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The Climate Change Debate: A Greater and More Varied Voice From the Social Sciences

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Introduction

As the debate on climate change in North America and Europe has heated up, the full voice of the social sciences, for the most part, has not been heard.[1] Indeed, the relatively small representation of academic scholarship in this debate has come predominately from the physical sciences in defining the problem (e.g. ref. 1, 2), and from one narrow branch of social science – neo-classical economics – in generating solutions (e.g., ref. 3). Both disciplines focus heavily on the quantitative and "rational" treatments of the climate change issue, rather than on its more qualitative and less rational dimensions (ref. 4, 5). In our opinion, this focus limits the development of a *social consensus* around both the reality of the problem and the effective implementation of solutions.

While the physical sciences and neo-classical economics can address issues related to "what" is at stake and what to do about it, a greater and more varied voice from the social sciences (e.g. sociology, psychology, anthropology, political science, etc.) is needed to address issues related to "how" the problem is accepted by the public and "how" that public will respond to the solutions that are imposed upon it. In fact, behavioural economics (ref. 6, 7, 8) has begun to incorporate research from other social sciences, especially psychology, but even this newest branch of economics under-represents what the social sciences have to offer.

In this paper, we will provide a brief overview of the ways in which a broader array of social sciences can inform the debate over the problem of climate change, and, more importantly help refine solutions. We then summarize these benefits by offering a modified model of

[1] In fact, the voice of academic scientists in general has not been heard. For example, a recent study found that of the 244 individuals quoted in news stories following the UN Copenhagen climate summit, only 4% were scientists (ref. 9), most of whom were physical scientists. Of the nearly 750 editorials and letters to the editor written for major newspapers and magazine between 2007 and 2009, only 9% were written by academy-based scientists with an even smaller number of those coming from behaviorists (ref. 10). And within the ivory tower, the top 30 journals in management and business published only 40 articles on climate change between 1970 and 2006; the top 30 sociology journals, the same number, and the top 30 political science outlets, only 11 (ref. 11).

problem and solution assessment in risk and science communication (ref. 12, 13); one that moves beyond their present focus on the "rational weigher" or "irrational weigher" models for describing social responses to scientific information (ref. 14). In this paper, we expand upon the "cultural evaluator" model in which individuals do not engage in expected-utility "weighing" (rational or irrational) of information; but rather use affective and related faculties of perception to discern the nature of the problem and what stance they should adopt toward a particular risk (e.g. climate change, gun control, abortion etc.) (ref. 14). Affective features, in turn, depend directly on cultural outlooks and commitments. This cultural evaluator model offers several adjustments to current approaches to climate change problem definition and solutions, particularly around the array of communication strategies to be used.

How Social Science Enriches Climate Change Problem Identification

Currently, the problem of climate change is defined predominately as a scientific issue: anthropogenic sources of greenhouse gases (GHG) are leading to a build-up in the atmosphere, which leads to a general warming of the global climate and an alteration in the statistical distribution of localized weather patterns over long periods of time (ref. 1, 3). But, while the scientific and technical components of the issue are critical, climate change is also a *socio-cultural* issue. It is an issue in which competing movements engage in discursive debates – or framing battles - over the interpretation of the problem (ref. 10). In the eyes of the social scientist, people analysing important issues always employ *ideological filters* that are influenced by their identity and worldview; that is, their belief systems. Critical to the formation of such belief systems are the referent groups to which people belong. Beliefs are greatly influenced by group values and people will generally endorse the position that most directly reinforces the

connection they have with others in that referent group (ref. 4, 15). In the case of climate change, climate disbelievers[2] have successfully associated acceptance of global warming science with "liberal" views (ref. 16, 17) and in so doing have activated specific frames that compel people to cement their connection with specific cultural groups that strengthen their definition of self (ref. 5). Once these people have made up their minds, providing contrary scientific evidence can actually make them more resolute in resisting conclusions that are at variance with their cultural beliefs (ref. 15).

Beneath belief systems – and strongly shaping their nature – are *categories and frames* that either support or reject climate science. These categories have been examined by social and behavioral scientists interested in the deeper logics that drive observable thought and behaviour (ref. 18, 19). For instance, Hulme (ref. 20) has identified seven issue categories that underpin the logics or worldviews animating the climate change debate: 1) the nature of scientific method and knowledge, 2) views of the ecosystem, 3) views of human responsibility; 4) perception of threats; 5) approaches to risk mitigation; 6) relative prioritization of development, and 7) the role of government in the market. The social definition of the climate change problem depends on how these issue categories are resolved (ref. 21). The communications literature can benefit by augmenting its focus on cognitive biases to include considerations for these cultural biases that are at play (ref. 22).

Unfortunately, these cultural and psychological dimensions of the debate are overlooked because social scientists that can identify and analyse them have been notably absent from the public debate. This omission is due both to a lack of awareness among policy makers of the valuable insights that the broader social sciences can offer, as well as the internal reward and

[2] In this paper, we differentiate between climate "disbelievers" -- the active social movement members who do not believe that climate change is happening – and climate "skeptics" who question the scientific results with an open mind.

incentive systems of the academy that bias social scientists away from engaging in public debates. Were they included, social scientists would first note that the social constituency relevant in this debate goes beyond scientific experts and extends to broader members of society (ref. 10). Second, they would point out that the processes by which these constituencies understand and assess the science of climate change are often non-technical. Third, an important part of that assessment is the generation of a *social consensus* (ref. 23) that follows the generation of a *scientific consensus* on the debate that began to emerge in the 1990s (ref. 24)[3]. Finally, to begin building a social consensus, social scientists would say that the discussion must move away from positions - "climate change is occurring" versus "it is not" – and towards the underlying *principles* (interests and values) that are at play; that is, towards discussion over the validity of the scientific process, the risk related to the likelihood and impact of action (or inaction), the economic implications of action, and the myriad ideological issues around personal freedom, the proper role and size of government, trust in the free market, and so on (ref. 20, 21).

In the end, a socio-cultural lens on the climate change debate reveals that the public discussion is not so much about GHGs and climate models as it is about competing ideology,

[3] Signals of a scientific consensus include surveys of climate scientists (e.g. ref. 25) and academic scholarship (e.g. ref. 26) that show strong uniformity of support for the IPCC consensus statement, as well as affirmations of that statement by scientific bodies, such as: Academia Brasiliera de Ciências (Brazil), Academié des Sciences (France), Academy Council of the Royal Society of New Zealand, Academy of Sciences Malaysia, Accademia dei Lincei (Italy), American Geophysical Union (AGU), American Institute of Physics (AIP), American Meteorological Society (AMS), Australian Academy of Sciences, Canadian Meteorological and Oceanographic Society (CMOS), Caribbean Academy of Sciences, Chinese Academy of Sciences, Deutsche Akademie der Naturforscher Leopoldina (Germany), Environmental Protection Agency (EPA), Indian National Science Academy, Indonesian Academy of Sciences, NASA's Goddard Institute of Space Studies (GISS), National Academy of Sciences (United States of America), National Center for Atmospheric Research (NCAR), National Oceanic and Atmospheric Administration (NOAA), Royal Flemish Academy of Belgium for Sciences and the Arts, Royal Irish Academy, Royal Society (United Kingdom), Royal Society of Canada, Royal Society of the United Kingdom (RS), Royal Swedish Academy of Sciences, Russian Academy of Sciences, Science Council of Japan, and the State of the Canadian Cryosphere (SOCC).

worldviews and belief systems. Social acceptance of the climate change problem can only be achieved through constructive engagement at this deeper level of the ideological filters that lead to an acceptance or rejection of the conclusions of the scientific community (ref. 12, 13 and 18).

Driving the social discussion to this deeper level will require multiple roles to communicate climate science: "(1) Subject-matter experts to present the latest scientific findings, (2) decision scientists who can identify the most relevant aspects of that science and summarize it concisely, (3) Social and communication scientists who can assess the public's beliefs and values, propose evidence based designs for communicating content and processes, and evaluate their performance, and (4) Program designers who can orchestrate the process, so that mutually respectful consultations occur, messages are properly delivered and policymakers hear their various publics" (ref. 27: 39). But the process by which these participants can fully understand the social perceptions of climate science is a domain that the greater inclusion of the social sciences can help us to navigate. Further, as will be discussed below, a broader view from the social sciences can offer critical insights into social acceptance of solutions that are proposed by neo-classical economics and even behavioural economics – most notably the development of carbon pricing mechanisms.

How Social Science Helps Adjust Climate Change Solutions

Within policy circles, one of the primary solutions to climate change being debated is the use of the market to establish a price for carbon, either through a carbon cap and trade scheme or carbon tax (for review, see ref. 3). While there are many nuances within such schemes – including tax abatement, supply vs. demand-side focus, mass vs. focused market participation (ref. 28) – all are based on the assumption that the quasi-rational pursuit of self-interest by

individuals within a market will not only work best but will maximize net social welfare. To simplify the assumption: if we set a price for carbon high enough, innovators will develop new technologies that emit fewer (or no) GHGs, investors will invest in them, companies will adopt or swap for them (e.g., via emissions trading), and consumers in all parts of the value chain will buy them.[4]

While a promising starting point for reducing GHGs, the neo-classical economic approach places too much faith in pricing as a singular solution for altering markets to address climate change and ignores the context in which those prices are introduced and by whom. A broader array of social sciences can be used to adjust this economic solution by incorporating research on perception, decisions, consensus, and action across three levels of analysis: the individual, the organizational and the institutional (ref. 32, 33). Table 1 below summarizes some of the research and potential insights to augment the economic (both neo-classical and behavioural) solutions to the GHG problem.

----Insert Table 1 about here ---

Individual Level Solutions

A fundamental premise of psychological research on individuals, one drawn upon directly by behavioural economists, is that people attempt to act rationally on their own behalf, but are bounded in their ability to achieve "pure" instrumental rationality (ref. 34, 35). This self-interest and bounded rationality expresses itself in several elaborate forms. For example, research

[4] This highly simplified picture of the human decision maker in neo-classical theory has been adjusted at the margin by information economics (e.g., ref. 29, 30), which focuses on lack of information, uncertainty, and bounded rationality. More recently, behavioral economics, discussed in this article, has made more fundamental adjustments (ref. 7, 8), but these have yet to become mainstream (ref. 31).

has shown that individuals will use *extremely high discount rates* when judging future value (ref. 36). Even well informed, educated consumers do not take advantage of some of the most simple energy efficiency opportunities—such as energy efficient lighting—which often provide return on investments of 30-50% per year (ref. 37). Further, people will make *self-serving*, or egocentric judgments of what is fair (ref. 38, 39, 40) and tend to make *positive illusions* in seeing themselves, their future, and the world in a better condition than it is or will be (ref. 41, 42). And, people often fail to see common ground in contested debates because they work from the unquestioned assumption that their interests directly oppose the other party's interests, what Bazerman calls the "*mythical fixed pie"* (ref. 43); what is good for the environment "must" be bad for the economy, and vice-versa. This is exacerbated when the other side is viewed as the enemy, which is common in environmental contexts.

As a result of these complex forms of self-interest and deep self-reinforcing biases (among many others), individual-focused solutions will often, unwittingly, end up creating a "tragedy of the commons" (ref. 44) in which individuals in the short term will consume at unsustainable rates. For example, GHGs may unwittingly be increased in the short run through the emissions rates of specific operations in anticipation of the extension of carbon legislation and the tightening of cap regulations, either of which might increase not just the cost for emitting carbon but also the price for selling it (ref. 28, 29).

Fortunately, social scientists have had some success at demonstrating that these heuristics can be corrected (ref. 45, 46). Educational programs focused on pointing out large flaws in simple heuristics, like steep discount rates or presumed positions, have been shown to improve climate decisions and thereby aid in the efficient response to market signals (ref. 47). Experiential training simulations and policy games have also been used successfully to over-

come short-sightedness and simple attributions about trade-offs (ref. 48). For example, some simulations have been able to retrain participants to widen the domain of exchange and increase the possibility of integrative bargaining, which might be re-phrased as "not just increasing the size of the pie but the type of pie to eat" (ref. 49: 213). In the case of the carbon-cap-and-trade systems, while single markets (e.g. among suppliers, per ref. 28) may be the place to start, mass or multiple participant schemes can help to maximize necessary trade-offs across such market segments. The overall point here is to recognize that people deviate from instrumental rationality in predictable ways that can be used to develop associated policies to augment simple pricing signals.

Organizational Level Solutions

When economists advocate the pricing mechanisms for GHG control, the organization is presumed to be represented by individual decision makers and follow similar market logics. Even behavioural economists tend to make this assumption, although there is a nod in the literature to the work on organizational decisions and learning (e.g., ref. 7). Macro social science underscores the boundaries of markets and the growing importance of organizations of all sizes for economic and social life (e.g., ref. 50). Organizations have two predominant effects on decision making related to the environment. First, they become filters through which the external world is viewed and information is developed, interpreted, disseminated, and acted upon (ref. 51, 52). As with individual biases, this filtering process alters rational expectations and perspectives through unique organization level machinery for problem recognition and solution development (ref. 53, 54). Consequently, *organization specific* heuristics are needed to overcome this problem (e.g. changes in reward systems, organizational structure, reporting routines and

governance mechanisms) (ref. 55).

Second, organizations act as complex systems that are capable of making decisions on their own. These decision systems are sets of rules and routines for searching, identifying and handling problems in their multiple environments (ref. 56). One means of handling complex issues, like GHG reductions, within organizations is to break them down and separate them: that is, to create so-called "loose-coupling" between goals and routines across levels and departments (ref. 57). Departments handle issues based on their specialities and, as a result, the organization is unlikely to approach important green technology or capital investment decisions with a united voice and in any one market – but instead with many voices in many markets. Internally, this loose coupling also leads to disunited actions. For example, capital and operating costs in universities are typically separated, where one department pays for energy efficiency improvements while another pays for the energy bills. Neither department has an incentive to optimize energy use for the whole organization (ref. 58).

One common solution to this problem is the creation of pooled routines, feedback and reward systems (e.g., via "performance adjustment") in complex, rule-driven organizations (ref. 59). Another, more counter-intuitive approach, is to work with this loose coupling process by creating an "ambidextrous organization", one that deliberately splits a firm's functional operations into those concerned with shorter-term exploitation of current technology and market segments and those concerned with longer-range exploration of opportunities on multiple fronts (ref. 60, 61).

When developing market policies to trigger organizational compliance or change, it is important to acknowledge this divergence (heterogeneity) in organizational behaviors, particularly compared to neo-classical, economic assumptions about such behavior. Social

science research has demonstrated that individual organizations base their actions on their own distinct *organizational identity* (ref. 62) or culture (ref. 63). In addition, organizations are known to be strongly path dependent in their actions, with prior actions and choices determining future ones, even non-action (ref. 64). Thus, these multiple "personalities" and "paths" of firms must be considered when trying to resolve climate change problems using carbon pricing schemes, and organization-level climate change programs must be tailored to corporate cultures and histories (ref. 65).

To capitalize on these differences in organizational identity culture, social sciences highlight the importance of working with a firm's own *framing* and *language* (ref. 66). The encoding process and medium of language affect a host of features in a firm, including how the natural environment around the firm is recognized. For example, carbon reductions can be framed as being motivated by increased consumer demand, improved operational efficiency, or reduced cost of capital, each of which will provoke different categories of response (e.g. strategies) the firm uses, and how it portrays its behaviour to its stakeholders, even its competitors (ref. 67). For example, consumer demand may provoke a response of product redesign, operational efficiency may provoke a process alteration and cost of capital may provoke new internal financial pricing schemes. Because of language, firms in the same industry with similar economic profiles can have very different responses to the same environmental regulatory regime (ref. 68). On the one hand, the carbon-cap-and-trade market may be framed as a strategic "threat" by a firm (e.g. what some code as "cap-and-tax"), because the scheme exposes the technology of that firm to an expensive overhaul of the production machinery. On the other hand, the scheme may be seen as an "opportunity", because the firm now has the choice to invest in new technology and receive carbon offsets in the future to reduce that amortized cost

- or to continue with its current production process but swap emissions credits with less polluting firms (ref. 69). Progressive companies are working with the framing of language to encourage change. For example, as part of their GHG reduction strategy, the Whirlpool Corporation avoids using the words “climate change,” preferring instead to remain focused on “energy efficiency,” an issue on which it has been engaged for decades (ref. 70). By using careful framing and language, change agents within companies can get their organizations to act in their own self-interest, even non-progressive ones.

Institutional Level Solutions

Neo-classical economics acknowledges the importance of formal institutions as a means of providing the infrastructure for the efficient operation of markets (e.g., ref. 71). Institutions are formal rules and norms of behaviour that emerge from specific networks or fields within society (e.g. government regulation, trade association rules, educational standards). In neo-classical economics, these formal institutions must provide incentives and monitoring mechanisms to align individual behaviour with market activities. More recent economic work has focused on institutions and their governance as means of addressing “market failures” (e.g., ref. 72). Within this perspective, networks and organizations themselves are deemed to be substitutes for the market under particular conditions.

Again, using a broader array of social sciences can provide greater insights into the role of institutions and institutional change. To begin, institutions have a more complex and enriched meaning outside of market failure, regulatory economics, and applied political science. For so-called “neo-institutional” theorists in sociology, institutions act as cultural and contextual

constraints on individual or group behaviour, giving collective meaning and value to particular events and activities (ref. 73).

Analytically speaking, the effects of institutions on economic and environmental decision-making are categorized along three dimensions: the regulative, normative, and cognitive (ref. 74, 75). Any institutional change must work to try to establish congruencies within and across these three dimensions. The *regulative (or legal)* dimension of institutions refers to the coercive or legal sanctions applied by the institution which organizations, to varying degrees, consider legitimate. Institutional theorists underscore the fact that most regulatory regimes have unintended effects – resistance, avoidance, standard seeking, and perverse incentives – and thus regulatory adjustments must be made (ref. 76, 77). For example, traditional tax write-downs (such as depreciation allowances on particular equipment), regulatory inflexibilities that limit technology introduction, and legal restrictions like zoning that limit high-density development along transit corridors, at the very least, mute or dilute pricing signals that would lead to lower GHG practices. Sometimes such regulations backfire completely. Estate and property taxes, for example, are calculated based on the land's "highest and best use value", but the highest value is usually found in rich suburban growth rings or in the densest inner city, business blocks, neither of which will reduce future sprawl and urban blight just outside the downtown core.

As policy-makers endorse some types of carbon pricing regulatory regimes (ref. 78, 79), they must also analyse the institutional and contextual dimensions by which these market interventions are to be achieved. For example, in the gasoline price spike in the summer of 2008 within the United States, the market responded efficiently with increased sales of fuel-efficient vehicles. But, if that price spike had been created by a *government gas tax* rather than what had been seen as the invisible hand of the market, the response would have been fundamentally

different (ref. 79). While some consumers and economic interests would have responded as the price signal had intended, others would have resisted through tactics of delay, lobbying and protest. A price signal is always politically and social inflected based on who is imposing it and under what means. It's resultant stability and permanence is therefore affected (as witnessed by the recent public and political revolts against pending regulation to phase out incandescent light bulbs).

The normative (or social) dimension of institutions refers to their moral or ethical grounding and attendant set of social obligations. These take the form of rules-of-thumb, standard operating procedures, occupational standards, educational curricula, membership requirements and accepted social norms, which emerge through universities, professional training institutions, trade associations and social engagement. To be most effective, any pricing scheme must be accompanied by a normative set of institutions that motivate GHG reductions as legitimate. An interesting example is one that involves the normative underpinnings for an apparently straightforward market price in the Irish "plastax." In 2002, the Irish government imposed a 15-cent tax on plastic grocery bags, and within one year, plastic grocery bag use dropped by 94%. But in the US, this plastax has failed – notably in San Francisco. The reasons that the formal regulatory framework worked in Ireland is that it fit well with its normative institutional dimensions. Ireland has no plastic bag manufacturers to mount an organized opposition; there was no problem of leakage from neighboring countries or states that did not have a similar tax; almost all grocery markets are parts of chains that are highly computerized with cash registers that already collect a national sales tax, so adding the bag tax involved a minimum of reprogramming; and the country has a young, flexible population that has proved to be a good testing ground for innovation, from cell-phone services to non-smoking laws. In fact,

the country was primed for change having just shifted from the Pound (or Punt) to the Euro; and people generally didn't mind paying the tax as the litter from the bags was seen as a common nuisance. In the end, a social norm developed to accompany the tax that framed anyone using a plastic bag as rude, with violators being treated much in the same way as someone who did not curb their dog (ref. 79).

Finally, the co*gnitive (or cultural)* dimension of institutions refers to the taken-for-granted beliefs to which organizations and individuals will abide without conscious thought (ref. 80). These cognitive elements are like social scripts or mental maps, held among a large group of individuals. For example, in defining the natural environment within urban centers, people take for granted that transportation routes are primarily designed for cars, not people. Walkability, while a real design consideration in some cities like New York (created long before cars), is far from the norm in places like Houston or Dallas (ref. 81).

While alignment within and across new institutions is important to aid market mechanism and regulation, older institutions are frequently a constraint on change in environmental ideas and practices underlying GHG use (ref. 21). Changing behaviour tied closely to one or more dimensions of an institution is far more difficult than changing behaviour at either the organizational or individual level. In developing solutions to climate change, institutional change seems particularly difficult because of the deeper underlying logics that sew together so much thought and action across levels of behaviour, from the individual to the institutional level. Nevertheless, social and behavioral theorists have researched several mechanisms for institutional change, including the importance of catalysing events, the role of social entrepreneurs and leaders, and the impact of social movements (e.g. ref. 73). For example, critical events (such as the BP Oil Spill) can act as "cultural anomalies" for rupturing the

institutional acceptance of environmental practices (ref. 21). Such significant, visible events create opportunities for social movement groups and entrepreneur leaders to marshal unique entrepreneurial solutions to change oil industry norms and practice.

The Cultural Evaluator Model and US Climate Change Policy

By now it should be clear that social scientists have many concepts and models that can augment and adjust neo-classical and behavioral economic models of markets for reducing GHGs. As a way of focusing these contributions, we elaborate the "cultural evaluator" model as a simple framework that can be used, particularly by policy analysts (ref. 14). The model has three main components: the starting premises and preferences of the evaluator, the three levels in which those premises and preferences are embedded and executed, and the perceived endpoints in the model. All three components are linked, to varying degrees, as end-points are both the product of cultural processes that precede them, and are, in turn the starting points for future decisions. These components, in their recursive format, are depicted in Figure 1.

--- Insert Figure 1 about there ---

Individuals begin by discerning what stance they should adopt toward a particular risk (e.g. climate change, gun control, abortion etc.) based on affective and perceptual states. These states are strongly influenced by their cultural outlooks and commitments. Part of these commitments entail not simply starting premises for the model, but the future end-points that are believed to be worthy and some cultural valuation of those endpoints (goals). As is shown in behavioural economics (ref. 6, 7) and in the economics of happiness (ref. 8), such endpoints may

not be strictly based on narrow versions of self-serving utility, but on broader attributes like happiness at the community level based on one's vision of a "just society" (ref. 82). In short, the cultural evaluator model argues that individuals will behave in an embedded fashion where their individual behaviour will be strongly conditioned by organizational and institutional factors. Thus, the three levels discussed in Table 1 become important for both understanding individual behaviour and for adjusting it.

Augmenting Policy

It appears that policy makers are coming around to a similar conclusion about the need for a broader, more behaviourally grounded approach to policy on climate change. The National Research Council (ref. 24) concluded that there is ample evidence from the social sciences to suggest that a price for carbon alone will not likely be sufficient to accomplish all programmatic goals.

> "Even in the best of worlds, a GHG pricing system does not lay the foundation for all aspects of the necessary changes for responding to the threats posed by climate change. In fact, regardless of how 'perfectly' a greenhouse gas pricing system is structured, it will likely encounter specific structural problems that require remedy through a portfolio of complementary policies." (ref. 24: 16)

Overall, in the opinion of policy makers, the social sciences are needed to help fill six policy gaps in climate policy: 1) to address temporal considerations, 2) to overcome market failures, 3) to fix information deficiencies and promote behavioral change, 4) to provide public goods and infrastructure, 5) to reduce distributional inequities, and 6) to coordinate with existing policies (ref. 24: 17; also see ref 83). And the cultural evaluator model helps to explore ways in which these gaps can be filled by highlighting that individuals do not simply use an expectations calculus that is biased by decision heuristics, but instead, frame their starting preferences based

on their cultural context. In other words, the "happiness quotient" (see ref. 8, 88) becomes part of this calculation and often outweighs the more obvious, boundedly rational expectations. The cultural evaluator model suggests that start and endpoints, like preferences, are framed heavily and can thus be re-framed by engaging a process for aligning individual, organizational, and cultural activities. For instance, where companies apply inappropriately short time horizons to decision making processes, solutions would necessarily focus at the individual level (e.g. biases in the discount rate can be fixed with adequate re-modelling and education), at the organization level (e.g. the short horizons might, in part, be addressed through more comprehensive, corporate accounting and information programs, but also by relying on the complexity of the ambidextrous nature of firms to encourage experiments with varying time horizons), and at the institutional level (e.g., the various dimensions of the market, such as the end-consumer or the building trades group, must be aligned to support changes in discounting horizons). Laws and regulations allowing amortization of green materials, for example, will not be effective without the normative support of engineers, architects, and tradesmen and the perception that such materials enhance quality (ref. 84).

Another example is in the area of information deficiencies. For example, it appears that price signals often do not reach individual consumers with sufficient strength or clarity. This is for varying reasons, such as the bundling of products, which creates complex trade-offs among their many attributes and a high cost to obtaining information on energy (ref. 81). This individual level problem can be seen as an opportunity for applying a cultural evaluator model towards organizational and institutional level solutions. For example, more incentives for organizations to use green marketing (e.g. via heavier rebates and credits for repaired green products) will encourage at least one arm of complex manufacturing and distribution

organizations to provide end-consumers with necessary information. Regulatory regimes that create sets of standards to support green marketing will encourage green marketing strategies at the firm level, which will cascade down to the individual level. The same is true for normative belief in business that "green" will sell and the cognitive mind-set that "green strategy" is one viable option for the firm (ref. 65).[5]

A Final Irony

Unfortunately, beyond the lack of connection between policy-makers and social science research on climate change, we social scientists suffer from our own institutional constraints that undermine our ability to make a difference. As noted recently by American Sociology Association President, Michael Burawoy, the rules of the Academy (e.g. tenure and promotion) are based primarily on the publication of top-tier academic journal articles in already established social science topic areas, areas which do not include topics like climate change, environmental management, and the politics of technology adoption (ref. 86). At the same time, publishing in practitioner journals, writing practitioner books, speaking at practitioner conferences – even serving on government panels - are discouraged as being "anti-intellectual" at worst, and as "impractical" wastes of time at best (ref 87). Thus, the lenses of social science need to be turned not only on the climate change debate and its current solutions, but also on itself in order to forge new academic institutions that will help contribute to social debate over climate change problems and solutions. One of the ultimate ironies about the climate change debate is that many of the

[5] The advisory committees of the National Research Council and the Department of Energy, like those in the Environment Protection Agency (EPA), are only one part of the policy formation group that is affecting the climate change approaches to pricing. While these two examples represent the government-sector, white-paper, positioning arm for policy adjustment, they do not represent the array of corporations that are engaged in GHG emissions and the political action groups around these firms. This constellation of loosely affiliated emitters and consumers who are their beneficiaries have their own agenda, as the climate change debate discussion made clear. Furthermore, some of them use the same behavioral adjustment techniques discussed above, but only to undermine the belief in climate change and the active pursuit of better GHG reduction policies (ref. 85).

social scientists that can help create truly new policy would turn down such opportunities because they must write a few more arcane scholarly articles to satisfy their tenure and promotion committees.

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Table 1:
Supplementary Sources and Solutions to Market Distortions

Levels	Sources	Solutions
Individual	Instrumental rationality	• Soliciting underlying cultural norm of "fairness" and distribution. • Doing dross-cultural comparisons of norms.
	Bounded rationality	• Using simplified, "adequately accurate" models. • Training and education in specific environmental management contexts with biases using decision heuristics.
	Multi-modal goals	• Using of multi-item bargaining in environmental context. • Creating a "package" or portfolio of environmental outcomes.
Organizational	Loosely Coupled Structures	• Recognizing the central nature of loose coupling and ambiguity • Using feedback routines across segments. • Working with decentralized solutions.
	Multiple Identities	• Basing appeals on identity. • Tailoring programs to identities not segments or markets.
	Unique Languages	• Studying corporate environmental languages. Using firm's own rhetoric for strategy formulation
Institutional	Regulatory domains	• Recognizing that regulatory systems have formal and informal sides – anticipating and adjusting to unintended effects.
	Normative frames	• Accepting in a deep way that underlying societal norms MUST be in place to support a regulatory change.
	Cultural cognition	• Recognizing, studying, and adjusting for the deep , taken-for-granted categories and logics in a field

Figure 1:

The Cultural Evaluator Model