

Decision making under uncertainty

H. Dowlatabadi

Cultural Content of Integrated Assessments & Models

Prof. Hadi Dowlatabadi

Center for Integrated Study of the Human Dimensions of Global Change
Department of Engineering & Public Policy,
Carnegie Mellon University, Pittsburgh, PA 15213, USA
v: (412) 268-3031; f: (412) 268-3757; e: hadi@cmu.edu.

Abstract

Integrated assessments are attempts to bring ordered analysis to global change problems. Culture is rarely considered explicitly in these assessments. However, the manner in which problems are perceived, formalized, and solved reflects the culture of the practitioners and their intended audience. Consideration of the cultural content of integrated assessments permits us to realize their strengths and weaknesses in informing the process of global environmental decision-making.

I show that, in general, assessments are parochial in their construction. Dynamics of socio-economic processes, values, and options, reflect the culture of a mature industrialized nation. When these tools are used to generate insights stemming from the heterogeneity of socio-economic processes and distribution of impacts and costs, they are likely to reflect the limitations of their parochial origins.

Introduction

What is the cultural content of an assessment? I can think of two distinct interpretations of this question: (i) how have assessments attempted to reflect culture and its diversity in their representations of the world? (ii) how do assessments reflect the cultural perspectives of their developers (or their intended audience).

The answer to these questions can shed light on why models such as DICE and IMAGE 2 differ so dramatically in their formulation, policy implications, and interpretations. Integrated assessments rarely document and communicate their underlying assumptions. These assumptions are partially matters of science and partially matters of culture. Examination of these assumptions permits us to evaluate the power and relevance of each assessment in a given context.

Representations of Culture in Assessments

To the best of my knowledge, culture and its dynamics are not an explicit component of any integrated assessment of climate change. However, various projects have attempted to reflect some aspects of the cultural *status quo* in their analyses. For example, in the design and implementation of the MBIS project Cohen took care to have stakeholder representation (Cohen 1995). This helped the assessment team to recognize and consider a broader portfolio of valued natural services and features of the Mackenzie Basin. Stakeholder participation also alerted the assessment team to various forms of inflexibility in adaptation to climate change impacts — especially adaptations which would impinge on culturally valued practices. MBIS also serves as a vehicle for showing that cultural diversity exists, at all scales, even across the catchment area of a single river. Assessments often brush aside such

diversity, formulating problems in terms of a single representative agent, making choices for the whole globe or a large region.

In the IMAGE 2 project (Alcamo 1994), the assessment team held consultative meetings with elite decision-makers. In this effort, the team followed the successful pattern of stakeholder involvement pioneered by Alcamo and others in the RAINS project (Alcamo, Shaw *et al.* 1990). Here, the European cultural norm of a decision-making elite and technocracy are reflected in the design of IMAGE 2. For example, the decision-makers' need for high resolution impact assessments is reflected in the high spatial resolution of the model. However, this desire to be responsive to the decision-making elite has not always been moderated by a realistic consideration of the accuracy with which geographically specific models of global change can be calibrated and validated.

In the ULYSSES project, the investigators are concerned with how assessments can be used by the public in the process of collective decision-making. Unfortunately, this issue is often only addressed after the assessment is completed, if ever. Thus, where the IMAGE 2 development team appealed to a panel of elite decision-makers to help in identifying the key issues and setting its design parameters, the ULYSSES team seeks to understand how the lay public assimilates and interprets information from integrated assessments and models. Their philosophy is that, in democracies, the general public will have to choose between consumption patterns which assessments associate with various future climate and environmental conditions. Do the assessments identify issues of concern to the public? Are the options they consider realistic? Are the insights generated by the assessments persuasive?

In the Targets modeling framework, Van Asselt, Rotmans *et al.* (1995) have used Cultural Theory (Thompson, Ellis *et al.* 1990) as a framework for categorizing structural uncertainty in assessment models. For example, in addressing the issue of demographic change, the authors construct competing paradigms for Hierarchist, Egalitarian, and Individualist cultures. This taxonomy is then used to label situations in which forces acting through micro/macro and family planning processes dominate demographic dynamics. This attempt has been useful in highlighting how structural uncertainties lead to dramatically different projections of key trends.

Unfortunately, Cultural Theory is mute about how a society moves from one cultural category into another. Thus, while it is helpful to consider how cultural factors may effect the dynamics of demographic and socio-economic processes, we do not know how cultures evolve. Consequently, while we are able to show the diversity of outcomes associated with assumption of different cultural settings, we are unable to shed light on how existing cultures evolve through time.

Cultural Flavour of Current Assessments

Assessments as a cultural construct

Beyond the explicit attempts to consider cultural issues described above, each assessment is a reflection of the cultural perspective of its developers. As the model developers are mostly academics, many assumptions in assessments reflect the reductionist approach to scientific inquiry. This may serve disciplinary research well, but is of limited value in application to problems of global change. Global change is contextually defined. Examples are provided below:

- For the vast majority of the world's population, climate change is a distant uncertain concern. For them basic human needs such as adequate nutrition, shelter, and public health are the immediate and certain concerns. However, the OECD is home to the majority of environmental scientists and activists. In the OECD local environmental problems such as potable water and soot abatement were largely solved in the first half of

this century. In the latter half of the century, their focus has turned to regional problems such as acid rain, and now onto global issues such as stratospheric ozone and climate. OECD scientists and representatives have mobilized the IPCC, INC, and COP to bring the issue of climate change to the fore in the global arena. However, in doing so, they have also diverted the attention of the very limited human resources outside the OECD away from more pressing and immediate local environmental challenges. In developing *integrated assessments of climate change* we are helping this process. If we were to develop integrated global change assessments we would be better placed to identify global environmental priorities. This observation suggests the need for an IPGC (Intergovernmental Panel on Global Change), in order for assessments to be of greater global relevance: process which will involve identifying and addressing environmental change issues at all spatial and temporal scales. I believe such a framing of issues is likely to have greater success in establishing a global ethic of environmental concern.

- Integrated assessments have tried to characterize the costs and incidence of climate change mitigation policies and the benefits of averted climate change. However, the vast majority of these assessments rely on an idealized representation of human activity. They idealize *status quo* as a world in which resources are currently optimized to maximize economic output. Because of this formulation, meeting any additional goal will be costly by construction. That is, if GNP is being maximized, the allocation of resources is optimal and a certain level of CO₂ will be emitted. Placing a constraint on the CO₂ emissions has to be costly, otherwise, the original activity could not have been making optimal use of the available resources. In reality, human activities are not optimized. The CO₂ mitigation effort may highlight opportunities to make better use of current resources. Hence, it is far from clear whether GHG mitigation will be costly, especially if carefully designed policies are pursued.
- In scientific assessments of climate change over the past century, there has been a tendency to attribute all change to anthropogenic factors. The recently released IPCC Science Assessment claims high confidence in detection of the climate change fingerprint, assuming GCMs are accurate reflections of nature. GCMs are not nature. They are tuned to exclude century scale natural oscillations. Thus, by construction, they do not admit natural climate oscillations on the same timescale as the era of rapidly rising anthropogenic GHG and aerosol emissions. However, recent research has revealed significant long-term oscillations on a regional scale (Schlesinger and Ramankutty 1994; Mann, Park *et al.* 1995; Mahasenan, Watts *et al.* 1997). Inclusion of natural climate oscillations raises two issues. First, the current estimates of climate sensitivity and response time to atmospheric composition are made less certain because it is difficult to attribute the patterns of climate change over the instrument record to human and natural factors. Second, if all climate change is assumed to be of anthropogenic origin, total control of climate change is conceivable. In reality, there is going to be climate change of natural origin whatever the magnitude of climate change due to anthropogenic factors. Thus, from an assessment standpoint, it is important to consider both: GHG mitigation policies and adaptation strategies to ameliorate impacts of climate change.

Treatment of uncertainty

I do not know if this has a cultural root, but why are decision-making & uncertainty characterized so naively?

- More often than not, uncertainty is missing from integrated assessments. When it is present, it is assumed to decrease with acquisition of knowledge through time. When uncertainty is reduced, decisions are assumed to grow more assured. I guess it is unrealistic to expect the culture of academics, my culture, to contemplate passage of time without reduction of uncertainty. I think we sometimes have too high an opinion of our

state of knowledge. Under these circumstances, acquisition of knowledge can provide evidence of how little we know and increase uncertainty. Climate change is a fledgling problem domain. Over the past two decades, we have learned over and over again that prior estimates of knowledge in the physical, natural and social sciences have been overstated. Beyond the issue of not knowing how little we know, is the question of how uncertainty affects decision-making.

- In most climate change assessments, where uncertainty is considered, it is assumed that sometime in the future, usually by 2020, there will be full knowledge about climate change and its impacts. These integrated assessments are used to identify the appropriate hedging strategy in the near term. Resolution of uncertainty is considered a pre-requisite to assured decision-making. This misconception is probably a reflection of how decision-analysis for individuals and firms has been inappropriately extended to global change phenomena. The key to global climate change mitigation is collective decision-making by a diverse group of agents. This involves accords between nations and interest groups which are heterogeneous in both the incidence and distribution of costs and benefits. In these situations, it is risk aversion and the value of uncertainty combined which motivate the actors to agree to collective action. Once the uncertainty in climate change and its impacts has been removed, the identity of winners and losers will also become known. Let us be realistic, after the uncertainties have been resolved, what are the incentives for the winners to sign a climate accord with the losers? Generic altruism is not an often seen feature of international relations.

Physical *cf.* Economic models of change

Yet another aspect of the disciplinary culture shaping integrated assessments is the manner in which the relationship between economic activity and environmental change have been formulated.

- In models developed by economists, there is an explicit attempt to place values on climate change impacts, and tradeoff the benefits and costs of particular abatement strategies. In this formulation, it is assumed that changes in the natural environment can be exchanged with changes in the economic environment. Integrated assessments models such as CETA, *ICE, FUND, GCAM, and MERGE permit exploration of an optimal tradeoff between the costs of climate mitigation and pursuant benefits. If the changes which are feared were marginal for *all* parties, this approach to problem formulation can maximize global utility. However, at any policy level, or climate change level there is a danger of non-marginal changes for some human activities and the environment. We have a poor record in understanding how large changes effect people, let alone compensating people for such non-marginal changes in their environment.
- In models developed from a natural science perspective, there is a tendency to define absolute limits on physical measures of climate change. This is reflected in the efforts of the FCCC to interpret Article 2 of the Climate Convention, and projects such as ICLIPS (Toth 1997). In these frameworks, environmental change beyond the specified limits (e.g., $T_{rise} = 2^{\circ}C$) is intolerable. These approaches can be faulted for two oversimplifications. First, no physical bound is sufficient to protect all biota. Second, the tight limits will, in some regions of the world, lead to human actions even more damaging to the environment than the avoided climate change.

¹For the * you can insert R, PR, SL to cover the range of models developed from DICE developed by Nordhaus (Nordhaus 1994).

These economic and physical paradigms for integrated climate change assessment can also be regarded as representing the difference between utilitarian and rights-based cultures.

Interestingly, the majority of the rights based integrated assessments have originated from Europe while most utilitarians call the US home. Could it be that interest in the utilitarian perspective has its roots in the vast frontiers of the new world, and that the rights-based perspective is shaped by the cramped quarters of the old world?

In the old world, long-term habitation has left few places untouched by human action. Very little, if any, of the landscape is in its natural form. There is a strong belief that what remains needs to be protected from further encroachment. Hence, rights are accorded to nature, and "ecological carrying capacity" is a prevalent concept.

In the US and other frontier economies expanding horizons rarely impinge upon existing societies and landscapes. The impact on nature is often considered marginal because many believe there is still a vast expanse of wilderness out there! Thus, somewhere there are substitutes for impacts of continued encroachment. Hence, the adherence to a utilitarian perspective, hedonic methodology, and attempts to value ecological services and capital (Costanza, d'Arge *et al.* 1997).

The fingerprint of cultures can also be detected in the policy instruments considered in various studies. In Japan, there has been a greater tendency to consider R&D subsidies and managed technological progress than elsewhere. In the US, the studies have most often focused on carbon taxes. Perhaps, there has been such a focus on carbon taxes because of a political leadership which has identified any new tax as unpalatable. In Europe, there has been a technocratic focus on prescribed emission limits. Finally, I know of no assessment which has considered the monitoring & enforcement costs of a climate accord. Perhaps this is because the main client of assessments, the governments, would not like to draw close attention to the efficacy of their own performance!

In almost all assessments, the impacts of policy and climate change are based on the culture of a mature industrialized economy. For example:

- Climate policy is simulated to shift the economy to a less carbon intensive pattern of activity. More than 50% of the world's population still live in rural regions, and have partial reliance on biomass fuels. For this group, the response to a climate policy increasing fossil fuel prices is intensified reliance on biomass derived fuels.
- Supply and demand for energy are assumed to be in equilibrium. In rapidly industrializing countries such as China and India, there are severe energy supply shortages. In assessments of the benefits of joint implementation, this supply shortage has been ignored. Thus, it is unlikely that projects which introduce new carbon efficient energy supply technologies will lead to the immediate retirement of the current inefficient power supply plants.
- The imbalance between energy supply and demand also renders static comparisons of the carbon intensity of such economies ill suited for measurement of benefits to tradable emissions permits.
- When assessments consider adaptation to climate change, they invariably consider avenues of making patterns of activity more robust to climatic uncertainty. For example, if there is going to be greater uncertainty in precipitation, the optimal adaptation is assumed to be the construction of water reservoirs. In much of the world, resources are insufficient for such a strategy. The pattern of activity and ownership is shaped by a culture of resilience. In arid regions, rain-fed agriculture is practiced at much lower intensity with a portfolio of cultivars which have performed adequately over a broad range of rainfalls.
- Many impact assessments rely on insurance markets or central governments to address the impacts of extreme outcomes. This may be an apparently fixed feature of mature industrialized nations. Institutions providing insurance in a material sense are far from

prevalent in more than 3/4 of the world. This has necessitated a pattern of behaviour distinctly different from that of OECD inhabitants. Instead of monetary insurance, there is widespread reliance on spiritual insurance, a service provided by religious institutions. Within this cultural framework, the responsibility for climate change is also often defined in fatalistic terms.

Discussion

I have discussed many different aspects of assessments reflecting their cultural origins. But I have reserved one specific issue for special treatment. The climate accord and assessments of future trends in key indicators of the social and environmental condition have a very narrow conception of "development." In fact, mobilization of resources and materialism is considered the only measure of development. This is a North American cultural perspective which is rapidly influencing cultural values elsewhere in the world. In more ancient cultures, where resources have been scarce, culture has been defined in terms other than materialism and economics.

In Asia, development has historically been associated with aesthetic achievements such as: poetry, art, and consciousness. Historically, when the limits of resource mobilization were reached in a locality, sustainable development could only be defined in terms which were divorced from material mobilization. This has been a shared experience for ancient cultures throughout Asia.

Today, resource exploitation is a global pursuit. In each region, trade has permitted each society to strive towards a level of materialism which is beyond the boundaries of what was once locally possible. Trade thus serves to distance "development" from its environmental implications.

Globalization is the buzzword of the decade. It has served to diffuse cultural values which are more consistent with materialism than aestheticism. This is not consistent with historic cultural values around the world. How long will the current cultural craze last? I cannot say. Perhaps climate change and other global environmental crises will re-introduce the notion of a local or global carrying capacity.

This would change the current debates about climate policy from the narrow confines of how to maintain economic growth while reducing climate change impacts. Development need not be in terms of economic growth.

Summary

The discussions above lead me to conclude that insights from integrated assessments are often culturally parochial. Thus, when issues revolve around multi-cultural acceptance of a particular vision of the future or policy option, there is unlikely to be agreement on the basis of a common understanding of the insight. The agreement, if ever present, is the outcome of divergent interpretations of the option and outcome space giving each party the impression of a desirable future. Reality may well disappoint many, if not most.

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