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The American Meteorological Society's Summer 2014 Policy Colloquium
Part I: Policy Fundamentals

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1. Introduction

On 1-10 June 2014 I had the honor of participating in the American Meteorological Society's 2014 Summer Policy Colloquium in Washington D.C. This was the 14th annual colloquium, a program that brings together 35 to 50 professionals in federal and state governments, academia (faculty and graduate students) and the private sector with atmospheric, ocean, environmental and climate science backgrounds. Colloquium participants are trained how to best use our scientific expertise to affect policy making and the budget process, by influencing politicians and funding organizations to create policy that would improve society's resilience and response to atmospheric, oceanic, environmental and climate challenges. This paper provides a summary of policy fundamentals presented during the colloquium. The discussions provided in this paper and the companion Part 2 paper that focuses on science policy communication and applications (Stuart 2015) are intended to provide a summary of this very interesting and unique experience. More information about the AMS Summer Policy Colloquium can be found at: http://www2.ametsoc.org/ams/index.cfm/policy/summer-policy-colloquium/

2. Policy Overview

Speaker:

- Toby Smith, Vice President for Policy Association of American Universities

The first three days of the colloquium were devoted to policy fundamentals and featured speakers with a broad spectrum of experience and expertise. One interesting point that was made was the difference in perspectives between scientists and politicians in relation to policy. Scientists typically seek to solve long term problems and approach solving those problems in very specific, objective terms. Scientists try to make everyone aware of sources of uncertainty in their studies and tend to be cautious about publicity. Politicians seek issues to promote and need to know why they should care about an issue so they can prioritize their efforts. They prefer short term solutions, think and talk in very subjective terms, enjoy publicity and make many promises.

These differences between scientists and politicians are important when considering

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how to best influence science policy. At the national level, science policy refers to a set of federal rules and regulations, methods, practices and guidelines. There is an important difference between policy for science and science for policy. Policy for science refers to decision making about how to fund or structure the pursuit of knowledge. Conversely, science for policy refers to the use of knowledge to assist or improve decision making. If policy makers don't understand or agree with what science tells them, it affects funding priorities. This is apparent with the current discussions and debates regarding physical science and social science funding priorities.

Sometimes it is more important to make progress solving components of a problem even if all facets of a problem cannot be addressed – making some progress solving a bigger issue is better than making no progress. Science is only one input into the process of solving problems in society. Other factors include ethics, economics, budgets and public opinion. The policy making process as it relates to scientists and politicians was compared to marriage, where each partner understands and respects each other's differences. It is important to ensure policy makers are informed by science, but keep science out of politics.

A history of science policy in the U.S. explains the origins of the National Science Foundation (NSF). Two men of very different scientific and political backgrounds, Vannevar Bush and Harvey Kilgore, worked with the Roosevelt and Truman administrations to take a number of steps that eventually resulted in the creation of the NSF. The National Institute of Health (NIH) and Department of Energy (DOE) were also created in similar fashion, and also benefitted from some of the first funding initiatives of the NSF, which focused on mission oriented research for individual agencies and institutions.

Ultimately, it is often crises and perceived crises that truly drive American science policy. The Russian launching of Sputnik in 1958 motivated the U.S. to take steps to eventually establish the National Aeronautics and Space Administration (NASA). The terror attacks of 11 September 2001 led to significant increases in funding for research in health and diseases as a result of the exposure to harmful airborne residues from the collapsed buildings. Research and development in alternative energy sources often fluctuates based on the price of crude oil, which is affected by politics and stability of countries in the Middle Eastern part of the world. More recently, Hurricane Sandy has led to unique funding opportunities that have accelerated a number of research and development activities. The complexity of the process of developing policy even during crises is slow and often involves multiple agencies with unique cultures and missions, overseen by multiple congressional agencies and committees.

Science policy at the highest levels is created by the President of the U.S., with assistance from the Office of Managing Budget (OMB), Office of Science Technology Policy (OSTP), President's Council of Advisors in Science and Technology (PCAST) and the National Science Technology Center (NSTC). Congress works with various committees and personal staff, various congressional support agencies and the Legislative Council, who write policies into legislative language for bills to be considered for passage. Federal agencies work through NSF, the Department of Health and Human Services (HHS) and other similar entities. Courts and the judicial branch of the federal government evaluate and assess intellectual property issues. Finally, national academies, scientific societies, higher education associations and non-governmental

organizations (NGOs) (sometimes referred to as think tanks) lobby to politicians.

The President often pushes issues in which he personally believes, while Congress determines whether to accept or reject initiatives and/or impose regulations, after coordination with the appropriate agencies. Agencies establish their own policies within the larger scientific policy frame work, distribute research funding and evaluate scientific misconduct if there are conflicts of interest or integrity issues.

The federal budget process is so complex that the broader the range in perspectives within Congress and all three branches of the government are, the more challenging it can be to pass annual fiscal year budgets. Many times, regulations impact the progress of science more than the support and passage of laws because relatively few laws involving or supporting science are actually passed. Getting a large enough segment of Congress to sufficiently agree on an initiative to pass a bill takes significant work, especially in recent years.

A recent profile of Congress shows that there is increased turnover in recent years as voters preferences change with each election. This can make the establishment of partnerships and compromising between parties more difficult since long-term trusting relationships are more difficult to foster. The development of swing districts is allowing for more specific factions within Congress (typically tied to party affiliations) since these districts are often formed primarily to foster representation from certain demographics. Also, most Congress people have areas of expertise outside of the scientific realm, while many have law backgrounds. There is a small percentage that has not graduated high school although another small percentage do have PhDs.

This broad spectrum of demographics and the forces promoting the range of perspectives and political makeup of Congress results in big challenges in effectively communicating scientific information and needs to Congress. To be fair, scientists often cannot objectively predict outcomes of their proposed studies and the value of the ranges of results is largely unknown. Typically, investments in science produce long-term benefits while politicians understand and respond to more immediate results. We need to emphasize how incremental science investments have contributed to long term benefits.

Some examples of multiple components of science investment over a long period of time are smart phones and automobiles. Many components of these objects were developed by different people from different funding sources over many years, yet they contributed to the finished product that is used by the general masses. The more examples to which scientists can refer, the more the decision-makers may understand and be motivated to support more scientific research. Additional examples of initiatives that benefitted humankind, including some that initially appeared wasteful but eventually turned out to be useful can be found at: www.goldengooseaward.org.

Conversely, there are multiple web resources that highlight scientific studies in which very clever grant writers used creative language to get highly non-traditional studies funded in which benefits of the research are not immediately apparent, such as shrimp running on treadmills (Greenfieldboyce 2011). We as scientists must be very cautious and discerning about associating or judging non-traditional scientific studies. However, the question will always remain; will a study in which the benefits are not immediately apparent be serendipitous and lead to something revolutionary in the future?

Ultimately, with the federal deficit increasing and discretionary spending shrinking with time, there are initial

indications of a resulting innovation deficit in the U.S. (see http://www.innovationdeficit.org for further discussion of this topic).

Since scientists are still highly respected, it is important to speak with a unified voice, even if our individual messages are not communicated as effectively. Scientists often need to become persuasive advocates, which can be contradictory to many who are more comfortable explaining data and being objective. Personalizing the benefits of scientific research, why it matters to us and society in general, is critical. Communicating in this manner should be more successful in garnering additional widespread support for scientific research.

3. Congressional overview

Speaker:

- Judy Schneider - Specialist, Government Division for the Congressional Research Service, and adjunct scholar at the Brookings Institution Center for Public Policy Education

The process of legislation in Congress was presented in great detail, and complimented the other material presented at the colloquium. We were given a very condensed version of information presented to "freshman" representatives and senators when they first arrive to Congress after their election. This training normally takes several days.

Congress was not necessarily created to pass laws but to prevent bad laws from being passed. Over 10,000 pieces of legislation are proposed each year but only around 200 become law. Congress is not driven by policy alone but by politics and procedure as well, in as much balance as possible. The Senate is more of a political chamber while the House is more of a procedural chamber. It is interesting to note that there are now more former House members in the Senate than ever due to the perception that the Senate provides more political power than in the House, whether that is true or not.

Much of the work that goes into creating legislation occurs in committees. The congress people who make up and lead committees are determined mainly by seniority, networking and making friends with fellow congress people. There are committees that are perceived as better than others, so legislators try to work their way onto the preferred committees with the most power and visibility. There are term limits and the number of committees and subcommittees varies depending on who is in charge of the House and Senate (i.e., which party is the majority).

Legislation often gets held up in committees and subcommittees due to rules that are enacted that require all committees and subcommittees to take some sort of action before advancing to the next committee. It is a challenge to get all committees and subcommittees to agree on everything, and the progressive changes often result in changes in support for or against certain aspects of legislation. So, legislation can be hung up in committees and subcommittees for very long periods of time, especially if it is deemed important enough to be debated for any length of time.

Sometimes there are public hearings on an important topic being considered for legislation. Testimony must be presented in advance of the hearing so Congress people can process some of the key issues before they are discussed. Hearings are to some degree intended to prompt public input into an issue. Now that hearings are covered more frequently by the media, congress people are increasingly motivated to attend and actively participate in hearings and motivate the pubic to respond so they can

garner public opinion. This is also why there is so much extra attention when celebrities testify - it can influence public opinion greatly.

Once legislation has passed through the committees and hearings, and resulting modifications have taken place, the bill gets to the floor. There can be inconsistencies that are not initially detected in the wording of the legislation. Congress people can debate, add and delete sections of the legislation and propose amendments.

As stated previously, the House and Senate operate differently. In the Senate, there can be a filibuster, where a Senator can take unlimited time to talk about a subject of interest as long as he remains conscious. In the House, there are time limits for speaking. All the rules and procedures in the legislative process seem very complicated but the Article 1 in the Constitution states that the legislative branch can make its own rules for the legislative process. In the 200+ years since the founding of our country, many legislators with many different motivations have created rules they believed benefitted them and their colleagues, and at the same time provided obstacles for their political adversaries.

Most of the legislation that is passed is noncontroversial legislation like honoring a sports team that won a national or world championship. Some bills are so important that Congress will pass it, even when there are very wide range of perspectives on the legislation, like the recent health care law.

Ultimately, the system works since a relatively small percentage legislation that is proposed each year is passed. If every piece of legislation was passed, increased spending would contribute to even more of a deficit. Congress is also very aware that there would be so many rules and laws it could result in near anarchy because no one would be able to keep track of what local, state and federal laws applied in any given situation. Legislation that becomes law is often what is needed, which is better than catering to every want or desire of every interest group. Judy closed her session by stating that Congress people are eager to hear public opinion on all subjects, but much of the public are not as engaged in the legislative process as Congress needs us to be.

4. Senate Perspective

Speakers:

- Sean Houton, Fern Gibbons – Senate Commerce Committee Staff
- Kevin Rennert - Senior Advisor on Energy Policy for the Senate Finance Committee
- John Righter - Deputy Staff Director of the Senate Budget Committee Staff
- Aaron Goldner and Kate Stoll - AAAS Congressional Science Fellows

We went to the Senate Office Building to learn the perspectives of Senate committee staff, who work for the Senators on the various committees. As previously stated, committee staff does much of the research and writing of legislation and there is often a mix of party affiliations within the committees. Debating and negotiating items in legislation can sometimes take years to satisfy all interests involved. Writing committee reports and legislation has some similarities to writing scientific research papers in terms of the review process, except committee members have to write in a less-scientific but persuasive manner. Expertise in language and being a wordsmith can be the key to moving legislation forward. Sometimes it is necessary to just stop the process and take a break if the debate and

discussion is becoming unnecessarily contentious. Legislation can also be delayed if higher priority issues and crises occur.

Examples of climate change legislation were presented based on recent experience in various committees. The legislation they worked on needed to resolve the various issues related to carbon taxes, cap and trade and alternative energy. Reports from the International Panel on Climate Change influence legislation. The baseline understanding for much of Congress is that regardless of the causes of climate change, it is happening, and we need to take steps to address as many of the contributing variables as possible. However, there are some members of Congress who reject any evidence of climate change for various reasons outside of the scope of this summary.

Some other issues being discussed relating to climate change legislation include carbon tax credits and regulating carbon emissions, which are creating new markets and reducing taxes for those complying with regulations. These are the types of compromises that are an attempt to bring agreement within both political parties. However, some of the potential solutions to reducing carbon, such as supporting research into alternative energy sources, are often subsidized at great cost by governments (U.S. and international) and may not be sustainable if governments must continue to provide the subsidies.

Some of the budget considerations during the process of creating legislation were also discussed. Some of the difficulties in passing budgets during recent years were described, such as the challenges experienced by the super committee, the sequestration, the shutdown, debt limit crises and continuing resolutions as substitutes for full fiscal year budgets. The Senate is more motivated now to pass balanced budgets because everyone has grown weary of the lengthy discourses resulting from the very diverse perspectives that have complicated the process in the past.

The most recent (FY14) budget that was passed was the result of closed door meetings between the House speaker, a select few of his colleagues, the Senate majority leader and a select few of his colleagues. It was not the most open or transparent process but they thought it was the only way a budget would be passed because if all the Congress people were involved in the process, it would get too complicated and the sequestration and shutdown would continue. It was hoped that this example of the select few agreeing on terms in a budget would inspire and motivate everyone else to modify their approach to the budget process for the next fiscal year. Congress is also looking into a possible 2 year fiscal budget cycle instead of an annual cycle.

There has been speculation that gradual improvements in the economy and GDP would contribute to more money available to the federal government and contribute to reducing the deficit. However, there is also some caution as when there are big changes in power in the House and Senate after an election, it can result in huge changes to the committees and membership to the committees, as well as the priorities for legislation. So, the 2014 and 2016 elections could have some important impacts on priorities and on the budget process.

Finally, the opportunity of becoming a Congressional Science Fellow, and its potential benefits were discussed. This fellowship is basically an educational job shadow type of program that provides experience for future policy related job opportunities.

5. The White House Perspective

Speakers:

- Kei Koizumi - Assistant Director for Federal Research and Development for the OSTP
- Grace Hu - Program Examiner for NASA science and education programs at OMB
- Susan Ruffo - Associate Director for Climate Change Preparedness at the Council on Environmental Quality (CEQ)

There are many staff members with different backgrounds that work at OSTP to research all the information needed to advise the President on science and technology issues. The President has a particular science and technology agenda, which is: to meet key challenges of enhancing the economy; biomedicine and healthcare; clean, safe, affordable energy; climate change issues; land and water use; the health of oceans; homeland security; and improving the human condition through discovery, invention and expanded understanding. The President's proposed 2015 budget is intended to sustain America's world leading science and research enterprise and improve America's long term fiscal health.

Each fiscal year about 2/3 of the budget is dedicated to entitlements and interest on the debt. The remaining 1/3 of the budget is the discretionary portion, which is what Congress determines how to spend each year. Over $130 billion is planned for the research and development component of the discretionary spending with the money being divided between many government agencies. The apportionment varies from year to year depending on how the agencies communicate their needs. Funding for climate change research varies from administration to administration but has been increased under the current administration. A National Climate Assessment is required by Congress every 4 years that summarizes for the public what we know about climate change.

The complex process of creating a federal fiscal year budget was described using the examples of recent fiscal years. At any given time, Congress, the President, and all committees, advisors, consultants, lobbyists, think tanks and other interested parties are working on 2 or 3 budgets in different stages of completion. The budget for the next fiscal year is initially planned 2 years in advance. During those 2 years, various interested parties take the budget and revise it to their needs before sending it to the next interested party. Producing a final version in which Congress and the President agree takes a lot of time and compromise, which is often a challenge.

The specific steps in a hypothetical FY 2015 budget process are as follows:

- Spring 2013 - Agencies begin to formulate proposals
- Fall 2013 – Agencies submit proposals to OMB and negotiate with them while being advised by OSTP.
- Later fall 2013 – Pass backs to the agencies.
- Winter 2013-2014 – Appeals if agencies unhappy with pass backs.
- Early 2014 – Settlements as agencies finalize requests working with OMB and OSTP.
- Spring 2014 – President submits his budget proposal.
- Spring 2014 – Agency officials including OSTP and pubic witnesses testify at hearings so Congress understands what the President is proposing.

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- Summer 2014 – Congress approves the President's budget, the big picture budget plan. Appropriations committees receive allocations and divide the total discretionary spending into multiple bills.
- Fall 2014 – Discretionary spending bills for 2015 spending must be signed by 1 October otherwise a shutdown occurs, unless a continuing resolution is passed.

So, at any given time there can be at least two budgets at different stages of completion being worked on at any given time, and sometimes three if a continuing resolution is passed to prevent a shutdown at the beginning of a fiscal year. Scientists can provide input at all stages of the process even as "concerned citizen scientists". However, scientists who are employed by the federal government must ensure they are not lobbying as lobbying is prohibited by law for government employees.

Different funding agencies recommend different scientists and experts for input into funding initiatives. Usually, large, overarching initiatives need to be divided into smaller research components. NSF and National Academy of Science (NAS) reports are important references throughout the process, often utilized as a basis for funding incremental pieces of a large initiative, such as improved Numerical Weather Prediction. Social science research funding has been slowly increasing and is an initiative of the current administration, but social science is still less understood than physical science, thus Congress is still working to understand the components and optimal applications of social science research before committing to further increases in funding.

Success of the initiatives must be measured to justify further funding. However, there are few truly objective metrics available, and it can take years to produce results of research. One popular metric is tracking research grants and ensuring the research is being conducted and money being spent as proposed. Weather related disasters often prompt supplemental funding, as was the case with Hurricane Sandy. Even when disasters are anticipated or are in progress, predicted or occurring, OSTP and OMB are often already planning what to do with supplemental funding, as was the case with Hurricane Sandy.

OMB and OSTP are examining the systems and approaches other countries use to optimize the research to operations to improve these processes in America. However, the systems can be quite different and sometimes a huge challenge to replicate. For example, trying to match the very different European Numerical Weather Prediction research system (since there has been extensive publicity touting the "superior" ECMWF model) is problematic because the European system is very different than our American numerical weather prediction systems.

The role of the CEQ in shaping environmental policy was described. The CEQ focuses on research/funding issues related to climate change and reports directly to the President, giving advice on environmental policy. They coordinate with all federal agencies on how to address environmental issues.

There has been a shift in language from climate change adaptation to climate change preparedness. The CEQ advises on risk mitigation and resilience to climate change effects. Many communities understand their vulnerabilities to the effects of climate change, but some don't have the funds or the desire to take steps to prepare for these events. The state of the science is not sufficient to provide the type of detailed information desired about where and when significant climate events will occur, but

ranges of possibilities are helpful and contribute to planning information such as flood inundation maps.

Some local and state governments are including climate change mitigation efforts into their budgets since the Federal Emergency Management Agency (FEMA) will be requiring these activities within 5 years. Resiliency funding is often provided to multiple agencies such as state Departments of Transportation and Health. Private sector entities such as insurance companies are also becoming more involved with risk and vulnerability assessment, adjusting rates and insurance coverage due to potential local effects of climate change.

6. House of Representatives Perspective

Speakers:

- Clint Woods, Dan Pearson - House Science, Space and Technology Committee Staff
- David Skillman - Chief of Staff for Congressman Earl Blumenauer of Oregon
- David Wegner - Senior Democratic Staff of the U.S. House Committee on Natural Resources and Subcommittee on Energy and Mineral Resources

As in the Senate, many committees are composed of a mix of people from both political parties to consider all points of view on issues. Despite their different political views they often exhibit a comradery and relationship that allows them to work well together. It is important to use common interests like weather-related legislation to build trust and relationships between committee members and representatives.

The makeup of committees can be heavily influenced by the personal interests of the committee chair and past relationships with people. It is a lengthy process to build caucuses of people with a common interest and build trust through relationships. Many deals are still based on handshakes, and if someone is disloyal than that individual's reputation is tainted for a long time. Most committee work is done during the first half of a term, as the second half of a term is devoted at least in part to campaigning for the next term.

More issues related to the effects of climate change were discussed including resource management. We learned that resource management and hazard mitigation is extremely complicated due to multiple interests that must coordinate together. Rivers and estuaries serve large populations in many jurisdictions that have very different laws and policies regulating them, including the transportation systems, dams and power generation that can be affected by them. The laws and regulations upstream can greatly affect people downstream. Similarly, people who build homes in coastal areas may not have the money to elevate their homes, fund sea walls or oppose naturalists who don't want to create barriers on coastal national parks. Shifting resources from one region or country to another can just move climate change problems and issues. Job creation and job preservation issues are important as well.

7. International Perspective

Speakers:

- Tegan Blaine - Senior Climate Change Advisor for Africa and for the U.S. Agency for International Development (USAID)
- Jonathan Pershing - DOE and Principal Deputy Director of the Energy Policy and Systems Analysis (EPSA) and Deputy

Assistant Secretary for Climate Change Policy and Technology in International Affairs

- Norman Neureiter - the Director of the Center for Science, Technology and Security Policy and Center for Science Diplomacy for the American Association for the Advancement for Science (AAAS)
- Andrew Light - University Professor and Director of the Institute for Philosophy and Public Policy at George Mason University and Senior Advisor to the Special Envoy on Climate Change at the U.S. Department of State

Climate change in America was certainly a well-covered topic at the colloquium but climate change also affects other areas of the world. We learned about organizations that help African countries with issues like deforestation and use of resources. Typically, larger parent organizations give money to local organizations that do the necessary work. Since there are an increasing number of governments that are hostile to western interests, many of which are not very democratic or open, organizations at all levels need to be very careful about whom they give funds. Sometimes they have to work with ambassadors and negotiate with respective governments.

Determining how climate is changing in Africa is difficult due to challenges obtaining data but tracking drought and heat and adjusting plantings based on changing tolerance levels of different types of crops is important in sustaining the lives of the African people. Climate information can also be determined through the telling of stories of past weather-related events as story telling is a common tradition passed down through the generations in this region.

A history of significant international agreements related to climate change, including the Kyoto and Copenhagen Protocols and the upcoming meeting in Paris in 2015 were described. There is a sense that idealism in American and international politics is making it increasingly difficult to achieve consensus on international issues like climate change. Another challenge is the perceptions by developing countries, that while some studies show they are currently contributing more pollution into the atmosphere than developed countries, they believe the developed world is primarily to blame for climate change due to their past emissions. Some developing countries suggest the developed countries should pay for climate change mitigation efforts since they caused the problems.

Some insights to climate change mitigation at a more regional and local level was also given. People are generally hesitant to move out of a flood plain or other area vulnerable to a weather related hazards, so more funding is being put into improved emergency services. Some states are more supportive of climate change issues than others, but we as scientists all need to provide the best information we can to build the trust and credibility necessary to influence people to address the effects of climate change.

A fascinating history of how science has contributed to international diplomacy was also presented through a series of stories of how presidents from Eisenhower to Obama fostered international cooperation between the U.S. and countries such as Russia, China, Cuba, North Korea and Middle Eastern countries.

It was also explained that there is an important difference between science for diplomacy and diplomacy for science. Examples of science in diplomacy are

negotiations with regard to acid rain, global health and climate change. Examples of diplomacy for science are the international efforts and cooperation in development and use of telescopes, and ocean drilling for natural resources. The world is still learning that cooperation with scientific research benefits not only the people of the world but fosters improved international relationships.

Ethics in science and policy was an interesting and important topic that was discussed, particularly in relation to the effects of climate change on humanity. There was an emphasis on some of the points made in earlier presentations about differences in perspective between developed and developing countries regarding who is responsible for, and what steps should be taken to reduce humankind's influence on climate change. Some developing countries are promoting the concept of owning the atmospheric space above their land so they can manage their sector of the atmosphere as they see fit. However, this concept is not being accepted very broadly because as we all know, components of the atmosphere, including pollutants are transported beyond political boundaries.

Recently, the President declared carbon dioxide (CO_2) as an official pollutant, which gives the President more authority to regulate it. There is increasing emphasis on taxing CO_2 not only to enhance efforts on capping emissions, but also to create new jobs. This would occur through an economic shift where it should be profitable to develop and use new, clean energy alternatives. Carbon offsets and auctions could also create profits to offset penalties.

The point was also made that we scientists need to communicate the health benefits and benefits to our future generations by personalizing reduction of pollutants for our children and make other emotional appeals. There is a wide spectrum of perspectives for what humankind is morally and ethically responsible, with climate change believers completely buying into moral obligation to address climate change issues. However, there are still enough skeptics who still see climate change as theoretical with limited contributions from humankind. This group does not share the moral obligation to force people to contribute to a cause, or make legal or societal changes that they don't necessarily believe, such as taxing carbon emissions. Morals and ethics related to climate change are largely shaped by the perception of whether current observable impacts match prior predictions, and this varies from individual to individual depending on their personal experiences.

The subject of ethics in science and policy was concluded by stating that we have to get all humankind to work together toward common goals by focusing on extreme weather hazards that occur independent of one's belief or disbelief in climate change as a contributing factor. The private sector could increase its resources toward developing solutions to reducing pollution and expanding alternative energy sources. Simple changes to lifestyle such as altering our diet to allow adjustments to agricultural contributions to climate change could be effective in terms of less demand for fertilizer and cattle. Finally, it could be helpful to find and enhance carbon sinks such as forests and the oceans in the tropics without harming any living organisms.

8. Conclusion

This very condensed summary represents only the formal sessions of the colloquium on the topic of policy fundamentals and does not include the numerous insightful offline discussions during social time throughout the 10 days in Washington D.C. The colloquium

organizers and my classmates shared many heartfelt and uninhibited dialogues about not just weather, climate and policy but many life issues and it greatly enhanced our entire experience. This experience was truly one of the highlights of my career and I am now better equipped and more motivated than ever to make a difference in the world.

Acknowledgements

The AMS Summer Policy Colloquium has been conducted since 2001 and has consistently provided a solid foundation of knowledge of how we scientists can best influence science policy to benefit society. Each annual class is unique and the total experience is very much shaped by the perspectives and interaction with your fellow colleagues. I am honored and privileged to have been a part of the class of 2014, with colleagues that were very enthusiastic and encouraging, exchanging all our perspectives on all issues discussed freely and respecting our differences.

I would like to thank Dr. Bill Hooke, Dr. Paul Higgins, Caitlyn Buzzas, Dr. Shali Mohleji, Dr. Peter Cowan and the American Geophysical Union (AGU) for organizing a truly enjoyable colloquium with such a diverse spectrum of speakers, fora and methods for learning about policy fundamentals, budgets, science policy, communication and leadership. Thanks to Ray O'Keefe, the Meteorologist in Charge of NWS Albany, NY for informing me of this opportunity, encouraging me to apply and sending my statement of interest to NWS eastern region director Dr. Jason Tuell for consideration to attend. I would like to also thank Dr. Jason Tuell for choosing my statement of interest to forward to Dr. Edward Johnson at National Weather Service headquarters for consideration to attend and chose me among a select few to represent the National Weather Service at the colloquium. Finally, I would like to thank John Sokich at National Weather Service Headquarters and Caitlyn Buzzas of the American Meteorological Society for their assistance with various aspects of my travel and lodging arrangements.

For Further Reading

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