Environmental Governance Challenges in the 21st Century

Proceedings of a Symposium on the Occasion of the Retirement of Edward L. Miles

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University of Washington
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Edward L. Miles received his Ph.D. in International Relations and Comparative Politics from the University of Denver in 1965, taught there for nearly a decade and came to the University of Washington in 1974 as Professor of Marine Affairs in the newly founded Institute of Marine Studies. He served as the Director of IMS from 1982-1993, shepherding its transformation into the School of Marine Affairs in 1990. He founded the UW Climate Impacts Group (CIG) in 1995, as Principal Investigator on a major NOAA grant to study climate change, climate variability, and response strategies in the Pacific Northwest.

Following 36 years of distinguished service, he retires [July 2010] from the University of Washington as the Virginia and Prentice Bloedel Professor of Marine and Public Affairs and as the Co-Director of the Center for Science in The Earth System within the Joint Institute for the Study of Atmosphere and Oceans (JISAO). Ed remains Emeritus at SMEA, a Senior Fellow of JISAO, a former trustee of the H. John Heinz III Center for Science, Economics and the Environment, a member of the National Academy of Sciences, a Fellow of the American Association for the Advancement of Science, a member of the Board of the Union of Concerned Scientists and a Fellow of the American Academy of Arts and Sciences. Further details of Ed's wide-ranging and illustrious career can be found at http://depts.washington.edu/smea/users/edmiles.

A sampling of Ed's major publications outlines the scope of his career. His books include Global Ocean Politics (1998)79 and Environmental Regime Effectiveness (2002),80 while articles range from a very early consideration of integrated ocean policy (Miles, 1989)81 and one examining a specific problem in fisheries, that of straddling stocks (Miles and Burke, 1989),82 to a recent article which considers the increasing vulnerability of the oceans to multiple stressors and the problem of ocean acidification (Miles, 2009).83 Three major articles are collaborations with his team at CIG,84 including the promising proposal for the creation of a National Climate Service.


Dr. Edward L. Miles

Before I begin, I want to say how moved I am by the generosity of my friends and colleagues, people whom I think very highly of. In situations like this, I keep hearing in the back of my mind words from my father as I was growing up, warning me not to get a swelled head. For much of this afternoon, I heard my father saying: "Boy, watch that head!"

Introduction

This talk is a response, a lament and a proposal. First it affords me an opportunity to respond to serious questions raised at the Climate Impacts Group (CIG) Seminar on 5/4/10: “Reframing the Discussion of Global Warming and Climate Impacts”.

In summary from that discussion, we were in agreement that the essential issue that needs to be addressed by the CIG and others is one of sustainability, but we were not in agreement on the degree of emphasis that should be given to global warming and climate change.

This talk is also a lament regarding institutional barriers to effective learning on problems of sustainability. I will reference approaches to institutional design in fisheries management and lessons learned from negotiating the Law of the Sea Convention (LOSC). I am worried about the capacity of the human race to learn and I will explain my concerns. The paleo-evidence is clear about what happens to species that fail to learn.

This talk concludes with a proposal. It is not sufficient to identify a problem; rather, it is essential also to present remedies. I will make recommendations on institutional design, and conclude with a proposal to the University of Washington’s College of the Environment to see if there is any resonance for these ideas.

Sustainability vs. Climate Change: What is at stake?

To set the context for my response, I will tell you that those of us at the May 4th CIG seminar took an assessment of what had been covered in the discussion, and we all agreed that sustainability is and was the core issue. What we did not agree upon was the role of climate change and whether or not we were guilty of stoking this issue up. I want to carry on the discussion from this point.

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85 The UW Climate Impacts Group (CIG) is an internationally recognized interdisciplinary research group studying the impacts of natural climate variability and global climate change.

First, there is no question that the planet will be fine. It has sustained far more violent changes than we are imposing upon it and has survived. The critical question is whether or not we, the human race, will be fine since we are eating up the ecosystem services on which we depend. Considering the span of the last 20,000 years in relation to temperature change, it is helpful to use an image prepared by Bob Corell. Following the last ice age and subsequent warming from about 10,000 years ago to the present, conditions on the globe have been suited to human life. Those conditions are changing as global temperatures increase, and these temperatures are projected to continue increasing rapidly in the coming 100 years. The Intergovernmental Panel on Climate Change (IPCC) forecasts we will experience an increase of 2 to 3 degrees Centigrade above pre-industrial temperature levels within 100 years. Since human civilization has only been in existence for 10,000 years or so, as Corell asks in the title of his slide: Is this era of human existence simply an historic sweet spot? We as a species are now moving into a realm where we have never been before.

Focus on the world ocean: The problem of institutional barriers to effective learning on problems of sustainability

I will speak in the context of my domain, the ocean, not because the terrestrial side is not also important and warrants a separate and necessary discussion, but because I am really troubled about the ocean side and, as noted by Tom Dietz in his remarks, in the area of the ocean a lot less work has been done. I want to do this first by looking at two global conventions, the 1982 Law of the Sea Convention (LOSC) and the 1992 United Nations Conference on Environment and Development (UNCED), and I will ask a different set of questions than those addressed by Professors Burke and McDorman. I will consider what has been learned from and since those conferences.

The LOSC, despite containing things to be criticized, also includes important and deeply knowledgeable items that diplomats wanted to address. The preamble is farsighted and of note is the statement: “…the problems of ocean space are closely related and need to be considered as a whole”. When you consider what underlies the convention, beyond the extension of coastal state jurisdiction, you can detect three central design elements the diplomats wanted to accomplish. They first intended a fully comprehensive statement on the global law of the sea (which they have done). They also wanted an integrated design of the components and a balancing of classes of interests. The interests they wanted to balance were of different classes of participants focusing on two sets of objectives: equality of access to the ocean and a system to assure stability and order in anticipation of change. The objectives are not to avoid change, for change will inevitably occur; rather
the objectives are to establish systems that would keep conflicts within bounds. I think it is a really impressive piece of work by a large group of diplomats, even though a much smaller group of participants ultimately was consequential in shaping the outcome of the work.

Let’s fast forward to the 1992 UN conference in Rio, UNCED. Ten years after settling most of the outstanding issues, though not all, what set of concerns tripped the next convention? As already noted in Tom Dietz’s introductory reference to the Brundtland Commission (1983)\(^{91}\), there was a concern about sustainability. What drove UNCED? There were three factors, quite distinct from the concerns that drove the LOSC. They are:

1. The largest impacts on the quality of the coastal ocean environment come from human population growth, the density of populations accumulating at the coasts, and human activities in urban and rural environments.

2. Land-based pollution of the marine environment, particularly from non-point sources via river run-off and atmospheric transport, represents the most serious hazard to the coastal environment.

3. Since technological advances, in combination with population growth and economic development, facilitate rapid growth of multiple uses of ocean space, the only adequate policy response is Integrated Coastal Zone Management (ICZM)\(^{92}\) in addition to controlling land-based pollution.

What was learned from the LOSC in 1982? The thinking of many delegates, myself included, was centered on the question of property rights. Specifically the issues associated with managing the commons that derive from a lack of property rights.\(^{93}\) Giving coastal States’ authority over all living and nonliving resources within 200 nautical miles from their shores in the Exclusive Economic Zone (EEZ)\(^{94}\) was based almost solely on the assumption that management of the ocean would become more rational if the question of property rights were addressed. Creation of each State’s rights over the EEZ was intended to generate responsible fisheries exploitation that would modulate historic wild swings in fish populations generated by bad fishing policy.

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\(^{91}\) The Brundtland Commission was convened by the United Nations in 1983 to address concern regarding deterioration of the human environment and natural resources and the economic and social impacts of this deterioration with the understanding the environmental problems are fundamentally global and it is in the common interest of all nations to establish policies for sustainable development.


\(^{94}\) The Exclusive Economic Zone (EEZ), established by the LOSC, extends from the state’s territorial sea to 200 nautical miles from the state’s coast. Within this zone each state has special rights over the exploitation of all marine resources.
Were we ever wrong! As noted by one of our colleagues, the LOSC created a culture of sovereign entitlement for coastal States, but even with this new authority, they did not do any better in management of the fisheries resources at their disposal. They in fact did even worse. The period of 1970-1990 was the era in which it is correct to talk about serial depletions of fish stocks. Ten years after the LOSC, the world fishing fleet was severely overcapitalized, and sadly over-harvesting of commercially important species continues to this day. There have been, and continue to be, massive failures of fisheries management both within EEZs, as well as on the high seas.

So I ask: why couldn’t we learn when the rules had changed? Why, even within 200 miles, did we have such excesses? One answer is that the institutional design was wrong. Institutional fragmentation at the national level is responsible for many failures of policy and management with respect to the oceans. If that charge is correct, then problems of fragmentation of authority are solvable only through significant innovations in institutional design.

**Approaches to Institutional Design: How to avoid failures of governance**

So let’s talk about how we avoid failures of governance. I must first explain what I mean by governance. Governance involves, as its most important characteristic, the distribution of authority to prescribe and apply policy. This is the source of the authoritative definition of objectives and the pathways to achieve them, control over budget and resources, and monitoring and evaluating performance, etc.

Theoretically at least, if harmonized these functions can be done simultaneously at all levels of society. But in many cases these functions are not harmonized. If you want to talk about lessening fragmentation at the national level then you have to think about how ocean policy systems are put together, and what you have to do to understand them. Cutting a long story short, and based on considerable empirical investigation, I find that you must begin by addressing the overarching political, social and economic culture. From this level, you then move into the institutional structure and understand how authority is distributed and what the underlying dynamics are within the culture. Finally, you are then equipped to descend to the decision rules specific to the coastal State subject to the institutional structure within the culture.\(^{95}\)

When you do such a study of multiple countries, you arrive at a certain set of conclusions:

- National policy is simply the aggregation of haphazard responses to external demands; there is no coherence.

- Most national decision processes are highly fragmented and suffer from internal duplication and competition between jurisdictions, resulting in no clear sense of priorities.

\(^{95}\) Appendix D, slide 14.
• Little formal attention is paid to formulating objectives, and identifying and evaluating alternative strategies.

• No official perception exists of the need to calculate national net benefit relative to a wide range of resources and activities in the new EEZs.

In the last few years, however, there is an emerging interest in making integrated national ocean policy. An organization, the Global Forum on Oceans, Coasts and Islands, led by Biliana Cicin-Sain\textsuperscript{96} from the University of Delaware in collaboration with the Intergovernmental Oceanographic Commission (IOC)\textsuperscript{97}, is convening annual global meetings. When you look at that work, and talk with those in attendance, everyone is on the bandwagon of making integrated national ocean policy. While that seems encouraging, you must then look at the implementation side to see what is actually being done. It is easy to be declarative in support of major change but eventually one must ask: What did you do? How did it turn out? This is my analysis of what questions have to be resolved if indeed you are going to actually implement integrated national ocean policy.

I am well aware that making a plan is not necessarily where you stop. Even a good plan does not guarantee it will be implemented as designed because it must pass through the screen of bureaucratic dynamics. Policy innovation resembles a "garbage-can process\textsuperscript{98}" characterized by three things: problems looking for solutions; solutions looking for problems to which they can attach themselves (e.g., Homeland Security); and politicians looking for work. These garbage can bureaucratic conditions may be instrumental in creating windows of opportunity to advance innovative plans.

You get major innovation only when there are windows of opportunity, which do not stay open very long, powered by triggers, in the context of appropriate background conditions. If the changes are not made when the timing is just right, society moves on to other concerns, and you have to wait and hope the opportunity for change will come up again in the future.

There is no algorithm that automatically connects national attributes to implementation, capacity and behavior. It therefore puts the onus on those who would innovate to provide as part of the plan the behavioral strategies that would produce the outcomes we are seeking. In every case political culture dominates all national planning context, i.e., what

\textsuperscript{96} Dr. Biliana Cicin-Sain is Director of the Gerard J. Mangone Center for Marine Policy, Professor of Marine Policy at the University of Delaware’s College of Earth Ocean and Environment and Editor-in-Chief of the international journal Ocean and Coastal Management.
\textsuperscript{97} The Intergovernmental Oceanographic Commission (IOC) was formed in 1960 within the U.N. Educational Scientific and Cultural Organization to research and protect the ocean.
\textsuperscript{98} The Garbage Can Model of organizational theory was developed in 1972 by Michael D. Cohen, James G. March and Johan P. Olsen within the field of public administration. It explains organizational decision making from a systemic-anarchic perspective and states that decision-making is accidental and is the product of problems and solutions that get associated randomly. Cohen, MD, March, JG and JP Olsen (1972) A Garbage Can Model of Organizational Choice, \textit{Administrative Science Quarterly} \textbf{Vol. 17, No. 1} (Mar., 1972), Cornell University, pp. 1-25.
you can do in the Netherlands you cannot necessarily do in the United States and you certainly cannot do in Japan or Russia.

Looking again at the evidence empirically, you find that centralization vs. decentralization of decision making is not dichotomous, but rather there is a continuum. Relatively centralized systems can muddle through successfully if they have high technical capabilities and socio-cultural consensus. The fully centralized option can theoretically give an order and facilitate integration of all ocean activities in a single ministry and this has been done in Korea, for instance. But there is great danger there. What you do when you bring all the houses under a single roof is to bring all the conflicts with them and you generate policy gridlock by doing so. In the case of Korea that did happen and the new system began to be attacked much as Homeland Security was attacked in this country, with questions such as: “What have you done over the last five years?” In the Korean system, presidential elections occur every 6 years and you cannot be reelected. It is quite possible to have a president who dictates the creation of an integrated system, brings everyone under one roof, and may only accomplish one or two things. This eventually generates a lot of dissatisfactions that expectations were not realized and when a new president is elected they overturn what was done 6 years ago and the process continues on another track. Both culture and scale matter quite a lot.

So what is the outlook for integrated ocean policy? The fact is, redesigning institutions to make national ocean policy is a very difficult task, and at the present fewer than 20 States are making a serious effort. Only the Netherlands has succeeded [an interesting story if I had time to tell it here], and only Canada is making significant progress. There are elements in the United States that wish to go down this route, but at this time no such decision has been made. There is a lot of talk but little action that conforms to the characteristics of an integrated system, and there is not a lot of learning.

Notice I have not said a word about climate. Climate is not a part of this framing; rather it is an additional factor that will add further pressures to a whole range of conditions that are already not being managed constructively. I would give these systems a grade of F. The systems are pathological. They do not work. They are not capable of accomplishing what we want them to accomplish, and we are not willing to go through the effort to change them as they must be changed to have them do the work we expect them to do.

The Problems of Fisheries in the Regime of Extended Coastal State Jurisdiction

Let us now consider fisheries. The information presented comes from the most recent assessment of the Food and Agriculture Organization of the United Nations (FAO) and is based on 2006 data. What you see here is a quite interesting increase in aquaculture

100 Appendix D, slide 21.
production. China is the largest producer, and the rate of growth of aquaculture is outpacing population growth. Jodie Toft referenced this earlier and we do not know if it will happen, but one must ask if there will be a trade-off between aquaculture and capture-fisheries because of the food necessary to support that commercial level of aquaculture.

If you look at the whole situation, you see that fisheries management problems continue. States have made very limited progress regarding the reduction of fishing capacity. Harmful subsidies are being provided, and even buy-back programs are not exerting control on markets. This is because when a vessel is bought back it is not demolished but rather moved so that the buy-back simply dislocates the vessel from one fishery to another.

There does not seem to be a willingness to match fishing capacity with sustainable harvesting levels. This continues because many are prospering under the current conditions, and the growth of world population is driving demand and prices up which perpetuates the cycle of unsustainable exploitation. The FAO 2008 review documents a pattern of over-exploitation and evidence is surfacing of even more aggressive exploitation in serial depletion of fish stocks. We're not moving in the right direction. We continually run into an increasing demand for fish and fish products as a function of population growth.

At the same time, there are noteworthy examples of innovation in the science of fisheries management, as Jodie exemplifies. Examples of these approaches include ecosystem-based management (EBM), fisheries as socio-ecological systems, marine spatial planning, embedding EBM in MSP - which is particularly interesting because it is

The U.N. Food and Agricultural Organization (FAO) serves both developing and developed countries to address issues of agriculture, forestry, fisheries, nutrition and food security.


103 Ecosystem-Based Management is an integrated approach to management that considers the entire ecosystem, including humans, with the goal to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need and considers the cumulative impacts of different sectors. Leslie, HM and KL McLeod (2007) Confronting the Challenges of Implementing Marine Ecosystem-Based Management. Frontiers in Ecology and the Environment Vol. 5, No. 10 (Dec., 2007), pp. 540-548.


congruent with the advances of the Netherlands in spatial planning. In addition there is ample information about effective tools for fisheries management. Worm and Hilborn\textsuperscript{107} have provided a great service in their recent \textit{Science} article that distinguishes essential, important and incidental tools of good fisheries management.

What strikes me is that very few parts of the world seem to be moving in the right direction. Scale does matter and there is a lot of regional variation, but one cannot say there is a dominant trend toward responsible management. The essential tools for reducing exploitation rates have been identified, but surprisingly few nations are using these tools. An example is catch share. New Zealand has adopted it but few others. There is not much learning from example.

**Can we afford NOT to emphasize the impacts of climate change on the ocean?**

We now consider climate change in the context of these historic patterns of failures in governance and management, and in light of growing population pressures. We must add climate impacts to the discussion of all the other stressors causing habitat destruction in the coastal zone, the evil twins of changing ocean thermal structure and increasing ocean acidification.

It is of great importance to understand the time scales of climate, thermal structure and ocean acidification changes. These are systems that run in cycles of hundreds and, in the case of the ocean thermal structure, thousands of years. The implications of time scale are illustrated by an interesting experiment by Susan Solomon and her colleagues\textsuperscript{108} showing the sensitivity of the climate system to increasing temperature forced by increasing emissions. These data show that even if we were to instantaneously reverse our current CO\textsubscript{2} emissions, the momentum of conditions as they already exist would be sustained for hundreds and thousands of years.

**So What Can We (The College of the Environment) Do? A Research and Educational Contribution for Decision Makers and the Public**

First of all, what do policymakers need to know about ocean acidification? These would be my suggestions.

Far from reducing our impact, patterns of emissions are increasing worldwide\textsuperscript{109} with China’s emissions now exceeding those of the United States, the previous major emitter, and with India, Japan and Russia yet to show the full force of their developing capacities.

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Current trends of fossil fuel emissions indicate that even the worst-case scenario anticipated in the IPCC 2007 projections is being exceeded. The most dramatic emission projection is incorporated in the A1FI scenario assuming a rate of increase of 2.71 percent per year. Remarkably, the A1FI projections are being substantially exceeded by current emissions growth of 3.5 percent annually. The lasting effects of not getting control of this problem earlier will impose dire costs on future generations.

The most important point is that while we cannot reverse these trends in the lifetimes of humans today, we can prevent the trends from increasing indefinitely. So, can we afford not to put a high priority on climate change in the ocean? I do not think so. In my view we are in a precarious position and it is unconscionable not to point this out.

So what else do policy makers need to know? Global climate change and ocean thermal change distill to regional and local implications. The drivers in ocean temperature change impact marine ecosystems primarily from the bottom up, as does ocean acidification. The combination of these drivers is powerful enough to change entire marine ecosystems on a regional scale. While polar oceans are most threatened, coastal oceans in certain locations may also be very much at risk. Feely et al. have shown that the west coast of North America is very much at risk due to the increasing extent of acidification in the open ocean combined with seasonal/inter-annual patterns of upwelling along the coast. The pace at which these patterns are occurring is startling, as indicated by the fact that aragonite under-saturated water is reaching the surface more than 50 years before it was expected to do so.

The managerial needs for addressing these challenges distill to these three elements:

- Increased information derived from expansions in monitoring capacity in the open and coastal ocean and Puget Sound (and current research being conducted by Dick Feely and Jan Newton will contribute to this area);
- More research and assessment tied to policy development;
- Systematic evaluation of policy options for responding to multiple stresses, not just climate, in a changing environment.

So what can the College of the Environment do?

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111 The A1FI scenario describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies in which the technological emphasis is on fossil intensive energy sources. http://www.ipcc.ch/ipccreports/tar/wg1/029.htm
113 See www.hoodcanal.washington.edu
I now direct my concluding question to the new College of the Environment. What can we do with our resources to assist decision makers and the public? We are well positioned to put together a competitive proposal to the National Science Foundation (NSF), which has undergone a major change in favor of interdisciplinarity in which the social sciences have a major role to play. There is a new NSF program called Science, Engineering, and Education for Sustainability (SEES). It describes itself:

SEES research will investigate the fundamental role that social, economic, and political systems play in creating and addressing major issues in sustainability. It will include conceptual, theoretical, empirical, and computational research needed to further develop the basic science, engineering, education and policy knowledge base, as well as address the multifaceted challenges of sustainability (energy-economy-environment) at both individual and systems levels.\textsuperscript{114}

There are key scientific issues that NSF is looking to have addressed that the teams we can field can certainly do.\textsuperscript{115} It will require integration across a wide variety of earth and social sciences, all of which we have here now.

We have the opportunity and capacity to compete and we cannot continue to complain.

It took a long time to get to this point, but it has arrived, the window of opportunity, the urgency of the issues, and the capacities to respond have all converged at \textit{this} moment. There are a lot of choices of how we are to do this. It is climate but not only climate. It is the much more difficult problem of dealing with multiple stresses, and it is certainly about sustainability.

Thank you.

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Q & A

Question #1: (Unidentified questioner)
In the Gulf of Mexico, now dealing with the uncontrolled oil spill of the Deepwater Horizon rig, there are indications that fishermen are abandoning the use of turtle exclusion devices (TED) in light of the impending environmental disaster and the urgent need to make the most of the time to fish before the full force of the spill is felt. There is evidence that endangered turtles are dying not from the oil but from failure to use TEDs. Taking this to a global scale, some say climate change is inevitable, there's nothing we can do about it, let's exploit the resources to the max now. How do you take this on?

Response:
If that were to be the general sentiment, there is very little we can do because we lack the enforcement capacity. It means things will crash much sooner. I do not see how the

\textsuperscript{114} http://www.nsf.gov/geo/sees/
\textsuperscript{115} Appendix D, slides 37 and 38.
globe would mount an effective strategy in the short run because they would have to do all the things they have not wanted to do so far. That comes close to being an unmanageable problem.

Question #2: Mike Wallace (UW Atmospheric Sciences)
I do not want to downplay the importance of the threat of climate change or ocean acidification, I think we agree on the relative importance of them, but rather to question how we frame these issues for the public and policy makers. Climate change is one of many stressors. I wish to make the plea that we tackle multiple sectors and that we not try to justify all environmental decisionmaking on the basis of climate change as the sole vehicle for conveying concerns regarding multiple issues and stressors.

Response:
Thank you, Mike.

Question #3: Michael Jacobson (SMA Alumnus; Division Manager, Performance Management, King County)
In response to the basic science focus, there are real issues regarding where to invest resources and effort today. Where is the role of causality and responsiveness research? Policy makers are at a loss to know what to do about this. Understanding is only the first step.

Response:
The essential response is to engage in dialogue. We are learning about the Sound and there are many questions that are being asked, about changes needed in land use policy, for example. This is politically challenging and the process by which research funding has been distributed through the Puget Sound Partnership is of concern.

Question #4: Vince Galluci (SAFS)
In light of matters of institutions and policy, the two conventions CITIES and the UN Convention on Migratory Species recently fell short of making decisions to limit or forbid trade in sharks and other cetaceans. How can such political indecisiveness be countered?

Response:
That is pretty much par for the course. As you say the political dynamics are nothing new. Similar things went on in the North Pacific on salmon between the U.S. and Japan about the quality of the evidence and proof of overfishing. Decision rules tend to require complete agreement by both sides, consensus instead of a majority provision. You just have to slog it out.

Question #5: Stan Barer (UW Regent; Of Counsel, Garvey, Schubert and Barer)
I am captivated by your suggestion of trying to bring together on campus a greater integration of social scientists with hard scientists. The hard scientists can tell us what is happening and what needs to be done, but the social scientists can tell us what is possible as policy.
To my mind the failure of Copenhagen is a shared failure. When you talk about external verification, you are talking about external sovereignty. As long as we have nations we have a problem with sovereignty.

Response: Head nod in agreement from Ed.

Question #6: Dave Armstrong (Director, SAFS)
Five years from now what role, stature, presence of human dimensions scholarship would you like to see for the new College?

Response:
I would like to see this new College capitalize on its strengths by working somewhat deliberately to identify those disciplinary-based social scientists who are willing to participate in dialogue on particular problems of priority where we see the University has some comparative advantage. We have tended to develop this capability in specialized enclaves within the University. The next step after aggregating the capabilities in the earth sciences is to zero in on that. If we are to play nationally in this game, given the opportunities offered by the changes at NSF designed to integrate social and natural sciences in the research it funds, anything we can do to facilitate that conversation will not be easy but is certainly necessary. We need to increase the concentric circles where different groups of natural scientists, social scientists, lawyers and others can come together to work on these problems.

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Concluding Remarks, at the dinner following the Symposium June 4, 2010
Edward L. Miles

Where to begin? Best at the beginning. But where is that? With Bill Burke? No, even before Burke. With being an island boy from a seafaring family for whom the ocean was a powerful force in everyday life. A constant presence, much appreciated and sometimes feared.

Moving to Denver from the East Coast for Graduate School, I found that real mountains were another powerful force and I thought that if I could ever find a place which combined real mountains with the ocean, that would be home. But I began working with the law of the sea in Denver of all places, combined with the law of outer space, because I was interested in the regulation of the global commons. NOW, enter Burke, then based in the great oceanic state of Ohio, successfully raising funding from the then Carnegie Endowment for International Peace to put together an interdisciplinary group of natural and social scientists and lawyers, along with engineers, who were willing to commit to studying the ocean for the long term and to combine the science with the major policy issues which were being raised from the mid-1960s. The time in fact was 1967 and they were finding that collaring a political scientist willing to make such a commitment was a scarce commodity. However, through a mentor of mine visiting friends in Columbus, Ohio, the connection was made and the rest, as they say, is history.

For a young man of my interests, being in the same group with Wib Chapman, Benny Schafer, Lee Alverson, John Craven, Francis Christy, Don McKernan, Johnny Knauss, Warren Wooster and a host of others was like being the virtual kid in a candy store. Burke moved to Seattle where the conspirators sought to create an interdisciplinary Institute of Marine Studies with Burke as the first Acting Director, whereupon he hired McKernan and me. Lo and behold I found not only oceans galore but real mountains too. I was home! The time was 1974 and the world had discovered the law of the sea in UNCLOS III. What a turbulent absorbing time! So tonight I say thanks for all of that, from the beginning to one end and another beginning, but still here with the mountains, the ocean, the fish and the atmosphere. But now there is another time of turbulence, and this is much more serious, combining climate change with changes in ocean thermal structure and its evil twin, ocean acidification.

I say thanks to the colleagues in the former College of Fisheries, the Department of Oceanography, the Applied Physics Lab, the Institute of Marine Studies, and the Graduate School of Public Affairs with whom I worked over the years. I say a particular thanks to the legions of students from most of those places with whom I also worked for so many years. You have kept me intellectually much younger than I would have been without your exciting stimulation. I say a special Thank you as well to my Secretary at SMA for the last sixteen years, Suanty Kaghan, who is always willing and ever efficient.
IMS changed in response to the nudging of our then Dean, Ross Heath, and became SMA, aside the School of Oceanography and SAFS within COFS. We are now in a new era of organizational evolution in which we have integration at a much higher level than ever before, combining the great strengths of this University in the Earth Sciences into a single College of great promise as we face the troubled future of a non-sustainable world.

For the last fifteen years, I have been even more fortunate to have had, in my exciting professional and intellectual world, the privilege of founding and leading the Climate Impacts Group in JISAO under Mike Wallace's leadership. Five years later we combined with Ed Sarachik's Hayes Center, which housed the Climate Dynamics Group of JISAO. Our units fused into the Center for Science in the Earth System (CSES) of JISAO and I want to thank Ed Sarachik for fourteen years of harmonious and productive collaboration in science, international cuisines, and fine wines. I am incredibly indebted to the members of the CIG over this period for providing me with yet another intellectual delight of my life. I have been privileged to serve as your leader and I thank you for the quality of your unsurpassed collaboration.

This brings me to today and this evening. You have overwhelmed me and filled my heart with your generosity and caring. I want to say a special thanks to many people:

The leadership of the sponsoring units: The School of Marine Affairs, the Climate Impacts Group, the College of the Environment, and JISAO. Thank you most warmly to Tom Leschine, Nate Mantua, Amy Snover and Tom Ackerman.

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Finally, I would like to express my delight at the prospect of spending a lot more time in collaboration with the following people with whom I will be working in the future: Dick Feely, Jim Murray, Terrie Klinger, Brad Warren, John Guinotte, Ken Sebens and the staff of Friday Harbor Labs.

As the late Duke Ellington used to say: "I love you madly".

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