobson's framework by wind power. Jacobson's study focused on generation plus end-use replacements for oil-fueled transport. If we excluded the balancing effects of networked storage from battery electric vehicles assumed in Jacobson's framework,

CSTEP with TES would look still more favorable as a generation technology.

9) With adequate transmission and land use planning plants can be permitted and built within 3 years as compared to nuclear plants that require as many as 20 years, while coal with CCS presents unknown complications.
10) Renewable supergrid proposals that integrate Midwestern and offshore wind resources and Southwestern solar resources overlap and expand the community of interest in large scale renewable energy development to most of the United States.

The barriers to implementation of CSTEP with TES are not insignificant but pale in comparison to the threat of continued use of fossil power plants. Each of these difficulties is surmountable via deployment of ancillary existing technologies, policy and persuasion rather than through wishful waiting and gambles on technical innovation that may not occur in a timely manner.

1) Some of the areas with the most intense sunshine are located in habitats for endangered species. Some tradeoffs will be required between uncompromising desert preservation and utilization of areas of the Southwestern states appropriate for power production (if all energy were produced via CSP…an unlikely outcome.). There is no "perfect" solution that will satisfy all parties.
2) CSP requires water for either cooling or with dry cooling, for washing mirrors. CSP uses much less water per acre than irrigated agriculture. If combating global warming is a priority, more of the fresh water resources of the Southwestern states would need to be devoted to power production and away from uses such as agriculture though still a fraction of available resources.
3) The cost of CSP with storage is in the current generation around $.20/kWh which is just under twice the current price for a new combined cycle natural gas power but emits almost no carbon and has almost total price stability. In subsequent generations this price will come down. Current American power plant economics does not allow for the positive externalities of CSP with storage to be paid for except through feed in tariffs or other price premiums which contradict the mandate for the cheapest possible power. Ratepayers and to some degree taxpayers as well do not make the connection between their payments for power and its positive externalities.
4) Both privately held and publicly owned utilities in the United States are highly risk-averse and seek to squeeze value from current assets rather than embark on massive retooling programs that would provoke controversy with shareholders and public utilities commissions. The interest of the population as a whole in a stable climate is not yet connected with the type of power for which these utilities contract.

5) Current regulations seek to maximize the amount of renewable energy produced up to a quota (the RPS) without regard for the ability of that power to replace fossil fuels and reduce emissions.
6) A multi-use regional planning process with CSP with storage and other renewable energy development in mind has yet to be entered into by all relevant parties.

Each of these hurdles to large-scale CSP with storage development are surmountable with sufficient effort; to do so requires a sophisticated understanding of the technology, the human, the economic, and the environmental issues.

While the United States is starting to develop a reputation in the world as a country with a seized-up political process, the particular type of logjam with regard to acting on climate solutions effects not only the US population but people throughout the world. The failure to realize the carbon mitigation potential of the desert solar resource through CSTEP with TES development is an example of an ethical error of omission in overlooking the potential of this resource.

"Critical" sub-criterion

The label "appropriate, material and effective policies and technologies" implies that there may be a choice of a number of technologies or policies to achieve the same ends. Adding a "critical" sub-criterion to "material" implies that there is no other choice to achieve emissions reductions goals or other choices add unnecessary risk to the achievement of those ends. As there is perhaps one other technology that is rapidly deployable and has a low environmental impact yet serves power demand with less certainty than CSTEP with TES (a wind supergrid), CSTEP with TES should earn the additional attribute "critical". Building a wind supergrid might also earn the "critical" attribute if a prototype for it existed.

Conclusion: CSTEP with TES is for electric power generation in North America an **appropriate, material and effective** means to cut carbon emissions. Furthermore given that there are within the next decade no foreseeable substitutes with similar certainty, rapid buildout of CSTEP with TES is a **critical** US national and global priority.

Example 4: Deployment of Appropriate, Material and Effective Means – Passive House Technology in Heating- and Cooling-Dominant Climate Zones

Another technology that has developed a following but is underutilized is the passive building technology formalized by Wolfgang Feist of the University of Darmstadt and now installed in over 15,000 buildings throughout Europe. Using superinsulation, passive heating and cooling and mechanical ventilation with an energy or heat recovery ventilator, these houses can either eliminate or reduce by 85% the space conditioning energy needs of buildings with smaller internal spaces. Most new multi-unit dwellings could easily achieve the passive house standard with an estimated 10% increase in building cost. Renovation of existing multi-family housing can achieve a passive house level of performance at a 25% overcost compared to a conventional renovation project.

The resulting building would after paying back the emissions associated with the renovation (a one to 3 year period) radically reduce overall emissions.

While achieving the passive house certification may be impractical for certain buildings or climate zones, the application of the technology is a progressive improvement in building envelope, building ventilation and, with pre-fabrication, construction methods that improves building energy performance markedly under most conditions. By both increasing the tightness and insulation of buildings and simultaneously increasing the fresh-air flow through those buildings with minimal energy losses, passive house technology as a retrofit in most cases and in many new building projects, will enable reductions in energy use and emissions.

Current national standards for building, at least in North America, do not have the rigorous, technology-based standard which is the passive house standard.

Conclusion: Passive house technologies are **appropriate, material and effective** means to cut emissions in climates with existing high per square meter/foot energy use for heating and/or cooling.

Discussion: Applying Rule-Based Ethical Standards to Policy and Technological Means

My effort here is to show that a relatively simple set of rules can guide discussions and action in the area of policy and technology choice. While I arrived at three abstract descriptors for good or better means to just and adequate ends, these descriptors are not necessarily the end-point for developing an easily applied set of rules to determine where to direct energies and attention.

If the use of these rules proves clarifying, I would hope policymakers, policy advisors, technology specialists, participants in the climate community and mitigation projects would take up these ideas and refine them, and optimally contribute their perspectives and efforts to the worldwide discussion on rule-based ethics as related to climate.

5th Criteria Set: Application of Ethical Standards to Total Cost of Mitigation and Adaptation

Some of the most contentious issues in the area of climate change are the projected costs of efforts to mitigate and adapt to climate change as well as the distribution of those costs among social groups and nations. Often rule-based ethics has shied away from discussions of costs, leaving these to the discipline of economics, which has in general avoided rule-making because of its roots in utilitarianism. The economist Nicholas Stern in his Review on the Economics of Climate Change estimated that a 1% annual commitment of GDP would suffice to hold off the worst effects of climate change, which he estimated as being as much as 20% of GDP in damages, a cost for mitigation which he revised up to 2% in 2008 because of the accelerated effects of warming. Stern, in his position as an economic advisor to the British government suggested these numbers but,

as he is not in the business of making ethical rules, did not propose this type of spending as a rule or mandate.

Unlike many who write about climate change and the related economics, I believe the tendency to underestimate or downplay the costs of climate change works against ethically informed action because of the enormous costs of failure to mitigate climate change. If for instance, it required 5 years of spending 5% of GDP (which is one half of what most developed countries spend on health care and less than one third what the United States spends on healthcare) and then 2% for 10 years afterwards, the price in my reckoning would be still affordable. There is, especially in the economic downturn in which we find ourselves, a multitude of worthy projects that would set our societies on a new zero-carbon course. To start these projects sooner rather than later would be of greater benefit than adhering to a fixed amount of expenditure per year or worse, attempting to pare expenditure to a bare minimum subject to political struggles and horse-trading.

The Least-Cost Doctrine

In discussions of the costs of climate change mitigation and adaptation, "least-cost" is brought into discussions as if it were an unalloyed and unquestionable "good", an ethical value beyond reproach. While "most-cost" is clearly a bad from the point of view of the entire economic system, it's opposite, "least-cost" is not necessarily a good. "Least-cost" is one of the ethical justifications for the use of cap and trade, which reputedly saved polluters money in cutting the emissions of acid-rain causing pollutants in the US during the last 15 years. Cap and trade has for the most part incentivized the purchase of low-sulfur coal by power plant operators, a relatively low cost and convenient pre-existing solution to sulfur-emissions, for which we do not have an equivalent in the area of greenhouse gases.

It is not yet verifiable whether cap and trade incurs fewer costs to mitigate carbon emissions because it has not yet certifiably cut any carbon emissions. However the rumor of its "least cost" nature has remained an unquestioned assumption within the various presentations of advocates for its use. Speaking against "least-cost" then is not speaking against the ethical value that companies and society as a whole should place on cost savings or economic efficiency or any past savings that they have incurred while cutting emissions.

One of the chief problems with "least-cost" is the questionable durability of the products and services that it buys and thereby the durability of the "retired" emissions that are promised via the purchase of products, offsets, or derivatives thereof. This is based on two observations, one a commonsensical rule of thumb and the other factual. In general the cheapest things are less likely to be of high quality and to be as durable as those things that are more expensive. For some reasons in the promotion of the cheapness of climate mitigation the durability and reliability question seems to have largely escaped the advocates and least-cost oriented economists who attempt to reassure policymakers, corporations and the public of the ultimate inexpensiveness of climate action.

As could be predicted by common sense, the request for "least cost" can lead to "cheap" in the sense of poor quality and has been realized by the implementation of cap and trade so far. Offsets are a key device in the notion of an international marketplace of carbon reduction opportunities targeting "least cost". The questionable nature of offsets is now recognized by most who have studied the quality and authenticity of offset emissions reductions, recognizing rampant fraud and by some estimates one-third of offsets not accounting for actual emissions cuts.

Furthermore, certain key technologies and investments are disadvantaged by "least cost" despite their role in long-term sustainability and future reductions that follow-on preceding investments. "Searching out all least-cost carbon mitigation opportunities" as a mandate or stated value of carbon mitigation policy means passing over, postponing, and therefore removing priority from necessarily expensive investments like electrical infrastructure, many renewable generators, more expensive but durable energy retrofits, and carbon-free energy storage. Collecting all "low hanging fruit" first does not lead necessarily to net total lowest cost for the entire project of building a zero net carbon emitting society: in many cases entering a cost-curve earlier is going to lead to lower costs.

Conclusion: The "least-cost" doctrine is pernicious in so far as the performance, longevity, appropriateness, and integrity of the physical products, services, and tradable certificates of value cannot be guaranteed. "Least cost" as applied to individual measures also ignores the systemic nature of building a zero-net-carbon society. Without such guarantees or as the only cost-related rule, adherence to a "least-cost" rule is unethical.

Where are Mitigation and Adaption in a Hierarchy of Needs?

While it is "taboo" in current economic orthodoxy to prioritize needs and wants *a priori*, a prioritization of such needs for the society as a whole is contained in the varying budgeting priorities of nations and the international community as a whole via the UN. How much to spend on the climate crisis lurks behind every argument about what to do and how much to do and differences in assessment of the priority of climate protection. Put in other words, there is an implicit hierarchy of needs and wants which people operate with. If we look at discretionary spending in the budget of the US government, defense towers over other priorities, though if we look at mandatory spending, retirement insurance and healthcare for the elderly come first. Arguments about spending on climate change can be seen as having at their root variations in what different political actors view as the to-them optimal hierarchy of needs.

To those in the climate action community, if you were to ask them in private what amount they would have governments and corporations invest in climate protection, many would no doubt cite a higher number than they would allow themselves to utter in a public setting. The passion and concern of this group, within which I include myself, has some rational roots: we are facing a wholesale destruction of the natural basis of our

wealth and well-being if we do not take some very ambitious actions, which appear to cost a good deal of money.

The injection into political discussions of those who deny that the climate crisis exists, alters and biases the numbers downward. This is particularly the case in the United States, where one of two major political parties in essence denies the importance of climate change. The reduction of expenditures on climate protection may one of the ultimate motivations of those who deny climate change, many of whom are funded by economic interests who stand to lose from a rapid move away from a carbon-intensive economy.

But even if we accept that climate change is our greatest challenge, on a day to day basis there are pressing needs which will continue on, that have equal or greater priority. Our own needs to eat, sleep, receive medical care, etc. surely take priority. However there is a wide range of other wants and needs that especially in the developed world are taken to be necessities of life or at least non-negotiable needs/wants. What are we willing among these "discretionary" expenses and activities to forego to ensure an environmentally protective, just and equitable resolution to the climate crisis?

The reasonable, non-destructive resistance to action on climate is based on these "opportunity costs" of investment in climate: people who say that they want to spend their money and time in concerns that deal with the here and now or an alternative, less climate-influenced future have our sympathy. In many ways, they could be and are all of us because we all want to keep on living lives of comfort or at least not-reduced comfort.

There are perhaps three classes of activity which we all might reasonably consider in comparison to climate protecting activities and investment

1) Immediate life-threatening emergencies
2) Basic activities like eating, sleeping, working, communicating, caring for and educating children, having sex, etc.
3) Optional or "discretionary" activities

The first two uncontroversially take precedence over spending on climate protection under all but the most extreme circumstances of adaptation to climate change that themselves could be considered life-threatening. But determination of how much spending on climate change trumps category "3" or which "line items" in that category are less important than climate change.

Those who are marginally interested in or do not understand the threat of climate change, are far more likely to believe that most or all of their current household or their nation's current set of spending priorities in category "3" are more important than climate mitigation and adaptation. Those are most concerned about climate change are perhaps willing to forgo many of their category "3" activities if that would mean a higher likelihood of a sustainable future.

I believe a public discussion of the investment priorities associated with climate change would be far more productive than settling on a single instrument as the sole vehicle for dealing with carbon mitigation. An open national and international discussion about the relative priority of dealing with the climate crisis should be linked with budget-setting for investment in climate protection activities. So massive is the climate challenge that anything short of such a discussion is unwise.

Conclusion: Determining the tolerable amount of investment (of time and money) in mitigation and adaptation to climate change in relationship to broader social and personal priorities is a necessary step in arriving at climate policies that can have a chance of addressing the scope of the climate crisis.

From Disaster Insurance to Sustainable Development

Even if we remove the reflexive insistence upon least-cost, there is a range of tasks and thereby cost levels which might be assigned to the overall project of climate policy.

Investment related to climate change may not be simply a means to prevent specific events and damages from taking place but a framework through which a sustainable society can be structured. If we conceive of climate policy as the leading edge to developing sustainable societies, a series of large scale projects that address water shortages, agricultural productivity, biodiversity, human population growth, education, and the definition of development itself in a resource-limited world might in part influence how climate policy is conducted and add or subtract costs from the enterprise.

Level 1: Basic Insurance

If climate policy is conceived of disaster insurance for certain circumscribed disasters that can be strictly related to climate, it makes sense to assign cost estimates to the specific projects required to mitigate the effects of carbon emissions. The cost of insurance follows the simple formula:

(Probability of Event) x (Cost of Mitigation and/or Repair)

Numerous studies, including the Stern Review as well as the McKinsey/Vattenfall study have looked at estimated costs of various mitigation measures yet have not taken into account the large and unique infrastructure projects (electric rail systems, electric transmission, earthworks to prevent flooding, etc.) that will be required to reach a zero-carbon emitting society. This oversight is part and parcel with the trend in economics over the past 30 years that has undervalued or taken for granted public goods while overinflating the role of exchange of goods and services in traditional market format.

Cost and Benefit Co-factor: Speed of Mitigation and Target Concentration of Greenhouse Gases

Stepping away from the simple insurance model, the course of three factors also impacts costs:

1) The rate of onset and spacing in time of damages due to climate change
2) The proximity in time from the present of tipping points in climate activity
3) The speed of action which has been selected to mitigate 1 and 2

Factor "3" has the most significant impact. If we follow the ethically and scientifically responsible "350 ppm Emergency Pathway", costs are greater upfront as large-scale infrastructure projects will need to be started right away to essentially design and build a zero-emissions infrastructure plus plan or steer via policy large increases in carbon sink.

Overall investment costs may be higher for the 350ppm pathway but benefits would appear to be much greater, including lowered risk of encountering catastrophic tipping points. A pathway that targets 450ppm or even 550ppm appears at first glance to have lesser cost in mitigation but much greater expectable costs in adaptation. For some reason these tradeoffs in relationship to less ambitious targets are rarely pushed to the front of discussions on climate change. The effort to present a "modest" cost proposal seems to trump for many the obvious corollaries drawn from the climate science and current emissions: "pay more upfront for mitigation to save adaptation costs down the road". The usual framework for estimating adaptation costs and losses assumes "business as usual" rather than milder versions of mitigation efforts. The future costs in adaptation and economic losses due to half-hearted, "cheap" or politically expedient mitigation efforts appear not to have made it onto center stage.

Level 2: Building Basis for Sustainable Societies

If action on climate change is not viewed as simply an insurance policy against disaster but part of a project to resolve long-standing issues of imbalance between human societies and their environments, the acceptable cost framework shifts yet again. While efforts to present modest cost proposals might mention this as a "side-benefit", it is far more likely that such efforts will incur both more and different costs than a simple insurance policy. I am not passing judgment here on whether it is realistic to simply try to block climate change via mitigation efforts versus establish a completely different method of interacting with the limited resources of the planet in total, including the atmosphere. Among the crises that are foreseeable with or without significant climate effects are the shortages of oil, fresh water, agricultural land and agricultural inputs like phosphate.

Developing a cost model then for building not only carbon neutral but all-around sustainable societies would need then to itemize what are the various tasks that societies need to undertake to become sustainable and where there are areas of overlap and ways to economize between these tasks.

1) Carbon mitigation

2) Climate change adaptation
3) Agricultural Sustainability
    a. Phosphate
    b. Nitrogen
    c. Water
    d. Conservation and Restoration of Organic Matter in Soils
4) Fresh Water
5) Viability of Oceans (beyond acidification)
    a. Sustainability fisheries
    b. Refuse and dumping
6) Biodiversity

The list above is merely suggestive of the task confronting those who want to rationally confront the "piggy-backing" of many sustainability issues on top of climate mitigation.

Level 3: Building a Basis for More Equitable, Healthier Societies

A further list of desiderata are added to the climate challenge if we feel, as some do, that the occasion of climate change is an opportunity to remake society in one of a number of ways to increase social equality and/or to make societies healthier places on a social basis. Certainly the enterprise of addressing climate change pushes to the fore the notion that some, mostly the rich countries and/or wealthy individuals, are using up a common resource, the atmosphere. Should more aspects of equity and/or criteria of what constitutes a good society be added into the effort and, if so, what are their expectable costs?

1) Medical Care
2) Public Health
3) Income Security
4) Right to Work
5) Freedom from Persecution/Social Prejudice/Cultural Rights
6) Child-friendly Society
7) Right to Shelter
8) Educational Opportunity
9) More Social Equality

As there are great political disagreements about how to address or not address these social goals, I will not offer a recommendation in this context on including these goals as integral to climate mitigation and adaptation efforts. On the other hand, in some way many of these goals will of necessity have to be addressed along the way. I believe that an open and rational approach to addressing the climate crisis and associated sustainability issues that will impact all people will by the nature of its process also develop a more effective and healthier social process. Some would insist that social justice is a prerequisite for an effective climate policy of any kind.

If a consensus or movement towards a transformation of society in one direction or another becomes attached to or turns out to be integral to the effort to address climate change, this will be the "maximal" position in the spectrum of transformations and/or costs associated with the entire enterprise. While those who prize social justice most highly will welcome this, there are downsides that even these people should acknowledge to the "maximum program". Much political opposition to addressing either the basic insurance model of cost or the climate plus sustainability model of cost comes from fears of social conservatives that society as it exists will need to change in a direction that they oppose. Discussing the complexities of this opposition goes outside the scope of this document, however delaying addressing either menu item "1" (mitigation and adaptation) or menu item "2" (mitigation and adaption plus sustainable development) because of fears that "3" (mitigation and adaption plus sustainable development plus unspecified social change) will go awry, would be negligence of duty for even social and political conservatives because "1" and "2" are simply addressing common interests of humanity. Surely if their political and social views are salutary, then they should prevail in "3", while not allowing us to neglect "1" and "2".

Conclusion: Calculations of the ultimate costs of addressing the climate crisis will have to rest on the degree to which moral actors link carbon mitigation and adaptation to either other bio-physical limitations of social development and/or to social preferences that go beyond issues of bio-physical sustainability.

Discussion: Rule-based Investment Cost and Benefit Estimation

The pervasive tendency in estimated costs for climate mitigation and adaptation appears to be to "underbid" the actual costs, especially if we are going to make timely cuts and target a lower atmospheric GHG concentration. Furthermore if climate policy incorporates other societal missions and environmental challenges, the overall investment cost may rise though total benefits will increase. A public discussion of the overall costs as they relate to the specific tasks required rather than to relative assignment of responsibility for those costs, would be the first step. The factors of timing of cuts in emissions and the accompanying issues should be openly discussed within national and international communities.

6th Criteria Set: Truthful, Sober, and Complete Representations of Fact, Intention and Statistical Probability

As commonsensical as it may seem and perhaps insulting to some, demanding that in the climate protection process, speakers, analysts strive to represent the real world, their own or their group's intentions with regard to the climate protection process and/or their projections of future events as truthfully, soberly and completely as possible might be a help in insuring that all participants, including those who are opponents of that process are reminded of their ethical duties. Natural scientists are already bound through the scientific process to truthful representations of the scientific data, an aspect of that process that self-anointed climate science "skeptics" seem to overlook. Similarly we expect leaders and social scientists to do the same but here there is more room for

representations to be flavored by the intentions of leaders or social scientists to represent the more fluid and "perspectival" social world in ways that are narrowly self-interested, either covertly or overtly. (The sixth criteria is located at the intersection of the philosophical disciplines of epistemology, the study of knowledge, and ethics.)

Ethical Rules of Communication and the Fight with Climate "Skeptics"

The recent controversies surrounding the public presentation of climate science are largely a distraction from the far more serious task of bringing together those who work in good faith on the climate crisis but have varying views on which goals to achieve and how to achieve climate protective or adaptive goals at all. Warding off the bad-faith efforts of those who attempt to pick apart small details of the climate science data or how that data is communicated can be taxing and can lead to efforts to simplify rather than elaborate. The bad-faith efforts of opponents of climate action will succeed if those who discuss and act in good faith on climate significantly alter the content of what they present or the actions they recommend in response.

There are clear differences in the ethical rules of communication and presentation used between opponents of climate action and those who defend the majority view within climate science of anthropogenic warming. "Skeptics" subscribe to the following rules of discourse:

1) It is ethically permissible to ignore, misstate or misrepresent large swaths of scientific data (implicitly in the service of some unstated "good" deemed to be higher by climate "skeptics").
2) There are no neutral utterances and assertions (by other people); every utterance and assertion serves the personal economic or political interest of its speaker. For the purposes of political disagreements there is no "mind-independent world". This leads to cynicism about truth-seeking and truth-speaking of any kind.
3) Scientific hypotheses about controversial or unpleasant topics such as human-caused warming must be "proven" rather than be subject to confirmation, refinement or falsification by successive empirical studies of the data. Scientific assertions that are not inconvenient to the lifestyles of residents of developed countries and the business interests that support those lifestyles do not need to be "proven". (Even established scientific theories like the theory of relativity or Newtonian physics are not "proven", they advance from hypothesis to theory by successive confirmation and lack of credible falsifying results.)
4) Ad hominem references and attacks are as valid as any other utterance in arguments. The criteria for "winning" an argument can include any proportion of ad hominem attack in relationship to topical references and assertion.
5) It is a sign of personal weakness or weakness in the argument you represent NOT to engage in ad hominem attack and bullying. "Bad and weak people make bad arguments" so if you imply or perform in such a way that your opponent is made to appear bad or weak, their argument must be bad or weak.
6) The views of scientific specialists cannot be accorded greater authority than either scientists from outside that specialization or non-scientists in interpreting

(climate) scientific data. Anybody can have an equally weighty opinion about (climate) science.

By contrast those who are engaged in efforts to study and/or protect the Holocene climate implicitly are following or should be the following these rules of discourse:

1) The views of climate scientists have greater authority in interpreting climate data than non-scientists or scientists from other disciplinary areas.
2) Descriptions of climate change or arguments for climate action should be based to a maximal degree upon climate science data or its analysis by climate scientists.
3) In addressing the climate crisis, scientific descriptions and analysis of events in the geophysical world come prior to and are independent of political and economic concerns of individuals (they are part of a mind-independent world even though we may only know them through our experience).
4) Ad hominem attacks on climate "skeptics" have a lesser place and priority in arguments than logical or content-based arguments. Ad hominem attacks are either excluded from or subordinated or ancillary to a logical or content-based argument.
5) Scientific data often may contain statistical probabilities, while its interpretation almost always uses statistical tools. Good science can contain uncertainty especially in studying complex systems like the climate.
6) Action in the real world requires tolerance of uncertainty under many circumstances, including in the area of climate. Uncertainty does not contradict the need to act.
7) Secondary benefits of climate action (oil depletion, local pollution, general sustainability, economic stimulus) can weigh into considerations of whether to undertake climate action.

There is no ethical comparison between these two positions. One, that of climate "skeptics", invents self-justifying premises and shies from confrontation with uncomfortable realities while the other hews to scientific standards of argumentation and representation of fact. The former shows disregard for past and present and future harm to our species and other species while the former shows reasonable concern for these and preparation to redress these harms. However the "skeptic" position has gained traction in the media and in public opinion out of proportion to its moral standing, so a response of some kind is necessary.

The result to date has not been a debate of any substance but a series of skirmishes in the public sphere that unfortunately distract from the much more serious tasks of designing climate policy and deploying mitigation technologies. Additionally, these attacks interfere with the ongoing work of climate scientists in deepening our understanding of the climate system. As there is no intellectual weight to one side of this debate and it appears that none will be forthcoming in the immediate future,

Possible Methods to Clear Away Distractions from Conflict over Climate Science

I believe it is useful to view the skirmishes around climate science as sketched above as stemming from a gap between the different sets of ethical rules of discourse adhered to by either side. There may be a real and substantial disagreement somewhere between the two sides, but the current debate does not reveal that disagreement. Some of the "skeptical" position does not merit attention on ethical grounds but there may be some real human reasons for their influence beyond wealthy backers. Bill McKibben makes the point in his recent piece on Grist that we are all complicit in resistance to climate action of which these "skeptics" are only the loudest exponents; McKibben's point is that we are comfortable in our lives. Despite this complacence our ethical duty is to fight on.

Response 1: Tit for Tat and Pre-emptive Ad Hominem Attack

Tit for tat is one of the evolutionarily stable strategies in "game" like situations where there is the potential for both competition and cooperation. If one side inflicts some damage the other side will respond with an equal and opposite response which may lead to either further escalation or a return to cooperation. Another strategy is pre-emption (or in game theory "defection") where you strike first anticipating a strike.

For instance, one response to opponents that outmatch you in volume is to turn up the volume yourself. Another is to adopt cutting ad hominem attacks in the same vein as your opponent. Or one might pre-empt these by simply starting out at a loud volume and opening with a cutting attack. The climate blogger Joe Romm employs both these tactics in efforts to expose and lambaste climate "skeptics", deniers, and a news media that in his estimate, as well as others, gives too much credence.

The problem with both pre-emption and tit for tat is that one is departing from the ethical high ground in the area of communicative strategy. On the other hand, showing "fighting spirit" indicates to listeners and readers that you either believe passionately in what you are saying or you have at least a strong wish to defeat your opponent. Neither of the latter two concerns have ethical standing though they also not violate any ethical rules either. Nevertheless, those who feel they represent the ethically correct position with universal impact are also ethically obligated to persuade those who are opposed to that position as well as bystanders of their ethical obligations.

Response 2: Clarification of/Reframing Terms of Argumentation

The "skeptic" position is most vulnerable if it is attacked via its standards of representation and argumentation. I believe that those who present climate science results, either climate scientists or others, would do well to point out that those who are bombarding them with "arguments" are standing on faulty ground that is also highly unethical in terms of the representation of reality. While some will not be impressed by the generic accusation of being "unethical" (being "bad" is "good") when the specifics of that unethical form of argumentation are exposed, many listeners will discount their utterances more than they would otherwise.

Primarily this means pushing to the forefront the assumptions that advocates of climate action are operating under (most likely those outlined above) and point out differences between the approach of those representing the mainstream position in climate science and geophysics and that of opponents of climate action.

A) Ad hominem variant

The ethically faulty methods of argument and representation can be attributed to the speakers or writers themselves and by implication their characters. This is a more sophisticated continuation of "Response 1": they are ignorant of the scientific method, are deceitful, are unable to face unpleasant realities, are moral cowards, etc.

B) Restatement of incompatible positions variant

A version that is more consistent with a focus on ethical standards and is more welcoming of eventual agreement at some future date is to simply highlight as above the incompatible nature of how opponents approach claims of truth and deal with uncertainty.

> Example 1: Climate "skeptics" attempt to isolate data points from the mass of data that has been collected and derive hypotheses from these data points that contradict the trends in the dataset as a whole. As a climate scientist or defender of the work of climate scientists, the view is to the contrary that we should look for trends in the ENTIRE dataset rather than isolate portions of it. The public and those who are looking to the future are probably more interested in the trend of the data as a whole rather than in a jagged line drawn through the data that excludes most of it.
>
> Example 2: Opponents of climate action attempt to suggest that the data of climate science is distorted by the personal interests of those who warn of impending climate change. This is "shoot the messenger": it is difficult for the messenger at that moment of attack to decide whether to defend the message or him or herself. Rather than a series of "stories" by self-interested individuals, defenders of climate science and those who rely on it see their views as part of a self-correcting system which substantiates or falsifies their claims. Their personal interests are made irrelevant by the self-correcting nature of the scientific process.

Ultimately a focus on the views of climate "skeptics" is a diversion of energy from more important endeavors. However, it should be possible to pay attention to two or more "fronts" in the complex and massive challenge of meeting the climate crisis.

Truth in Representation in Climate Policy and Technological Development

While the fight against opponents of climate action with regard to the results of climate science is indeed wearying and troublesome, at least the natural sciences have a fairly clear cut system by which hypotheses are tested: at least in the end we can turn to

temperature measurements and ice records to arrive at a consensual truth, however painful and alarming.

Less clear-cut is data from the social sciences or from efforts to apply science in the area of technology. In the social sciences, there are issues of differing values that color the results and the proposed mechanisms: how much are people motivated by self-interest and how much by duty to others? Who will benefit more from climate policy and who less? Is one configuration of climate policy at all effective or is another more effective? Is one configuration more fair and just than another? Is the most effective plan more or less fair and just than a less effective plan? Is there a tradeoff between one set of ethical criteria and another?

Technology, because it applies or utilizes natural science principles, would at first appear to escape the slipperiness of social scientific representation of reality. However, individual technologies apply these principles to human needs and wants in specific ways that are not value free, additionally their production and commercialization also contain values that are part of the relatively changeable fabric of societies. Many marketers of technologies try to draw as straight a line as possible from basic science to their utilization of those principles but elements of choice and value-judgment become difficult to overlook, especially for specialists in that domain of technology. Very naïve "technologism" sees it as an extension of science but those in the know realize that technology development and production are social processes constrained by specific physical, chemical and biological realities. The engineering disciplines are the academic and professional homes of people who work directly with technologies.

Commitment to Truthful, Sober, and Complete Representations of Fact, Intention and Statistical Probability

There is a long way to go in developing widely accepted methods of determining what is a true, sober and complete representation of reality in the area of the social sciences and in engineering. To develop these principles now on the spot on the occasion of the climate crisis is too much to ask of unruly disciplines like economics, psychology, sociology, anthropology, and political science. Likewise, individual engineers deal with circumscribed problems related to one technology or another and are often employees of non-engineers who direct them to serve the purposes of a business that may want to control propriety secrets.

Still, in the face of the climate crisis, I don't think it's too much to ask for individuals involved to commit themselves to as complete, truthful and sober representations of social or technical facts as possible and to reveal as much as possible how they constrained NOT to do so by binding relationships and obligations. I don't think of those active in climate as particularly remiss in these matters, only that this enterprise requires the evaluation of many alternatives in as sober and truthful a light as possible.

The harangues of those who want to stop climate action are particularly distracting and misleading in this discussion. They are the not the reason for placing this ethical demand

upon participants in the process of determining climate policy. The question is not WHETHER to take climate action but HOW to take climate action. To do so in the optimal manner, involves knowing the domain of action in as much nuance as possible; that domain of action is society and the technologies that social actors employ to meet their needs and wants.

A development of an ethic of at least personal commitments to truthful representation (not the use of oaths and other legal devices) and perhaps a culture of doing so is an evolutionary step as we, by necessity, become a species that attempts to halt a global catastrophe.