Expert and Citizen
Assessment of Science and
Technology (ECAST)

Technology Assessment and Public Participation: From TA to pTA

December 6, 2012*

**Consortium for Science,
Policy & Outcomes
at Arizona State University**

The Loka Institute

Museum of Science.
Boston

**SCIENCE
CHEERLEADER**

**Woodrow Wilson
International
Center
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Expert and Citizen Assessment of Science and Technology (ECAST)

Technology Assessment and Public Participation: From TA to pTA

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Our Gratitude

Table of Contents

Boxes

Tables

Figures

TECHNOLOGY ASSESSMENT AND PUBLIC PARTICIPATION:
From TA to pTA

Executive Summary

Expert and Citizen Assessment of Science and Technology
December 2012

From 1972 to 1995 the United States became a world leader in applying insights about technological change to public policy by creating and operating the Congressional Office of Technology Assessment (OTA). The support base for OTA was always narrow, however, and the office ultimately fell victim to a political clash between Congress and the President in 1995, resulting in the cancellation of its funding.

In contrast to this narrative of rise and decline, more than a dozen European nations plus the European Parliament, inspired (ironically) in part by the U.S., established their own technology assessment agencies from the mid-1980s onward. Most remain in operation today as vital contributors to science and technology policy discourses and developments in their respective countries. In addition to strong analytical capacities, these agencies have pioneered promising methods for citizen participation, giving rise to a new practice known as participatory technology assessment (pTA).

In the U.S., recognition of pTA's value has grown in recent years. In light of the limited prospects for major initiatives to develop it, however, a number of organizations formed the Expert and Citizen Assessment of Science and Technology (ECAST) network in 2010 as the appropriate means to advance pTA in the U.S. ECAST's founding organizations are the Consortium for Science, Policy and Outcomes at Arizona State University; the Loka Institute;

the Museum of Science, Boston; Science Cheerleader; and the Science and Technology Innovation Program at the Woodrow Wilson International Center for Scholars.

This report about participatory technology assessment (pTA) is prepared by ECAST members. Our primary motivation is to articulate the role that a network like ECAST might play in conducting and institutionalizing pTA in the U.S.

ECAST's first large scale project was coordination of the U.S. component of World Wide Views on Biodiversity. This global citizen consultation, conducted in 25 countries on September 15, 2012, provided input to the Eleventh Council of Parties of the UN Convention on Biological Diversity (CBD) that took place the following month. In this report, we examine the process and results of WWViews as a means of understanding the challenges and opportunities for expanding the practice of pTA in the U.S. Our report thus takes up three main themes:

- The context in which pTA has emerged and in which it might develop
- The results and implications of WWViews
- Opportunities for developing pTA

From TA to pTA

TA and pTA developed in an era that witnessed a significant change in the role of science and technology in society. The

mobilization of scientific resources during World War II constituted a watershed beyond which S&T became increasingly central to the nation's military and economic development. Government support through the funding of research and development and the rapid expansion of higher education during the postwar period were critical to this transition.

By the 1960s, awareness of the escalating complexity and significance of the technological changes that government was supporting prompted Congressional interest in a dedicated capacity for foresight that could inform relevant public policies. OTA was a product of these developments. Despite being the smallest Congressional office, OTA published 755 in-depth reports from 1972 until its closure, and in 1994 alone provided expert Congressional testimony on 38 occasions.

The role of science in society continued to change over the course of OTA's institutional life. Given the insular and culturally exalted status of science, a significant trend of the past several decades has centered on broader access to and participation in technological policies and practices. Key elements in this opening have included:

- Diversification of the people who do science, especially as reflected in growing numbers of women, African Americans and Latinos in the S&T workforce.
- Direct participation by lay people in citizen science and community-based research.
- Challenges to the authority of experts by lay people.
- The emergence of dissident scientists who directly challenge research programs backed by powerful industry, government and scientific institutions.

Participatory impulses among OTA insiders dated to its inception, notably from Senator Edward Kennedy, who served on the Office's governing board, and Hazel Henderson, a member of a public advisory board. Both thought ordinary citizens had a role to play in such matters as suggesting topics for study. In a politically delicate context where professional expertise and objective knowledge were buttresses against partisan conflict, however, these impulses were never embraced by OTA.

Today's context is different, and harbors prospects for a reinvigorated technology assessment that includes participatory elements in appropriate circumstances. In addition to the European developments and more general shifts in the social role of science already mentioned, the Obama administration has advocated citizen participation in public policy through its Open Government Initiative, and a White House-commissioned report on the ethics of synthetic biology and emerging technologies lists "Promoting Democratic Deliberation" as one of the five ethical principles for the governance of emerging technologies.

World Wide Views Results

Organized by the Danish Board of Technology (a Parliamentary technology assessment body), World Wide Views on Biodiversity was the second global citizen consultation designed to provide input to a United Nations convention.[*]

At each WWViews site (including Boston, Denver, Phoenix and Washington, DC in the U.S.), 100 ordinary citizens were selected to reflect the diversity of their country in characteristics such as education level, income, race and ethnicity, and rural vs. urban residency. Experts in biodiversity did not participate in order to assure a deliberation that reflected the views and knowledge of lay people, and members of environmental organizations, who would naturally be interested in such an event, were limited in number to prevent undue influence in the

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[*] The first was World Wide Views on Global Warming, held in advance of the December 2009 UN climate summit in Copenhagen.

deliberation. Participants received a scientifically neutral briefing booklet on biodiversity and the policy issues to be addressed at the CBD in advance of the deliberation, which were supplemented by short videos with the same information on deliberation day. Participants were thus considerably more informed than most citizens would be about these issues. To assure a fruitful interchange of ideas, all participants were assigned to tables with 5-7 of their peers and a neutral facilitator, where they discussed four thematic issues for about an hour each, and then voted individually on multiple-choice questions. The themes were:

- Why biodiversity is important

- Protecting biodiversity on land

- Protecting biodiversity at sea

- Burden and benefit sharing among countries

Main Results

Looking across all the responses, it is clear that most participants think more should be done to stem the decline of biodiversity. Sixty-three percent of U.S. participants and 74% worldwide said they were "very concerned" about the loss of biodiversity, and on a question asking who is impacted by biodiversity loss, 87% (84% for the world) thought that most people in the world are affected by biodiversity loss today. Digging deeper, however, 42% percent thought that "My country in general" is impacted (participants could select up to three of seven statements). It may be significant that nearly half of participants from developing countries, but only a quarter of those from developed countries, selected this item, as this suggests a perception in the latter countries that biodiversity is "someone else's problem."

On a range of questions, participants were willing to support expanded regulation of activities that negatively impact biodiversity, while large majorities (60% from developed countries and 71% from developing

countries) thought that all nations should contribute financially to biodiversity preservation in developing countries, "but industrialized countries should pay the main part."

Beyond the widespread concern about biodiversity and a disposition to take action, the results show the participants' attention to nuances and multiple perspectives on the issues under consideration, rather than a single-minded urge to promulgate new rules that will mandate environment-friendly behavior. For example, participants were mixed in their responses to a question about trade-offs between new protected areas and economic aims, but overwhelmingly supported more regulation on the High Seas, where little exists at present.

Table 1 - Preferred Policy Instruments (US)	
Which of these measures do you prefer to ensure the protection of nature areas in your country?	*%*
• Stricter laws ……………………………	37
• Enforce existing laws …………………	33
• Incorporate biodiversity in planning ………	58
• Incentives for stakeholders …………………	70
• Educate children and public ………………..	87

Participants were thus willing to advocate new laws in particular circumstances, but were significantly more inclined to support policy instruments that inform citizens through education, help them adjust to change through incentives, and enhance government effectiveness through planning (Table 1).

Many differences thus end up in the details. For example, citizens clearly supported incentives to eliminate over fishing, but

Table 2 – Pacing Implementation	
Should incentives and subsidies that lead to over fishing be abolished?	
• Remove subsidies quickly with no assistance to fishers	9
• Phase out subsidies quickly with some assistance	37
• Phase out subsidies slowly with some assistance	48

differed over the pace of change (Table 2). This creates a clear and concise message for policy makers:

- Goal: overfishing should be stopped
- Policy instruments: incentives are an important tool
- Tactics: negotiations should focus on the timing rather than the means of change.

The National Question

The design of WWViews permitted hosts at the various sites around the world to develop a question focused on an important issue in their country. The U.S. team, with input from a panel of a dozen distinguished scientific and policy experts in biodiversity, designed a session that elicited individual and group responses, the latter in the form of a recommendation from each table. Participants were first asked to discuss what they could do "individually, among neighbors, or even at the state or local level, to preserve biodiversity" by identifying which of 13 statements reflected their views.

- One battery of five statements provided opportunities to decline involvement, for reasons ranging from busy personal schedules to a preference for market solutions over public policies for addressing biodiversity concerns. *The number of participants selecting these items was low, ranging from 0% to 13%.*

- A second battery of five statements included changes in personal behavior (eating less meat, etc.), learning about the issue, and participating in local efforts for education, taking direct action such as restoring a damaged natural site, or advocating new policies. *Participant support on these items ranged from 71% to 85%.*

- The final three statements called for leading educational, direct action and policy efforts. *A sizable minority (34% to 47%) expressed their willingness to take these types of actions.*

- For these last two types of actions (participating and leading), participants were *most willing to be involved in education, then direct action, with policy ranking last.*

The qualitative question asked participants at each table to prepare a statement that either identified ways of encouraging a national biodiversity strategy and action plan, or that argued against adopting such a plan. Again, calls for education were the most common, appearing in more than 4 of every 5 table recommendations. Other categories of recommendations were enhanced public awareness (e.g., labeling of products), incentives, funding, governance, research, new technology, and changing habits (e.g., planting native landscapes, eating less meat). None of the tables rejected a national biodiversity strategy, although individual participants at several tables dissented from the support that their peers registered for such a strategy.

Selected National Question Recommendations

Education
'Education should be central in a national biodiversity strategy. Biodiversity should be included in national common core standards. Also, each state should develop biodiversity educational curricula, which includes field trip activities that connect students with local ecosystems and farmlands.'

Governance
'Businesses, government and citizens should be accountable, therefore all need to work together.'

Expert and citizen participation
'Do grass roots education and organizing and develop written, detailed resolutions with support of experts.'

Research
'Create metrics to analyze impacts of actions/policies.'

Political Bias

The political orientation of participants was significantly over represented by those who described themselves as left of center and somewhat over represented for centrists, leaving those to the right of center significantly under represented. It is thus likely

that the results of the event register a greater disposition to rely on government action than would have been the case with a participant pool that more closely reflected the political leanings of the U.S. population. Notwithstanding the imbalance, however, even those to the right of center ranked economy and biodiversity as equally important goals. The near-universal support for planning on the national question may reflect a sense that the substantial resources (existing laws, local projects, etc.) that are already in place for a national biodiversity strategy should be better utilized.

Circulating the Results

The primary purpose of WWViews is to share the views of ordinary citizens with the biodiversity policymakers. Two important outcomes signal success in this regard:

- 3000 copies of a results report prepared by DBT with input from project managers were acquired by attendees at the UN biodiversity summit

- CBD leaders (e.g., the Executive Director and the Japanese Minister of the Environment) endorsed a future WWViews and called for improved integration of the results with the decision-making process.

This reception is an important milestone for the ongoing WWViews project, but there is both potential and need for a far wider and sustained amplification of the results.

Much like policymakers for science aspire to cultivate a research enterprise that generates "usable" research in the service of complex issues like biodiversity, calls for public engagement with science (pTA in the context of this report) demand equal attention for processes that articulate "usable public values" representing not only stakeholders and interest groups, but also the knowledge and experience of a diverse American public. Amplification of the deliberative results through public science centers, secondary and college curricula, and other channels can stimulate and sustain the public's engagement with the results of WWViews and create opportunities for their integration into policy networks, creating "usable public values".

Designing programs to engage the public in this way (Public Engagement with Science) involves a re-conceptualization of audiences as not only learners, but as decisions makers in society (see figure below).

Lifecycle of a Decision-maker
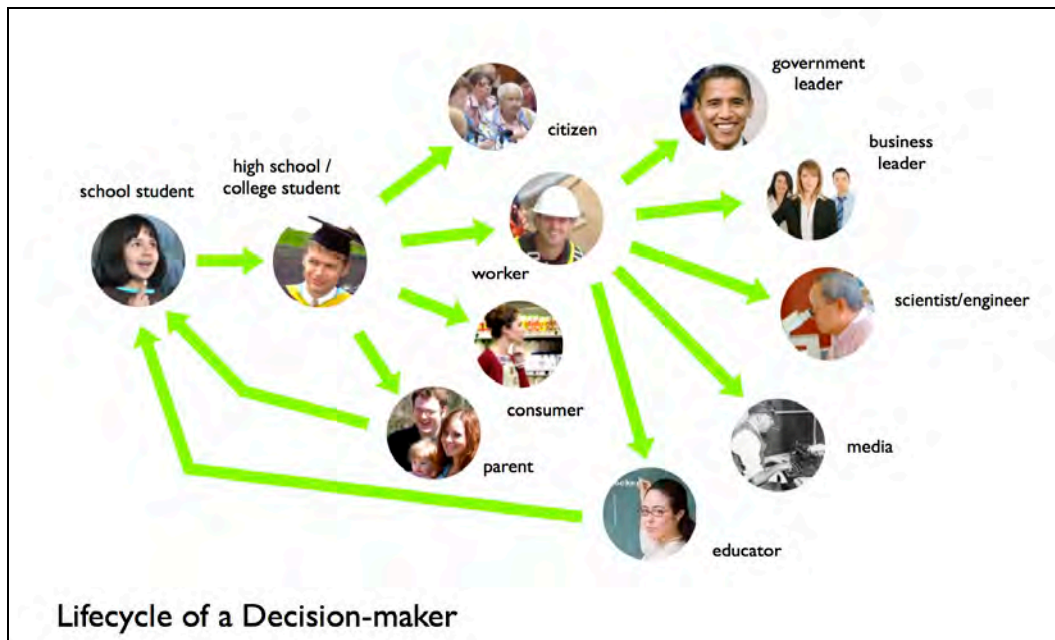
Activities undertaken after WWViews within this framework included:

- Biodiversity activities at the Museum of Science, Boston that culminated in a "Biodiversity Day" and forum on "Who Should Protect Biodiversity"

- A "science café" and online version of the WWViews "National Question" sponsored by the Marian Koshland Museum of Science in Washington, DC.

- Youth forums at the Phoenix Zoo and Seattle Aquarium that help participants understand the complexities of bringing science into the policy realm.

- Sessions at Informal Science Education professional meetings to introduce professionals to the concepts behind WWViews and learn their perspectives on adopting such programs at their own institutions.

Early indicators are that all of these initiatives met with enthusiasm, but a more sustained program and evaluation is required to better judge their prospects.

Pathways to pTA

The most promising *outcomes* of the WWViews project in terms of ECAST's development are:

- The insights it generated about the informed and considered views of ordinary citizens around the world on practical policy issues; previously there was little comparable information for such views on biodiversity

- The positive reception at CBD

- The engagement (although nascent) of citizens in addition to those who participated directly

- The mobilization of ECAST core members and significant contributions by experts, such as the panel that helped shape the National Question

There are three main *challenges* for pTA in the

U.S.

- The media has little interest in biodiversity except when high stakes controversies (such as developing an undisturbed landscape) erupt. Yet policy makers are unlikely to heed citizen views from deliberations in the absence of a wider public awareness of them.

- Sustained engagement is critical, but most professionals in the informal science education community lack the particular skills required for designing and conducting programs for this engagement.

- Research on WWViews to date has been organized informally and somewhat independently. Data on issues like the political orientation of participants or the dynamics of table conversations are thus missing for most sites, which limits project managers' ability to understand strengths and weaknesses and the options for addressing the latter.

Several a*ction items* for WWViews connected to these challenges are the need to make balance a priority in recruitment of participants and facilitation, strengthening the research capacity and integrating it with the project operations, including a few journalists as participants, and incorporating emerging technology issues (such as synthetic biology) into future deliberations to generate debate within CBD as well as media attention.

For ECAST, the agenda going forward includes the following:

- Encourage the Obama Administration to develop the citizen engagement component of the Open Government Initiative during its second term.

- Develop a strategy to encourage training in science museums, zoos and other science centers for the skills needed to implement programs for Public Engagement with Science.

- Solicit input from business, government and nonprofit organizations about the

ECAST mission and strategies for accomplishing it.

• Establish and sustain a presence in the European Parliamentary Technology Assessment organization; build ties with partners in the World Wide Views Alliance through collaborative research and cooperative projects for the next WWViews deliberation (e.g., for developing national questions).

• Connect participant recruiting with sustained engagement. For example, all applicants for a deliberation can be invited to subsequent events or receive results.

• Track and report events such as conference presentations, science cafes, and new ties. Prepare a protocol for tracking the resources (including in kind labor) required to conduct the next WWViews or other deliberation conducted by ECAST.

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When ECAST was launched in 2010, Richard Sclove noted in *Reinventing Technology Assessment: A 21st Century Model* that "the time is ripe" for integrating a "modern, expert-and-participatory technology assessment capability into our nation's civic life" (p. 41). The ECAST activities undertaken since then, including those highlighted in this report, are offered here as a proof-of-concept. The network's efforts in the next few years will be critical in determining whether that concept can begin to take shape as an ability to better inform public actions that affect the responsible design and use of technology.

Chapter 1

Situating pTA

This is a report about participatory technology assessment (pTA), prepared by members of the Expert and Citizen Assessment of Science and Technology (ECAST) network in the United States. The authors are advocates for pTA and think that it should become a more common practice in the U.S. and around the world, but we endeavor to strike a dispassionate posture in this report because pTA will only thrive if it can be responsive to a wide variety of perspectives and concerns. A strong advocacy posture would seem inconsistent with this aspiration to open engagement.

Technology assessment (TA) is a practice that was institutionalized in the United States in the early 1970s, and is now conducted in many countries, although it has been buffeted in its short lifetime by shifting political priorities concerning the role that technology does and should play in society. Practitioners of TA do what its label says: they assess technology. The field is rooted in the widespread recognition that technology has come to play an increasingly significant role in shaping the basic contours of contemporary society.

Like all human activities, technological endeavors bear social implications that are both positive and negative. Moreover, people frequently differ in their judgments of what is negative and what is positive in various technological practices and consequences. A new means of manipulating embryonic stem cells to restore normal functionality to the victims of spinal cord injuries would likely be seen as an exercise of freedom and creativity by its inventors that has the most direct and humane of outcomes, but the same development would also be viewed as morally suspect, an affront to religious beliefs, or politically dangerous (among other things) by some fellow citizens. The social dimensions of technology, however, involve far more than simple artifacts like a wheel or complex services like embryonic stem cell therapy. The ubiquitous demise of Main Street and the advent of sprawl, for example, is as much a reflection of a technological way of being as it is the product of particular devices and systems.

Because the design and management of the technological systems that increasingly shape society are typically left to a small and insular group of sponsors, researchers, innovators, managers, and enthusiasts, it is not unusual for some among the other members of society who are affected by technology (which includes practically everyone) to call for broader input into technological decisions, especially when they think things could go awry. Technology assessment, which is principally concerned with identifying potential impacts before they become deeply ingrained in economy, culture and society, is the practice that aims to fill this void.

The "p" in "pTA" emphasizes that everyone lives with the positive and negative consequences of science and technology. More fundamentally, as Langdon Winner has famously put it, things technological are so pervasive that we would do well to view technology as a form of legislation.[1] Viewed this way, ordinary citizens should have a role in shaping legislation in the technological arena as they do in others, and pTA advocates argue that they can and should play a

role in technology assessment. While some advocates for TA called for the inclusion of participatory practices from the beginnings of the field's evolution in the U.S., action to implement this idea did not begin until the late 1980s, largely in Europe. In society at large, however, participatory practices have expanded considerably over the past two decades in relation to science and technology in particular, and social decision-making in general.

One such opening has been expanded inclusion of the people who constitute the professional work force in scientific and engineering fields. Both the "white" and the "male" elements of the "white male" profile that has characterized the people working in these fields since the Scientific Revolution have changed. For example, the percentage of women with science or engineering degrees who have jobs in related fields increased from 31% in 1993 to 46% in 2008. For under-represented minorities (African Americans, Latinos/as, Native Americans and mixed race), the corresponding figures are 9% and 14%.[2] Another change has been an increased involvement in research by ordinary people.[3] The models here are diverse. Citizen science, for example, is normally understood as engagement in data collection (such as astronomical observation or water sampling) by ordinary people, who typically provide the data to professional scientists for analysis. A related practice is community-based research (also called participatory action research), which involves projects that originate in the concerns of community members.[4] These people may or may not become engaged in the actual conduct of the research, which differentiates the model from citizen science, but their role in deciding what gets studied and their sustained input into the research and later use of the results to address practical problems contrast sharply with conventional scientific practice. A third type of participatory practice that has evolved over the past several decades involves challenges by lay people to the authority of experts and their sponsors, often with significant practical impact. A case in point is the challenge to the nuclear power industry and its experts that undermined the latter's monopoly over the terms of scientific discourse and contributed to a virtual stop in U.S. nuclear power plant construction that has lasted more than 3 decades. Finally, dissidents inside science and engineering fields who challenge research programs backed by powerful industry, government and scientific institutions represent a departure from the heyday of science and industry collaboration (late nineteenth to the late twentieth century), when such internal opposition was rare.[5] Taken together, these openings of science/technology policies and practices beyond a coterie of experts and their sponsors have been coined "epistemic modernization" by David Hess. This term refers to the underlying assumptions about scientific expertise that are contested by these activities, and implies the social progress (modernization) that the changes represent.[6]

Clearly the participatory element of pTA fits well in the conceptual terrain of epistemic modernization, but one might also argue that merely assessing technology, whether or not in a participatory fashion, challenges the idea that it is produced by way of a value-free discovery of objective reality. Nonetheless, the institutional changes associated with the broad cultural shift that Hess describes have been slow and fitful, and TA provides an apt example. The most prominent institution for conducting TA in the U.S. was the Office of Technology Assessment that was created by Congress in 1972, but it was de-funded in 1995 (although it remains on the books as a legal entity). Other federal agencies and offices—e.g., the Congressional Research Service, the National

Research Council, and the Government Accountability Office (GAO)[7]—do some studies that assess technology, and active engagement of citizens and consumers in corporate and government inquiries at all levels has clearly expanded since OTA's demise. However, the scale of efforts is marginal by comparison to the centrality of science-based innovation in U.S. economic strategy (a priority that is now widely embraced internationally), and the organizational fragmentation of these offices and activities further limits its significance.

The spirits of pTA enthusiasts soared briefly when President Barack Obama issued an executive order on his first day in office (January 21, 2009) creating an Open Government Initiative to promote (among other things) citizen participation in policy making,[8] but the priorities of this initiative during his first term were the transparency of government operations and citizen collaboration in doing the government's work, not active engagement in shaping the policies that determine what work the government does.[9]

One specific development during the first decade of the 21st century within this larger framework was increased contact among institutions interested in science in public life, such as science museums, universities with programs in science and technology policy, and advocates for expanded participation in science and technology policies and practices. Seeing the need for pTA and some recognition of its value in an environment where prospects for major initiatives are remote, five organizations (the Consortium for Science, Policy and Outcomes [CSPO] of Arizona State University, the Loka Institute, the Museum of Science, Boston, Science Cheerleader, and the Science and Technology Innovation Program at the Woodrow Wilson International Center for Scholars) formed the network Expert and Citizen Assessment of Science and Technology (ECAST) in 2010. Among them, these organizations have considerable expertise in technology assessment and citizen engagement, as well as the ability to disseminate the results of participatory technology assessments to policy-makers and to amplify them through education and outreach. ECAST was officially launched at the Woodrow Wilson Center for International Scholars on April 28, 2010, where Loka Institute founder Richard Sclove presented his report *Reinventing Technology Assessment: A 21st Century Model.*[10]

ECAST's first large scale project was coordinating the U.S. component of World Wide Views on Biodiversity, a global citizen consultation held in 25 countries on September 15, 2012 that provided input to the Eleventh Council of Parties of the UN Convention on Biological Diversity held the following month. Many of the individuals and organizations involved in forming ECAST had participated in a previous project, World Wide Views on Global Warming, the first global citizen consultation in history that was conducted in 2009 to bring citizen voices to the Fifteenth Council of Parties of the United Nations Framework Convention on Climate Change. Other ties among them go back much further. One important project shortly before WWViews was the National Citizens' Technology Forum organized by CSPO in 2007, in which citizens at six sites around the country deliberated in small groups for several weekends to develop reports on new technologies of "human enhancement."[11] This revived an interest in "citizen panels" or "consensus conferences" around technology issues first undertaken in the U.S. by the Loka Institute in 1997,[12] and brought people into working relationships at what turned out to be a propitious moment.

This study is conceived as a progress report on the vision and call for action presented in *Reinventing Technology Assessment.* In it, we address the state of pTA in the U.S. with some reference to other countries, and focus in particular on WWViews as a case study to explore the strategies and capabilities of ECAST.[13] Our primary motivation in this report is to better understand what role (if any) a network such as ECAST can play in conducting and institutionalizing pTA in the U.S. To shed light on this issue, we aim to address the following questions:

- How credible, informative and useful are pTA deliberative results, as reflected in the specific case of WWViews, for policy makers and the public at large?

- What other benefits were produced by WWViews?

- What specific elements of WWViews require improvement? Do these apply to other types of pTA, or are they particular to a global deliberation?

- What are the next steps for advancing pTA in the U.S? Who could take them, and why *would* they take them?   What are the potential challenges? Where are the opportunities?

There are three main themes in this report, the context in which pTA has emerged and in which it might develop, the results and implications of WWViews, and opportunities for developing pTA. These are addressed in chapters on: (1) the origins and demise of OTA, the evolution of TA and pTA in the U.S. and internationally, and ECAST's structure, goals and activities since its formation; (2) the World Wide Views project, origins, design, and comparison of the policy issues addressed in the climate change and biodiversity deliberations; (3) results of World Wide Views on Biodiversity; (4) engaging the media, policymakers and public with the results; and (5) lessons learned and action items for taking the next steps with ECAST.

Chapter 2

Technology Assessment and Participation: From TA to pTA and ECAST

"We have recognized the important need for developing independent means of obtaining necessary and relevant technical information for the Congress, without having to depend almost solely on the Executive Branch. In my view, it is only with this capability that Congress can assure its role as an equal branch in our Federal structure."

Emilio Quincy Daddario
United States House of Representatives
May 1970[14]

"…citizens groups and potentially impacted parties are determined that technology assessment shall be a holistic mode of discourse where the vigorous articulation of pluralistic values, ethical norms and societal goals will allow all TAs to present the broadest range of technological and societal options to the electorate for democratic debate and resolution."

Hazel Henderson, 1974[15]

"What I think is important is to find a way so that the administration that gets so very busy… sees the relevance. We tried very hard to bring foresight into this administration and then the avalanche comes and you get inundated with the crisis of the day."

Ambassador Mary Yates
Former Special Assistant to President Obama & Senior Advisor
on Strategic Planning, National Security Council
"Anticipatory Governance: Upgrading Government for the 21st Century"
Woodrow Wilson International Center for Scholars
November 13, 2012.

From 1972 to 1995 the United States was a world leader in developing the practice of technology assessment through the Congressional Office of Technology Assessment (OTA). Public involvement was on the agenda for a technology assessment office even before the OTA was created in 1972,[16] but it was an idea that never bore fruit. In 1995, Congress defunded the OTA and since then has occasionally turned to ad-hoc resources for expert analysis. From the mid-1980s to the present, however, and inspired partly by the OTA, more than a dozen European nations, plus the European Parliament, established their own technology assessment agencies and pioneered promising new methods involving citizen participation (participatory technology assessment, or pTA).[17] A reverse flow of innovation now seems to be in progress as U.S. interest in the participatory approaches developed in Europe has picked up.[18] In this chapter we will explore these developments in order to place the formation of ECAST in an institutional, historical and political context, and to articulate its basic rationale.

Most broad rationales for the advent of technology assessment reprise in some fashion the argument in the preceding chapter that the mutual shaping of technology and society is increasingly consequential, and needs to be consciously managed in order to attain the best social outcomes. But few things happen in society without proximate causes among the people and institutions at the vortex of change. For TA, competition between the executive and legislative branches of the U.S. federal government was perhaps the most significant of the immediate considerations driving the advocates for a Congressional Office of Technology Assessment.[19]

The post World War II era is widely recognized as a golden era of science during which the federal role in research and development expanded beyond earlier initiatives (such as formation of the Geological Survey in the 19th century) to become an important function of national policy. As a consequence, budgets and prestige grew as never before. Efforts to understand the wider significance of these developments were not long in following. In the executive branch, the Department of Agriculture, the Environmental Protection Agency, the Food and Drug Administration, the Department of Defense, the Department of Transportation, and the Department of Health, Education and Welfare had all participated in technology assessments by the early 1970s. Congress, on the other hand, had little such capacity until the formation of OTA in 1972, but faced increasing pressures during the 1960s in sustaining growing budgets for science and research. Outside the federal government, increased concern about the broader ramifications of new technologies from consumer, environmental and other quarters added to the sentiment that technological affairs should be more closely monitored by the nation's top legislative body.

Under these circumstances, a Congressional office that could take stock of technological developments and foresee potential advantages and liabilities of emerging initiatives seemed eminently practical to many in Congress, including Emilio Daddario of Connecticut, who had been a tireless advocate of such an office since the mid-1960s. When Congress finally established the Office of Technology Assessment on October 13, 1972, Daddario, who had left his Congressional seat to make an unsuccessful bid for governor of Connecticut in 1970, was its first Director. The new office was to provide "early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist the Congress".[20]

OTA's governing board, the Technology Assessment Board, was composed of six senators and six representatives, divided equally between Republicans and Democrats. The legislation also created a Technology Assessment Advisory Council (TAAC) to provide independent advice from outside experts. TAAC was composed of 10 public (meaning non-governmental) experts, the comptroller general (who was also the head of the GAO) and the director of the Congressional Research Service.[21]

With an annual budget of just $22 million (less than one percent of the entire legislative branch budget) OTA was the smallest Congressional office. Yet, during its lifetime, OTA published 755 in-depth reports on topics including the environment (acid rain, climate change, and resource use), national security (the strategic defense initiative, the use of simple "tag in" explosives for incendiary devices, technology transfer to China and bioterrorism), health (disease and medical-

waste management), and social issues (workplace automation and how technology affects certain social groups). In FY 94 alone OTA's experts testified 38 times before Congressional committees.[22]

Participatory Sentiments

In her 1974 study for the Congressional Research Service, Rosemary Chalk[23] noted that technology and natural resource issues were becoming more prominent on the public agenda, that some groups have little representation in regard to these issues, and that access to data and reports such as those produced by OTA (which is sometimes framed by elites and authorities as a means of engaging the public) is not the same thing as meaningful public participation. Such participation would be particularly important with regard to technology assessment, as TA scholar Philip Bereano put it in his reflections on the discussions of that era, "because technologies are the means of human intervention into the natural and social environments, they themselves are imbued with human intentions or purposes."[24]

Notwithstanding these and similar arguments, OTA never developed a public participation program. Hazel Henderson (see p. 5) was a clarion voice for participation on the original Technology Assessment Advisory Council. Generally, however, it was populated by corporate officials and conventional academic experts who had little contact with citizen groups.[25]

OTA was put on the Congressional chopping block following the 1994 elections which produced a Republican majority in the House of Representatives that had campaigned on a platform of cutting government spending. Critics advocated OTA's closure for a host of reasons. First and foremost, it would exemplify an end to wasteful government spending,[26] which was of particular interest to members of Congress who felt the OTA reports took too long to complete and duplicated work produced by other agencies and think tanks, such as the National Academies and the National Research Council. Related to this, some members of Congress felt information and analysis on science and technology issues could be provided by the Congressional Research Service (CRS) and the General Accounting Office (GAO).[27] Given its inability to integrate or communicate with the public, there was little public support for the OTA. And it is not hard to discern partisan differences between those who have advocated the creation, maintenance and restoration of OTA and those who cancelled its funding, notwithstanding moments of bipartisan support and governance.

The Fall and Rise of TA

The overlap of TA's disappearance from the U.S. legislative scene with its ascent in Europe may have been disappointing for its American supporters, but proved fortuitous in sustaining the practice during an important period of "epistemic modernization" (see chapter 1) while also affording the opportunity to draw on European participatory traditions in fashioning new methods. Parliamentary Technology Assessment units throughout Europe range from permanent parliamentary committees for TA; to separate TA units as part of the parliamentary administration; to independent institutions with a mandate to serve as a permanent consulting institution for Parliament.

The European Parliamentary Technology Assessment Network (EPTA), formally established in 1990, is composed of 14 full members (European organizations which carry out TA) and 4 associate members.[28] Where the primary rationale for OTA had been to anticipate technological developments in order to better plan for them (although its actual work was more in the model of current policy analysis) Europeans sought "to open up opportunities to consider science and technology in society from different angles and to allow for feedback at different levels."[29] Participatory approaches were a good fit for this agenda. European TA agencies have also become adept in sharing methods and results, and have learned to undertake selected TA activities on a collaborative, transnational basis.

Sclove notes that these institutions have encouraged individual nations and the European Union to develop plans and programs for a wide range of technology-related societal needs: adapting to global warming; developing green industries; carefully determining the areas of genetic technology that warrant active promotion (e.g., pharmaceuticals) vs. those where significant expert and lay concerns make a good case for proceeding with caution (e.g., genetically modified organisms); and regulating chemicals on a group basis, as distinct from the one-chemical-at-a-time approach in the U.S. that leaves many unregulated.[30]

New Opportunities in the United States

Back on the North American side of the Atlantic, TA never died in the U.S. despite its travails. Indeed, OTA remains an agency of Congress, albeit without a budget. More importantly, the variety of forces that prompted Congress to create a technology assessment capability in the first place have not disappeared and, if anything, have grown. Indeed, the U.S. Congress recognized its own need for TA. At the request of congressional appropriators, GAO began a technology assessments pilot program in 2001 in order to provide the U.S. Congress with science and technology advice similar to that provided by the OTA and in 2008, the U.S. Congress asked GAO to continue conducting technology assessments as a permanent program for which the GAO established the Center for Science, Technology, and Engineering (CSTE). According to Dr. Timothy Persons, Chief Scientist, GAO, production of technology assessments is likely to remain constant at up to two reports per year, due to current demand and staffing restrictions.[31]

Guarded optimism coupled with the realization that, at best, the GAO has the capacity to produce less than 1/10th the number of reports issued annually by the OTA, has led to several attempts to bring back the OTA. Congressman Rush Holt (D-NJ) and Senator Jeff Bingaman (D-NM) have championed several efforts to reopen its doors.[32] Most recently, Holt proposed amendments to the 2012 Legislative Branch Appropriations Bill[33] to re-establish OTA, but the amendment was voted down 176 to 235.

While Congress is left without a dedicated source of TA, the White House continues to have access to a broad array of TA resources. While the component of President Obama's Open Government Initiative advocating citizen participation in policy making has yet to materialize (see p. 3), calls for participation continue to emanate from the White House. A case in point is a 2010 White House-commissioned report on the ethics of synthetic biology and emerging technologies

that lists "Promoting Democratic Deliberation" as one of the five ethical principles for the governance of emerging technologies.[34]

These unrealized principles contrast sharply with actual "public participation" practices by the Obama administration that have conceived the public as "public experts."[35] For its part, Congress increasingly eschews independent scientific input, and has largely relegated citizen participation to constituent service in district offices that are isolated from policy making.[36] Twenty years of European pTA experience has demonstrated, however, that it is possible for participatory and expert modes of input to be integrated into policy making.

pTA success need not be the purview of Europe, as a set of converging factors suggests. Factual knowledge of science among the public in the United States is comparable to Europe's. Americans have consistently expressed interest in science and technology;[37] and many affordable and accessible online tools[38] exist to enable participation and collaboration the likes of which we have not seen before. In the realm of deliberative democracy on general policy issues (but typically not including technology), organizations such as the Center for Deliberative Democracy at Stanford University, AmericaSpeaks, and the Jefferson Center are at the forefront of global practices. Never before have so many average citizens, untrained in the sciences, turned themselves into amateur researchers who help scientists analyze distant galaxies, monitor species populations, detect home and body microbiomes, and much more.[39] These so-called "citizen scientists" may hold one key to the development of a sound national science policy.[40]

"Citizen science" has helped democratize science and helped people to understand they can have an influence on science by being a part of it," argues Rick Bonney, an education expert at the Cornell Lab of Ornithology in Ithaca, NY, in the Cyber Diver News Network column, "Volunteer Citizen Scientists Dive in for Sex on the Beach," (the column, by the way, is about an expert/amatuer effort to catalogue fish mating habits on the beach). An opportunity exists for the U.S. to harness the interest and enthusiasm of "average" Americans and the power of citizen scientists to build upon the proven capacity, demonstrated by the Danish Board of Technology and EPTA, to create a 21st century technology assessment.[41]

Sclove argues that a nonpartisan pTA organization needs to be flexible and participatory in contrast to the formalistic governance practices and uncertain participatory urge of OTA. ECAST, he envisions, would have "the flexibility to organize technology assessments not only for Congress but also for the executive branch and for state or local governments. Unlike the OTA, which worked only and directly for Congress, an ECAST network could incorporate fostering societal discussion, as well as broad public education, into its mission. This would enable ECAST to inform business and other stakeholders' decision-making, and to enhance the quality of popular engagement with science- and-technology–intensive policy issues and, hence, of American democracy. Being constituted independently of the government, the ECAST network can select and frame topics more creatively, pro-actively or participatively than could an agency such as OTA, which, while it did informally suggest topics to Congress, was largely forced to focus on the topics assigned to it. Operating outside of the direct line of fire of partisan Congressional politics, ECAST will also experiment more freely with new TA concepts and methods."[42]

The Birth of ECAST

ECAST was envisioned and then created as a result of several converging institutional partnerships around the subject of public participation in science and technology policy. Darlene Cavalier, founder of Science Cheerleader (literally, cheerleaders for professional sports teams who are also professional scientists, and who playfully challenge gender stereotypes as a means to advocate for public engagement with science), had been working for several years to "re-open the OTA with citizen input" through print and social media channels as an outgrowth of her graduate work in science policy. Among her collaborators were Richard Sclove, founder of the Loka Institute that advocated for

World Wide Views on Global Warming: U.S. Sites and Project Team Leaders	
Atlanta	Georgia Tech (Susan Cozzens)
Boston	Museum of Science (Larry Bell and David Sittenfeld)
Denver	Colorado School of Mines (Sandra Woodson, Jason Delborne, Jen Schneider)
Los Angeles	Pomona College (Richard Worthington)
Phoenix	Arizona State University (Nalini Chhetri, Netra Chhetri)
U.S. Liaison to Danish Board of Technology, Richard Sclove (Loka Institute)	

democracy in science and technology, David Guston, co-director of the Consortium for Science, Policy, and Outcomes (CSPO) at Arizona State University, where he is PI and Director of the Center for Nanotechnology in Society (CNS), and David Rejeski, director of the Science and Technology Innovation Program at the Woodrow Wilson International Center for Scholars in Washington, DC.

At the same time, educators from a number of science centers had begun collaborating closely with CNS as part of the NSF-funded Nanoscale Informal Science Education Network , headed by Larry Bell at the Museum of Science in Boston. Gretchen Gano, outreach coordinator for CNS, had worked previously at the American Museum of Natural History and forged a partnership of the two groups to create products and offerings that would engage people in both public and academic settings. The Museum of Science also had collaborated with Rejeski's groups at the Wilson Center in holding two public forums with the Cambridge Public Health Department on the subject of regulation and labeling for consumer products made through nanotechnology.

As these relationships were building, World Wide Views on Global Warming in 2009 emerged as a catalytic force. WWViews deliberations were held at five U.S. sites (see box below), deepening ties among the ECAST founders, most of whom were connected with WWViews in some fashion, and drawing others into an expanding and active informal network. The spirit of collaboration and shared purpose that grew from these endeavors soon produced visions of participatory projects in the U.S. beyond World Wide Views. By late 2009 – early 2010, a name for the network had materialized, as had a set of understandings about the goals it would pursue and the types of activities it might undertake to reach them. The formal launch of ECAST was a well-attended event at the Woodrow Wilson International Center for Scholars in April 2010 featuring the presentation and discussion of Sclove's *Reinventing Technology Assessment.*

Creating and Sharing the Vision for ECAST

The structure for ECAST, as envisioned and presented in Sclove's paper and presentation, was designed to take advantage of the strengths, partners, and resources available to the founding institutions. A group of universities, led by ASU's Consortium for Science, Policy, and Outcomes, would lend expertise both in the scientific and technological areas for choosing topics and creating the materials for participatory technology assessment activities. ASU and the Loka Institute also bring experience and scholarship around the range and varieties of methodologies that could be employed in conducting multi-site pTA. Nonpartisan research centers such as Woodrow Wilson would provide connections to the policy world and a venue for reporting the outcomes of pTA exercises. The Museum of Science would lead a group of science centers, who would create educational activities and products to engage the broader public in considering the topics of pTA deliberations. Science Cheerleader brought familiarity with print and social media as well as connections to policymakers sympathetic to the idea of public participation in science and technology policy. Working together, these institutions were positioned to form an agile and flexible technology assessment organization that could help to inform multiple levels of policymaking and bring a wide and diverse public into the extended conversations.

The initial reception of ECAST in science policy circles after the Wilson Center launch was encouraging. Sclove was invited to publish a variation of his report in *Issues in Science and Technology*, a policy journal of the United States National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and the University of Texas at Dallas that analyzes science and technology issues and seeks to provide recommendations for effectively acting on them.[43] In a critical but supportive response, University of Wisconsin science policy scholar Daniel Lee Kleinman encouraged pTA advocates to challenge the "pervasive scientism" in American culture that at times influences deliberative exercises (e.g., by fostering an illusory pursuit of "unbiased" participants), to tread cautiously in extending deliberations to the Internet, and to "… engage in a rigorous evaluation of the different participatory assessment approaches they use."[44]

The top British science journal *Nature* also ran two complimentary pieces shortly after Sclove's presentation, one by the editorial staff and one by CSPO co-director Dan Sarewitz. Both argued that the vision for pTA was sorely needed in a highly polarized environment where public decision-making around issues in science policy was floundering. Considering the case of nuclear waste as an example where pTA might have been beneficial, the editors of *Nature* stated that "As National Academy of Sciences studies of risk assessment have inferred, it would have been wiser and cheaper to interact with the public at the beginning of the project, rather than at its end."[45] Soon thereafter, an article in *Science* written by a group of nuclear engineers pointed to participatory technology assessment methods as a way forward in the debate about how to address the US's decades-long stalled policy on spent fuel, saying that: "public engagement and transparent deliberations are 'communication acts' that build social trust and legitimacy, whatever their content. The social science needed to create such communications is well understood and essential for strategies that rest on the principal of voluntary consent and the public's right to know… Social science can provide effective guidance in the selection of representative publics, in the development of effective deliberation techniques, and in the integration of technical and lay knowledge."[46]

The ECAST vision also resonated in nanotechnology circles, where most of the ECAST founders had strong ties. The National Science Foundation's *Nanotechnology Research Directions for Societal Needs in 2020* report, issued shortly after ECAST was launched, argued that "Participatory technology assessment is essential to responsible nanotechnology development," and described the ideal structure for a network that would conduct pTA around nanotechnology and other emerging technologies: "The network should also incorporate organizations (including science museums, science cafes, and citizen groups) that have capabilities in citizen engagement, collaboration with schools, and broad public education concerning science, technology, and society issues."[47]

In the days and weeks following ECAST's launch, several founding partners met with members of the GAO and two White House agencies, the Office of Science and Technology Policy, and the National Science and Technology Council. They were greeted with enthusiasm and generally supportive dispositions, but it quickly became apparent that federal funding for these activities amid recession and Washington polarization was a non-starter. ECAST had a strong idea that appealed to a diverse group of scientific and policy stakeholders, but creating a distributed network, and finding resources that would allow it to translate the concept into meaningful action, would require a lot of work.

Expanding the Network, Implementing the Vision

The shift to building capacity and eliciting feedback from think tank, university and informal science professionals involved a number of collaborative presentations, workshops, and brainstorming sessions that consolidated ECAST's core group and broadened its network considerably. CSPO provided entrée to Arizona State University's innovative Rightful Place of Science Conference[48] in May 2010 that convened policy analysts, scientists, journalists, and educators, as well as the Third Annual Conference of the Society for the Study of Nanoscience and Emerging Technologies aptly titled *Exploring the Uncertain Technological Future: Lessons in Anticipatory Governance.*

One of the first public efforts for ECAST was a plenary session at West Virginia University's *Science and Technology in Society: Effective Communication Strategies* conference in February of 2011. Conducted by ECAST members from five different institutions, an audience of journalists, educators and scientists not only heard the ECAST vision but experienced a mock deliberation that might help them see what pTA would be like in the US.[49] Since then, the informal science education community has been instrumental in helping to establish a functioning network in a time of scant resources. The Museum of Science has held a number of sessions and workshops that have helped to build enthusiasm and capacity for doing pTA-style work in science centers around the world, and working to bring together the different kinds of institutions that will comprise ECAST to work together in creating tools and templates for use in future work. In October, 2011 at the Association of Science and Technology Centers Meeting in Baltimore, Maryland, a Community of Practice around Public Engagement with Science was established. Over 100 people attended this launch, which presented the strategies from the ISE field around convening multidirectional conversations between scientists and the public. A major focus was defining exactly what public engagement means, which drew on NSF-funded research around these questions that classified

some 200 examples of public engagement within the ISE field along a number of discrete dimensions. A recent workshop brought over 50 practitioners of these projects together to develop a number of shared goals to move the field forward.

This public engagement research became the focus of two NSF-funded workshops in Boston that convened ECAST and ISE members, most of whom had previously travelled in different circles. At the first workshop in December 2011, David Guston of CSPO and Rick Worthington of Pomona College and the Loka Institute reviewed various models that have been employed and proposed for pTA internationally and in the US. The workshop participants considered appropriate roles for science museums in extending conversations beyond formal pTA activities, and identified topics that seemed most ripe for engagement. The second workshop in July of 2012 applied the strategies identified from the previous meeting to envision a diverse mix of ISE activities and products for public engagement with biodiversity for science center and other kinds of audiences after World Wide Views on Biodiversity was held in September of the same year. Several templates for WWViews-inspired activities were developed, and their first applications are reviewed in Chapter 5.

Pilot pTA Collaborations

The individual members of ECAST brought considerable experience and some past collaborations to the formation of the network, but these were episodic rather than strategic in the fashion envisioned by the new initiative. Moreover, owing in roughly equal measure to the European leadership described earlier and a growing interest among younger scholars in the field of science, technology and society, the field was changing rapidly. A number of pilot projects at ECAST institutions were thus undertaken with three primary objectives: to strengthen ties *within* the network, to begin experimenting with new methodologies and ideas, and to develop external linkages with prospective pTA institutions in government, non-government and academic sectors.

The Woodrow Wilson Center held multiple focus groups and public programs on prediction markets on nanotechnology, synthetic biology, and geo-engineering. These provided content that was applied in a number of programs at the Museum of Science and other organizations, and the results were studied by scholars at ASU and elsewhere.

In another interesting collaboration, CSPO-DC Associate Director Mahmud Farooque and research professor Ira Bennett worked with DC-area high school students in STEM magnet programs in conducting pTA simulation exercises on the topics of geo-engineering and synthetic biology.[50] Working with the consensus conference model developed by DBT and adapted in the National Citizens Technology Forum (NCTF)[51], Farooque and Ira Bennet from ASU created an innovative four-step deliberation methodology. Given background information on scientific, technological, economic, societal and ethical issues regarding these transformative technologies, groups of high school students deliberated face to face with one another, then online with real world experts before deliberating again face to face to develop their consensus positions. The four-week project culminated with the formulation of policy recommendations in the students' own words that were presented in mock hearings before a panel of policy and scientific advisors. One deliberation was featured at the USA Science and Engineering Festival[52] and another was attended by the staff of

the Presidential Commission for the Study of Bioethical Issues[53]. This model was later adapted and employed as an amplification and youth engagement program for the WWViews on Biodiversity (see chapter 5).

A different tack was taken by CSPO affiliates Sarah Davies, Gretchen Gano, Ângela Guimarães Pereira, and Cynthia Selin of the Center for Nanotechnology in Society at ASU, when they conducted two experimental public engagement exercises centered on the question "how can we design deliberative activities that **allow publics to define** the systems and technologies of greatest concern?" The exercises, known as "Finding Futures", used an experimental walking tour format where participants captured and annotated digital photos of technological impacts in urban settings. Finding Futures was piloted at academic meetings in Lisbon, Portugal and Tempe, Arizona.[54]

During the same period Darlene Cavalier, founder of Science Cheerleader established SciStarter, a high-profile citizen science website that pairs volunteers who have interest in a particular area of science and geographic region with crowd-sourced data projects. SciStarter projects are regularly highlighted on *Discover* magazine's website and have broad national reach. Science museums in ECAST held a number of different kinds of experimental activities during this time as well. The Koshland Museum of the National Academies launched a series of online discussions and interactive web challenges around emerging scientific issues. An outdoor "endless table" engaged thousands of people in facilitated food policy conversations as part of a food festival organized by Museum of Science and a local food writer in collaboration with the cities of Boston and Cambridge. An NSF workshop on community conversations around scientific issues was held concurrently with the festival and educators from over 40 science museums attended and participated, considering elements that could be applied in their own communities. Another high-profile program on food policy focused on the Farm Bill reauthorization. In January of 2012, the Museum of Science held a day-long event in which Marion Nestle, author of *Food Politics* and Rep. Chellie Pingree (D-ME) from the House of Representatives Committee on Agriculture that was considering the reauthorization discussed the issues and challenges involved in the legislation, after which members of the public made their own recommendations for inclusion in the Farm Bill.

Other informal science education projects included an exhibit-based model for exploring socio-scientific questions in human biology, such as high school start time, genetic information in unborn children, and ASTC's Communicating Climate Change (C3) project, which convened community conversations on local adaptation plans for climate change in a number of different science museums around the country. The Science Museum of Minnesota also held meetings between city planners in St. Paul around a number of climate adaptation scenarios created by Cynthia Selin of CNS Arizona State University. Taken together, these pilot projects constituted a significant body of experimentation and collaboration that ECAST could draw on for larger endeavors in the future.

Stepping Forward: A Collaborative Launch of WWViews on Biodiversity

The Danish Board of Technology first indicated the likelihood of a World Wide Views on Biodiversity to ECAST members in June 2010, and publicly announced their intention of holding a

May 2012 deliberation in the spring of 2011. ECAST determined shortly thereafter that it would apply to coordinate U.S. deliberations, a proposal that DBT quickly approved. Funding delays to cover DBT's costs of managing the global deliberation ultimately required a change in the deliberation date to September 15, 2012, but ECAST continued as the U.S. coordinator.

After an extensive process of recruiting project managers to hold deliberations around the country, partners at four sites ultimately committed to hosting deliberations in their localities, Boston, Denver, Phoenix and Washington, DC. An organizational structure for managing the project was formed that identified functional areas (e.g., site hosting, media relations, research, etc.), and individuals or small groups who would manage activities in each of them.

The public culmination of these back stage operations was a project launch on June 5, 2012 at the Marian Koshland Science Museum of the National Academies in Washington, DC.[55] ECAST members explained the rationale for WWViews and previous experience with WWViews on Global Warming, and presented a vision for the biodiversity project that would take place at four U.S. sites: the Colorado School of Mines near Denver, the Koshland Museum in DC, the Museum of Science in Boston, and Arizona State University near Phoenix. Top experts in several fields relevant to the deliberation also made presentations: Carolyn Lukensmeyer, Executive Director, AmericaSpeaks (largest deliberative democracy organization in the U.S.); Barbara DeRosa-Joynt, U.S. Department of State and head of the U.S. delegation to the Convention on Biological Diversity; John Fitzgerald, Policy Director, Society for Conservation Biology; and Naba Barkakati, Chief Technologist, GAO. An array of participants from the fields of science and technology policy and biodiversity organizations learned about the structure and plans for ECAST and then participated in a mock deliberation. Recommendations from the exercise were included in ECAST's plans for making some programmatic enhancements to the WWViews on Biodiversity deliberation and amplifications of it, described later in this report.

A cynic reviewing the foregoing account of pTA might note that both technology assessment and public participation are perennial "good ideas" that never advance beyond a marginal role in policymaking. Are there reasons other than blind hope for optimism? Diving headlong into the challenge is one way of finding out, an undertaking to which we turn in the next chapters on ECAST's involvement with World Wide Views on Biodiversity.

Chapter 3

The World Wide Views Project

Once you get an event that's big enough, once you get an event that's global enough, there is hope that the political leaders actually will hear some of the discussions and some of the outcomes…Maybe we will have an effect, not immediately, but it will give them something to work with, something to think about and something to take to their policy making areas at some stage in the near future.

Australian participant in World Wide Views on Global Warming
September 26, 2009[56]

ECAST's largest project since its formation in 2010 is the U.S. coordination of World Wide Views on Biodiversity, a global citizen consultation on biodiversity policy that took place at 34 sites around the world on September 15, 2012. This deliberation was designed to bring citizen voices into the UN Convention on Biodiversity Eleventh Council of Parties held in India during the following month. WWViews on Biodiversity was the second global citizen consultation in history, the first being World Wide Views on Global Warming in 2009.

Origins of World Wide Views

WWViews is the invention of the Danish Board of Technology (DBT), a Parliamentary technology assessment organization that has been a world leader in developing methods for citizen participation in complicated issues. DBT was founded in 1986 to provide advice on technology issues to the Danish Parliament, and soon forged participatory approaches consistent with the Danish culture of social inclusion. Both the original formation of DBT and a 1995 act making it a permanent self governing body were hotly contested in Parliament, and DBT narrowly escaped closure when a rightist government took power in 2002. While that outcome was averted, DBT endured a reduction in its government funding in the following years, which made it difficult to both provide technology advice and continue experimenting with participatory methods. As Agger et al. note, "…to cease being innovative would be a sure path to irrelevance. WWViews can be seen as an initiative that responds to these tensions by taking deliberation to a global level."[57]

DBT's story took another turn in late 2011 when a newly-elected leftist government proposed severing the organization's Parliamentary ties and ending funding as of January 1, 2012, effectively leaving the organization either to dissolve or become a non-governmental organization. National and international protests resulted in an extension of DBT's funding until mid-2013, but the government also approved an act converting it to the non-governmental Danish Board of Technology Foundation. This leaves the organization's future, and by extension the future of WWViews, up in the air.

DBT frames its rationale for global deliberation in terms of the increased interdependency that has resulted in regulation of technology and environmental issues through transnational negotiations. Citizens have little access to these negotiations, generating a "widening democratic gap between policy-makers and citizens." WWViews is DBT's project to increase citizens' ownership of the global decisions that affect them, one that contributes more generally to the development of inclusive methods in a fashion consistent with its earlier work in Denmark and Europe.[58]

The basic design criteria for WWViews were formulated early in its evolution at a workshop with some of the first partners in WWViews1. Seven "cornerstones" of the project were put in place:

1. "Cheap and easy" – as a global project undertaken via partnerships with organizations around the world, the project would have to be accessible in principle to any country regardless of its financial resources and educational levels.

2. "Clear link to policy-making" – the topic addressed had to be of immediate relevance to policy makers to increase the chances that citizen input would be of interest to them.

3. "Both global and national" – the issue should be salient for decisions at both levels, which increases the pathways through which the results might affect policies.

4. "Clear and comparable results" – the ability to compare countries and regions with clear results facilitates communication to policy makers.

5. "Informed citizens" – citizens have to receive balanced information so that they have a legitimate basis for forming their views.

6. "Deliberation" – the consultation of citizens with one another is critical to forming their opinions.

7. "Qualitative and quantitative" – the results should include citizen responses to predefined questions that can be quantified (an important component of "clear results"), but citizens should also have the opportunity to make recommendations in their own words.[59]

A key element in the organizational infrastructure of WWViews is the World Wide Views Alliance, which consists of the national partners who have conducted or agreed to conduct a deliberation. The types of organizations that have become national partners include government agencies, non-governmental organizations, universities, and science museums. The Alliance functions as a network with no legal standing or formal governance structure, but in an assessment of its 2009 deliberation the WWViews Alliance was cited as the most significant outcome of the project because of its potential "to become a transnational actor with the aim of institutionalizing global deliberation."[60] The first deliberation on global warming involved 65 Alliance members at 44 sites in 38 countries. Participation for World Wide Views on Biodiversity dropped substantially, to

44 partners at 34 sites in 25 countries. Most of the difference reflected a precipitous drop in European participation from 14 to 3 countries, no doubt a reflection of Europe's financial troubles during this period.[61]

Project Design

In both of the WWViews projects to date, the deliberations were scheduled in advance of global policy conventions (the United Nations Framework Convention on Climate Change 15th Council of Parties in December 2009, and the Convention on Biological Diversity 11th Council of Parties in October 2012) that constitute the main global venue for public decision-making about the respective issues.   The project design entails amplification of the deliberative results via media and other outreach activities, and direct dissemination to policy-makers (the primary targets were delegates to the UN conventions from the countries where deliberations were held).

World Wide Views Day
• Citizens receive information materials 2 weeks before deliberation (20 pages)
• 100 citizens at tables of 5-8 participants plus a facilitator
• Welcome
• Video message from CBD

• 4 thematic sessions
   ○ Why biodiversity is important
   ○ Protecting biodiversity on land
   ○ Protecting biodiversity at sea
   ○ Burden and benefit sharing

• Each session includes a short video reviewing material from the information booklet, discussion of 2-3 questions (same questions at every site world wide), voting on multiple choice questions, and reporting results of previous question (45 minutes)
• Evaluation session
• Final session focused on a national question: what (if anything) can or should individuals do to develop a biodiversity strategy in the U.S.? Each table develops a recommendation.

From a production standpoint, the main phases of each deliberation are recruitment of national partners by DBT; a three day training seminar in Copenhagen for project managers that builds the capacity to implement the project locally, and establishes common standards for issues ranging from citizen recruitment to assuring the neutrality of organizers (this is critical in making the results comparable across different sites); the development of background information materials (print and video) for participants; the design of questions that citizens will answer at all sites; making and implementing all arrangements for the deliberation at each site; and development and coordination of amplification and outreach activities.

The biggest task for each site is to recruit 100 participants who reflect the diversity of their country. DBT requires each site to try to balance the participants in terms of gender, age, occupation, income, education, and geographic zone of residence (urban and countryside). Experts in biodiversity, such as scientists, policymakers, or business persons who are involved with biodiversity in their work, are screened out on the grounds that the purpose of the deliberation is to determine the views of lay people who have become informed about the issue and had the opportunity to consider it with their peers. DBT notes that this line may be hard to draw in some cases but that making the effort to do so is important because "…professionals would potentially be too dominant in the deliberation, where citizens' attitudes, concerns, and opinions (not just hard facts) are to be debated."[62]

The top motivation for participating in World Wide Views (based on surveys of participants) is to be involved in decision making. Most participants are also interested to learn about the issues,

but they are clearly more interested to have an actual impact. More than two-thirds of participants report that their opinions were significantly influenced by the exercise, and over 90% expressed a willingness to participate in a similar event in the future.[63]

At the global level a key dissemination document for both WWViews deliberations was a policy report based on the results. These were written by DBT staff and representatives from several national partners immediately after the deliberations so that they could be used in the period leading up to the UN convention that was the immediate policy venue for each project.[64] While this tight timeline precluded a deep analysis of nuances and limitations in the results, in both cases the global results supported a number of basic insights that were presented at the respective UN conventions. For example, the percentage of participants in WWViews on Global Warming who thought that climate change is an urgent issue and that an agreement to limit greenhouse gas emissions should be reached at the COP 15 meeting was very high (91% of participants world wide, 90% of U.S. participants). Large majorities thought that violators of such an agreement should be either severely or significantly punished (83% world, 71% U.S.). Most participants in World Wide Views on Biodiversity were "very concerned" about the loss of biodiversity (74% world, 85% U.S.), and even larger percentages thought new marine protected areas should be created on the High Seas, where they are virtually non-existent (90% world, 93% U.S.). Even if these results reflect a self-selection bias that yields a participant pool comprised disproportionately of people who are concerned about these issues and disposed to take governmental action to address them (a topic we explore in greater depth in the next chapter), the large majorities and consistency of results across different countries suggest that majorities would take these positions even with a different balance of participants.[65]

Based on the experience with World Wide Views on Global Warming, a few design changes were made for the most recent event. Most significant was the elimination of a session at the end of deliberation day, in which citizens at each table were asked to develop a recommendation in their own words to policymakers. The project managers at DBT thought the recommendation sessions at the various sites and tables, despite some interesting results,[66] had proven difficult to integrate with the quantitative results for presentation at COP 15, and did not want to ask citizens to express views that could not be analyzed and effectively communicated to policy makers in the short time between the deliberation and the CBD convention. While this left only the four thematic sessions with voting on multiple choice response items as the program organized by DBT, each site was invited to develop a final "national session" of its own choosing.[67] Part of DBT's thinking was that local design of these sessions would provide the flexibility to focus on issues of special interest at the various sites, and could be more effectively communicated with policymakers.[68]

The U.S. team responded enthusiastically to this opportunity, and ultimately designed a final session focused on efforts to preserve biodiversity that participants could undertake individually and through collective action, such as contributing to public education about biodiversity or developing components of a national biodiversity strategy. A first experiment for the national session was conducted at the launch of the U.S. WWViews project in Washington, DC in June 2012, where an audience of policymakers and experts were asked to deliberate on the connections between biodiversity and cultural diversity and develop a statement on the significance of such connections.

With critical feedback from the participants on this experiment, it became evident that designing a national session should involve iterative review of several options in order to settle on the best alternative. A panel of a dozen scientific and policy experts was created for the purpose of giving feedback and ultimately ranking three different national session proposals developed by the WWViews team.

A second change in the WWViews design was to add an environmental screen to the selection criteria by asking prospective participants to indicate on their application if they are members of an environmental organization. With this information, project organizers can manage the number of invitations to people who respond affirmatively to this question as a way of aligning the presence of environmentally-affiliated participants with the proportion of this group in the general population.

The final change in WWViews at the global level was a reduction in the volume of information materials provided to participants. While the videos presented before each session of WWViews2 were almost exactly the same length as those screened at the 2009 event, the information booklet distributed to participants two weeks in advance of deliberation day was 18 pages, compared to 41 pages for World Wide Views on Global Warming.

The U.S. team made a number of changes as well. Two measures were taken to better amplify the results of the deliberation to the general public, which had been a serious weakness in WWViews1.[69] First, the Museum of Science in Boston, an active partner in WWViews1 and one of just two such institutions in the WWViews Alliance at that time, expanded its ongoing efforts to encourage science centers[70] to shift from a "public understanding of science" approach to a more participatory "public engagement with science" orientation. WWViews provided an important project for developing this agenda. In the U.S., WWViews2 counted three additional science centers among its partners (Koshland Museum of Science in Washington, DC, Arizona Science Center in Phoenix, and Denver Botanical Garden), and dozens were engaged at workshops convened by the Museum of Science or held at professional meetings. The second change around amplification made by the U.S. team was to heed Schneider and Delborne's advice (see note 68) to engage a media professional as a member of the core project management team, and create events that, unlike an event at which citizens spend most of their time deliberating at tables, might support media attention.

The final change in the U.S., and probably the most fundamental, was the formation of ECAST that was discussed in the previous chapter. Even though ECAST functions as a network rather than a formal organization, this represented a significant step beyond the strictly ad hoc approach to organizing that was taken in WWViews1. Some of the results of this change and, more importantly, possibilities for improving the effectiveness of ECAST, will be discussed in the final chapter of this report.

Climate Change and Biodiversity as Issues

In addition to changes implemented in the design and management of the second project, the differences between the issues that were addressed in the two WWViews deliberations (climate change and biodiversity), including their respective institutional and political contexts, warrant

consideration because of their implications for citizen participation in associated policy processes. One difference between the cases is the transparency to citizens of the problem under consideration and its causes. The metaphor of a "greenhouse effect" describes the mechanism of climate change in terms readily comprehended by most people, and consequences such as melting ice caps and rising sea levels are similarly accessible. Biodiversity, on the other hand, is a scientific concept that was invented by biologists in the 1980s to supplant less robust but arguably more accessible terms such as wilderness and nature. Even among the experts, however, the definition of the term has proven elusive.[71]

A second difference between these two problems is the relative complexity of their proximate causes. Carbon dioxide emissions account for about three-quarters of the greenhouse gas emissions that cause anthropomorphic (human-induced) climate change, virtually all of it generated by burning fossil fuels.[72] In short, climate change can largely be explained by the emission of a single chemical compound that is produced from a specific source (fossil fuels) for a single human purpose (energy supply). The explanations of biodiversity loss, on the other hand, are themselves diverse, and far less robust. Some are so abstract ("The principal cause is the increasing conversion of natural ecosystems to human-modified landscapes"[73]) as to essentially say that human productive activity causes a decline in biodiversity. While this is true, it explains everything, and therefore very little. A richer account cites the main causes of biodiversity loss as damage and loss of ecosystems, overexploitation of wild species, water pollution, climate change, and invasive species.[74] In itself this account (while admirably accessible) is far more complicated than the climate change explanation centered on carbon dioxide emissions. When the productive activity that accounts for these mechanisms of pressure on biodiversity are taken into consideration, practically everything humans do to provide for their material needs is implicated, and the needs are similarly expansive in scope by comparison to the single purpose of energy supply.

A third distinction can be drawn between the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity as different types of environmental treaties. As its title indicates, UNFCCC is a *framework* convention, meaning that it serves as a venue within which binding agreements on climate change can be formulated. The primary example to date is the Kyoto Protocol of 1997 that established limits on greenhouse gas emissions for 37 industrialized countries and the European Union. At the other end of the spectrum are treaties such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, opened for signature in 1973) that are concerned with very specific environmental problems that stem from discrete behaviors of individuals and organizations (e.g., private companies) and promulgate detailed laws and enforcement mechanisms to regulate their behavior. CBD would be located toward the CITES end of the spectrum as a treaty that spells out binding commitments, although it typically does so in general terms that make strict legal accountability a challenge.[75]

Finally, the political economy of the two issues is different. Climate change is produced almost entirely by a single global industry, fossil fuel production and distribution, whose products are central for producers and consumers in countries around the world. Mitigating climate change is a simple matter of limiting the production and use of fossil fuels. In contrast, biodiversity decline is produced by a vast array of industries, from mining to agriculture to construction and water supply.

The means of stemming this decline are similarly diverse, and the restoration of biodiversity can be observed at specific sites where ecological damage has been repaired. Both the presence and loss of biodiversity can be experienced directly and locally even as the sources of its decline in expanding industrial production can be observed as a global phenomenon. The experience of climate change, on the other hand, is always ambiguous. Are the storms that wrought havoc in the northeastern region of the United States in the fall of 2011 and 2012 the product of climate change, or simply an unlikely coincidence of rare events? Science cannot answer this question definitely.

These differences add up to a climate change deliberation in which the basic problem can be readily grasped in its scientific and political dimensions by participants, with a clear focus on the policy issue of reducing emissions. Biodiversity, on the other hand, typically generates the question among ordinary citizens of "what do you mean by biodiversity?" Likewise, the policy issues are about the details of implementation more than the basic framework.

But why is either of these issues appropriate for *technology* assessment? Neither addresses the types of issues addressed by OTA that were cited in chapter 2, such as new defense technology or the workforce impacts of automation. In both cases, however, science and technology have been salient in constructing the issue and in that sense might be considered the type of "technological legislation" that Winner saw as an important feature of contemporary society (see note 1).

With two World Wide Views events completed by late 2012, the project can be described in diverse and even contradictory terms. As indicated briefly in the last section and as evidence to be presented in Chapter 5 will show, important strides have been taken in the effectiveness of the project's processes and outcomes. The completion of a second deliberation in 2012, plus strong prospects for another within the next few years, indicate that WWViews can be sustained over time. Yet the uncertain status of the Danish Board of Technology could take a turn for the worse and bring the project to a premature end.

Chapter 4

World Wide Views on Biodiversity

I have great hopes for this novel way of mobilizing citizens' views in the discussions about global biodiversity policies and the Strategic Plan for Biodiversity. This method could be extremely useful to the Secretariat and to governments as a means to facilitate the exchange of views between citizens and policymakers on how to build a future of life n harmony with nature.

Braulio Ferreira de Souza Dias, Executive Secretary to the Convention on Biological Diversity
Video screened at WWViews deliberations
September 15, 2012.

The topics discussed at World Wide Views on Biodiversity were driven by its goal of sharing citizens' views with policy-makers at the Convention on Biological Diversity Eleventh Council of Parties (COP 11) in Hyderabad, India in October 2012, and were oriented toward the issues that would be of particular interest there. COP 11 posed several telling contrasts with COP 15 of the UN climate summit that had been the focus of World Wide Views on Global Warming in 2009.

With the Kyoto Protocol that constitutes the only binding commitment of the climate convention slated to expire at the end of 2012, the focus at COP 15 had been on striking a new deal. Evidence was accumulating that the severity and negative consequences of climate change were worse than previously thought,[76] while a backlash from "climate skeptics" enjoyed increased sympathy amid a deep global recession that focused concerns on jobs and the economy above all else. All this added drama to COP 15, helping to make it the largest environmental conference in history.

The ambience in Hyderabad was decidedly more businesslike, where instead of trying to forge a new deal, the Parties were

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**The Strategic Plan for Biodiversity
2011 - 2012**

Although CBD was opened for signature in 1992 and 168 countries had ratified the agreement by mid-1993, biodiversity continues to decline.* As stated in the Strategic Plan, "It is against this backdrop that the Parties to the Convention on Biological Diversity …adopted the Strategic Plan for Biodiversity 2011-2012 with the purpose of inspiring broad-based action in support of biodiversity over the next decade by all countries and stakeholders."

The mission of the CBD's Strategic Plan for Biodiversity 2011-2020 is to: "Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication."

Most relevant to WWViews are Goals A and E of the Strategic Plan. Goal A aims to address the underlying causes of biodiversity loss, in part by assuring that "…people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably" (Aichi Target 1)." Goal E focuses on participatory planning and broad-based knowledge as critical to implementing CBD goals, and calls on all Parties to implement "…an effective, participatory and updated national biodiversity strategy and action plan".

*S. Butchart et al., "Global Biodiversity: Indicators of Recent Decline" in Science, May 28, 2010, pp. 1164-1168.

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concerned with implementing a Strategic Plan for Biodiversity 2011-2020 that had been approved at COP 10 in 2010, and that largely aimed to render the pursuit of existing goals more effective (see box). WWViews was relevant in particular to the goals in the plan of making biodiversity a mainstream issue in its member countries, and enhancing participatory planning, knowledge management and capacity-building that would increase the likelihood of effective action (Goals A and E in box).

Questions and Results

The citizen responses for the U.S., developed and developing countries from WWViews on Biodiversity are available in Appendix 1.[77] Participants in the deliberations were asked to report how much they knew about biodiversity and to discuss their level of concern about it, as they had been at the global warming event in 2009, but other topics reflected a policy agenda at COP 11 focused more on the implementation of existing policies than the passage of new ones. Where the global warming event had addressed the urgency, content and enforcement of a possible new deal, for example, WWViews on Biodiversity addressed the implementation of policies designed to preserve biodiversity in terrestrial and aquatic environments. These include questions about trade-offs with economic goals and the relative utility of policy instruments like education and regulation, among others.

The global warming discussion of who should bear the burdens of limiting emissions and of funding programs in the least developed countries was echoed in the biodiversity deliberation. However, the latter discussion addressed the sharing of benefits as well. These benefits are the diverse biological resources and knowledge of them that are concentrated in tropical areas where developing countries predominate, something for which there is no parallel in the climate change arena.

DBT notes in its report on the biodiversity deliberations that responses vary somewhat from country to country, but very little among continents or between youths and adults.[78] Developed and developing countries also were aligned on most issues, although some areas of divergence yield important insights about the citizens' views.

Several general outcomes where there was strong concurrence can be seen in the results. First, participants at the four U.S. sites and around the world are "very concerned" about biodiversity loss (85% U.S., 75% world).[79] Moreover, solid majorities of both groups support the expansion of international regulations to preserve biodiversity, prioritize environmental objectives over economic objectives, and are willing to share the costs of programs in developing countries.[80] Despite this broad concern and willingness to expand regulation, however, most participants recognize the importance of making trade-offs, and they advocate a diversity of means for preserving biodiversity. The results thus show the participants' attention to nuances and multiple perspectives on the issues under consideration rather than a single-minded urge to promulgate new rules that will mandate environment-friendly behavior.

Over 37% of U.S. participants (31% world) think that establishing new protected areas should "come first" if a conflict arises between this goal and existing economic interests, and an additional 45% (46% world) think new protected areas should be prioritized "unless very important economic

Table 1 - Preferred Policy Instruments (US)

Q 2.2 Which of these measures to you prefer to ensure the protection of nature areas in your country?*	%
• Stricter laws	37
• Enforce existing laws	33
• Incorporate biodiversity in planning	58
• Incentives for stakeholders	70
• Educate children and public	87
Q 3.1 Should incentives and subsidies that lead to over fishing be abolished?*	
• Remove subsidies quickly with no assistance to fishers	9
• Phase out subsidies quickly with some assistance	37
• Phase out subsidies slowly with some assistance	48
*See Appendix 1 for complete list and full text of responses	

aims are at stake." Even higher proportions (93% and 90% respectively) support a new international agreement to establish more Marine Protected Areas in the High Seas, where regulation is virtually non-existent. Setting aside the absolute level of support for regulation in these two cases, the relatively higher level of support for regulation of the High Seas where little exists at present suggests that the respondents are attentive to the details in determining the circumstances in which new regulations are warranted.

While participants were willing to advocate new laws, they were more inclined to support policy instruments that inform citizens and help them adjust to change (Table 1). In supporting a slow phase-out of subsidies that encourage over fishing, for example, citizens implicitly embraced a tradeoff that takes economic considerations into account, in about the same proportion as reported above for the question on conflicts between new protected areas and economic considerations (48% vs. 45%, respectively). The 87% of U.S. respondents favoring educational approaches was among the highest on this item in the world.

Citizens were also willing to share costs. Over two-thirds of all participants in the world thought developed countries should pay "the main part" for biodiversity protection in developing countries, with little variation: developed country participants who felt their countries should pay the main part ranked only two points lower than developing country participants who agreed that developed countries should shoulder the burden (see table below).

While there was significant concurrence on the issues just reviewed, there were also some interesting points of divergence between developed and developing countries. On the issue of paying for the preservation and restoration of biodiversity, a much smaller proportion across all country categories thought developing countries should pay the main part of their own biodiversity protection, but a notable result was that participants from the least developed countries were the *most* likely to select this response (22% compared to 14% for all developing countries, 9% for developed countries, and 8% for the U.S.). In the previous WWViews deliberation on global warming, a similar phenomenon was observed in which the least developed countries were 50% more likely than the wealthiest countries to advocate a global deal in which all countries would be required to make equivalent reductions in their own greenhouse gas emissions.

Table 2 - Q 4.1 Who should supply financial resources for biodiversity protection in developing countries?				
Who should pay?[1]	*Responses of participants in*			
	United States	Developed	Developing	Least Developed[2]
Developed countries should pay main part	61%	60%	71%	65%
Developing countries should pay main part	8%	9%	14%	22%
Companies and consumers should pay main part	23%	24%	6%	4%
1. Five percent or fewer selected the responses for continuing the existing system of voluntary payments, "no need for financial resources", and "Don't know". 2. A subset of developing countries that includes Democratic Republic of the Congo, Nepal, Uganda, Zambia.				

This might be interpreted as evidence that advocates for this position in least developed countries reject the idea that industrialization should come first, with environmental sustainability becoming a priority after a conventional mass consumption society has been established. Instead, these participants may see better prospects in devising relatively autonomous paths to social improvement than they think will come from adopting the model followed by the core countries and experiencing the constraints associated with the receipt of their financial support. While it seems likely that there are multiple rationales among these and other participants, the response from the least developed countries on this item is a strong signal that, for some citizens, the CBD is more a development than an environmental treaty.

The other interesting outlier on this question is the divergent responses of those developed and developing country participants who did not think the former should pay the main part for biodiversity programs in the latter areas. Among this group, developed country participants were considerably more likely than developing country participants to look to companies and consumers to foot the bill. Here, too, the citizen voices may point to a difference that can make a difference in the ways that biodiversity policies are conceptualized and developed.

Other variations on the "who should pay" theme were encountered on questions about exploiting biological resources. Virtually the same proportions of developed and developing country participants agreed that "…users of genetic resources from the High Seas [should] pay a fee for being allowed to use them" (85% and 86%, respectively). A question on the Nagoya Protocol, however, generated divergent levels of support. When it is ratified by 50 countries, this Protocol (approved in 2010 at COP 10 in Japan) will require users of species collections, who are mostly companies based in the developed world, to compensate the countries from which the resources originate, which are mostly in the global south. Reflecting ongoing debates over this issue, WWViews participants were asked if the users of these resources should be required to "share benefits with the countries of origin if the species were collected before the Nagoya Protocol enters into force?" Majorities agreed that the users should be required to pay, but the gap between developed countries (61%) and developing countries (87%) was wide. The solid majorities in the High Seas and Nagoya Protocol cases demonstrate that the "user pays" idea is attractive to citizens, and may be a valuable tool in mobilizing resources for the Strategic Plan. The divergence in the

level of support for a retroactive "user pays" policy around the Nagoya Protocol, however, bears further consideration. The parties who would be called on to pay in this situation can be expected to oppose such a move as an after-the-fact change of rules, and it is plausible that support for retroactive payment in developed countries would erode in the face of such opposition, whether the erosion is the product of an informed and civil debate, a slick industry campaign, or some combination thereof. The level of support in both developed and developing countries, however, does suggest the value of encouraging a constructive citizen discourse on this issue. Is U.S. support for user pays in this case a sign that informed citizens who have deliberated thoughtfully see ethical and practical value in transferring resources to developing countries under these circumstances, or is it merely the product of a group dynamic that was weighted to the left of the political spectrum? This question is pertinent for CBD specifically, and an important issue for pTA generally.

A final difference emerged in response to the question "Who do you think is seriously affected by biodiversity loss today?" Across all categories of countries, the top response on this item was that most people in the world are affected (the U.S. was highest at 93%, while 87% and 83% of developed and developing country respondents also selected this item). Participants were allowed to choose as many of the seven responses for this question as they wished. The second most frequent response was "My country in general" (is seriously affected). On this item developing countries were over two times more likely than developed to see their own country as affected (48% vs. 23% respectively; the U.S. was an anomaly at 37%).

This suggests that biodiversity loss, even though rated as a matter of great concern by most participants around the world, is a more distant one for citizens in the global north. This apparent notion that biodiversity is someone else's problem could turn out to be problematic for the ambitious goals in the Strategic Plan. If so, efforts to better understand and demonstrate similarities and connections between local and geographically distant biodiversity issues would be an important priority.

The National Question

The design of WWViews permitted hosts at the various sites around the world to develop a question focused on an important issue in their country. The U.S. team, with input from a panel of a dozen distinguished scientific and policy experts in biodiversity, designed a session that elicited individual and group responses, the latter in the form of a recommendation from each table. Participants were first asked to discuss what they could do "individually, among neighbors, or even at the state or local level, to preserve biodiversity" by identifying which of 13 statements reflected their views.

One battery of five statements provided opportunities to decline involvement, for reasons ranging from busy personal schedules to a preference for market solutions over public policies for addressing biodiversity concerns. The number of participants selecting these items was low, ranging from 0% to 13%. A second battery of five statements included changes in personal behavior (eating less meat, etc.), learning about the issue, and participating in local efforts for education, taking direct action such as restoring a damaged natural site, or advocating new policies. Participant support on these items ranged from 71% to 85%. The final three statements called for leading educational, direct action and policy efforts. A sizable minority (34% to 47%) expressed their willingness to take these types of actions. For these last two types of actions (participating and leading), participants were most willing to be involved in education, then direct action, with policy ranking last.

The qualitative question asked participants at each table to prepare a statement that either identified ways of encouraging a national biodiversity strategy and action plan, or that argued against adopting such a plan. Again, calls for education were the most common, appearing in more than 4 of every 5 table recommendations. Other categories of recommendations were enhanced public awareness (e.g., labeling of products), incentives, funding, governance, research, new technology, and changing habits (e.g., planting native landscapes, eating less meat). None of the tables rejected a national biodiversity strategy, although individual participants at several tables dissented from the support of their peers.

National Question Examples

Education
 'Education should be central in a national biodiversity strategy. Biodiversity should be included in national common core standards. Also, each stateshould develop diodiversity educational curricula, which includes field trip activities that connect students with local ecosystems and farmlands.'

Governance
 'Businesses, government and citizens should be accountable, therefore all need to work together.'

Expert and citizen participation
 'Do grass roots education and organizing and develop written, detailed resolutions with support of experts.'

Research
 'Create metrics to analyze impacts of actions/policies.'

Credibility of the Results

As noted in the previous section, the responses of U.S. participants were generally consistent with those in other developed countries. On several items, however, the U.S. participants either took more strongly environmental positions than their cohorts elsewhere, or were more aligned with views in developing than developed countries around issues of power and resources. Specifically, U.S. participants were more disposed to advocate new protected areas even where they conflict with existing economic interests, more concerned about the problem of biodiversity loss, and more supportive of transferring resources to (mostly developing) countries for biological specimens harvested in the past (Table 3).[81] Data collected from applicants wishing to participate in WWViews, as well as pre and exit surveys of participants, point to one possible contributor to these results, a participant pool that is over-represented in three demographic categories: people who are highly educated, who are members of environmental organizations, and who are left of center in their political orientation. These discrepancies raise questions about the WWViews results: do they reflect a "green" or "left-leaning" over-representation among the participants? If so, this would be consistent with previous participatory technology assessments in the U.S.[82]

Table 3 - "Outlier" responses by U.S. Participants			
Q 1.4 Loss of biodiversity is one of many issues people may be concerned with. How concerned are you about biodiversity loss?	U.S	Developed*	Developing
"Very Concerned"	85%	58%	78%
Q 2.1 If a conflict arises between existing economic interests and the establishment of new protected areas, what do you think should come first?			
"New protected areas"	38%	27%	31%
Q 4.2 Should users of existing species of animals, plants and micro-organisms share benefits with the countries of origin if the species were collected before the Nagoya Protocol enters into force?			
"Yes"	68%	57%	87%
	.		
* Excludes United States			

Political Orientation

Figure 1 illustrates a bias toward left-leaning participants at WWViews on Biodiversity in the U.S. Only 11.4% of participants claimed to be politically oriented to the right (categories 5-7), whereas 64.2% claimed to be politically oriented to the left (categories 1-3). Self-identified centrists were the second largest single category at 24.4% of participants.
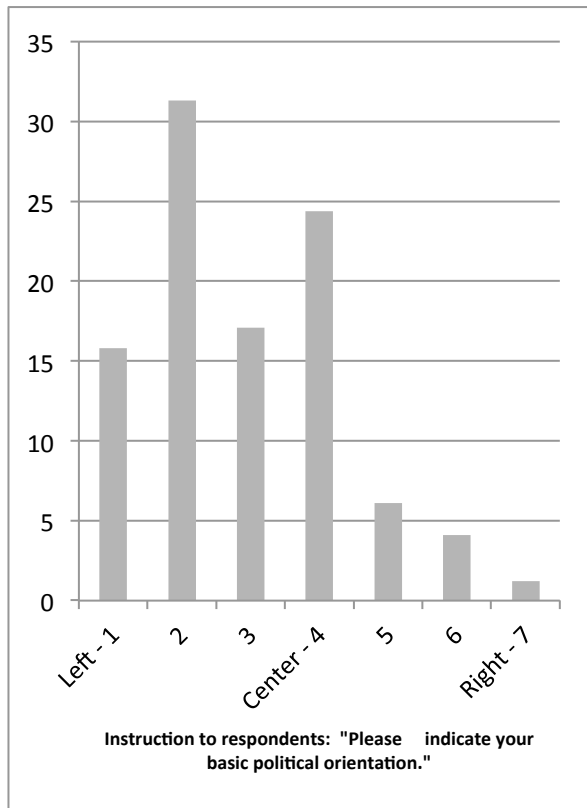
Figure 1 - Political orientation distribution of WWViews participants from all four sites combined: Boston, Denver, Phoenix, and Washington, DC. The distribution is based on a scale of 1 to 7, with one representing the political left and seven representing the political right. The bars represent the percentage of participants that fall into each of these categories (N = 246).

These numbers diverge significantly from the political orientation distribution in the general U.S. population. Using roughly similar political categories, a 2012 study conducted by Lydia Saad determined the general U.S. distribution breaks down as follows: 6% very liberal, 15% liberal, 35% moderate, 30% conservative, and 10% very conservative.[83] We found almost the reverse distribution at WWViews on Biodiversity. When we lump our three middle categories (3-5), which is roughly equivalent to Saad's moderate category to better align with her study, the percentage of centrists jumps to 47.6%, which is higher than the national percentage. This suggests that WWViews, along with over-representing left-leaning views, is also slightly over-representing the centrist perspective, leaving the political right's view in an extreme deficit.

The significance of this imbalance is demonstrated by survey items showing that participants with different political orientations see efforts to address biodiversity loss in different lights. For instance, when asked if "Addressing biodiversity issues is just as important as addressing economic issues" on a scale from 1 to 7 (1 = absolutely agree, 7 = absolutely disagree), right-leaning participants (lumped categories 5-7) averaged a score of 3.0, while left-leaning participants (lumped categories 1-3) and centrists averaged 1.70 and 1.75 respectively. Likewise, when asked if "The loss of biodiversity already has a negative effect on my everyday life", right-leaning participants scored a 3.45, left-leaning participants a 2.67, and centrists a 2.48, suggesting that people on the right are less likely to perceive biodiversity loss as an immediate threat.

Education Level

In the education demographic category (Table 1), WWViews participants with bachelor's (30.3%) and graduate (29.2%) degrees were over-represented relative to the general U.S. population (17.7% and 10.4% respectively), leaving people with less education under represented (Table 1). [84] The only education category that WWViews came close to effectively representing relative to the general U.S. population was people with some college experience (24.5% - WWViews vs. 28.9% U.S. Census). Patterns are fairly consistent across sites for the No High School Diploma, High School Diploma only, and Bachelor's degree categories, whereas Denver (37.8%) and Phoenix (25.0%) hosted relatively high percentages of participants with some college experience and Boston (35.6%) and Washington, DC (40.5%) had relatively high percentages of participants with graduate degrees. This is probably partly due to the relatively more educated regional populations in Boston (16.7% graduate degrees) and Washington (26. 9% graduate degrees) compared to Phoenix (9.2% graduate degrees) and Denver (13.0% graduate degrees). [85]

Table 4 – Education level of U.S. participants

Education Level	Boston (73)	Denver (45)	Phoenix (75)	Washington DC (84)	All Sites (277)	U.S. Census 2010
No HS Diploma	4.1% (3)	2.2% (1)	7.9% (6)	2.4% (2)	4.3% (12)	14.4%
High School	24.7% (18)	6.7% (3)	6.6% (5)	15.5% (13)	10.3% (21)*	28.5%
Some College		37.8% (17)	25.0% (19)	16.7% (14)	24.5% (50)*	28.9%
Bachelor	35.6% (26)	35.6% (16)	28.9% (21)	25% (21)	30.3% (84)	17.7%
Graduate	35.6% (26)	15.6% (7)	18.4% (14)	40.5% (34)	29.2% (81)	10.4%

*These calculations exclude the Boston data because a breakdown between High School and Some College was unavailable.

This finding raises several questions about the credibility of the WWViews deliberation. First, there may be a tendency for less educated participants to defer to the expertise or confidence of more educated participants, which is an issue that has received much attention in the literature on deliberative democracy.[86] This phenomenon may have been present at one of several WWViews tables where researchers observed the entire day of deliberations to gather observations on the interpersonal and political dynamics in the discussion. A typical description for this particular table was expressed in the notes of the table observer as follows:

- "Relative, efficiency, capital, notion, generate, regulation, displace"- all from one minute of Robert [names are changed to protect anonymity of participants]. Vocab is higher level than anything I have heard from other participants. It seems to be disengaging at least Jane and possibly Maria as well.

- Jane and Maria seemed pretty zoned out right now. No longer listening actively. Jane is gazing off.

The quantitative surveys were not designed to detect this dynamic, but items that address the participants' ability to voice opinions, their ability to contribute to the dialogue, and the effectiveness of moderators provide some clues.   Table 4 lists three statements (of 10 total) presented to participants on the exit survey that showed differences among education level that might indicate dissatisfaction with the deliberation process (responses to statements 1-7 all reveal a high level of satisfaction among participants in regards to their interaction with their peers and moderators). Statement 8 speaks to the overall satisfaction of the WWViews event. Here, those with no highschool diplomas and high school diplomas only tended to be more dissatisfied than the other educational groups. But how much can be made of this is unclear, because an average score of 2.29 (with a score of 1 equaling total agreement with the statement) indicates a relatively high degree of satisfaction.

Table 5 – Participant satisfaction with deliberative experience by education level

Survey Statements	High School or less	Some College	Bach. Degree	Grad. Degree	All Partic.
"I am fully satisfied with the event process."	2.29	1.85	1.55	1.74	1.74
"The results in my country meet with my personal perspective on the issues of biodiversity."	2.14	2.65	2.82	2.16	2.72
"Essential ideas contributed to the dialogues were not included in the final results of my country."	3.43	3.70	4.14	4.74	4.13
Note - All scores are averages on a scale from 1 to 7 where 1 is "total agreement" with the statement and 7 is total disagreement. Data are from exit surveys at the Phoenix and Washington, DC sites.					

Statement 9 measures each participant's assessment of whether or not their own personal views were reflected in the results reported to COP11. In this case, those with some college experience (Score = 2.65) and bachelor's degrees (Score = 2.82) felt that their views were slightly less represented than those with graduate degrees (Score = 2.16) and those with high school diplomas only or no high school diplomas (Score = 2.14). This difference, though, can also be explained by the more conservative nature of participants with some college experience (Score = 3.35) and bachelor's degrees (Score = 2.86) than those with graduate degrees (Score = 2.51) and high school degrees or less (Score = 2.57).

Statement 10, which measures participants' beliefs on whether "essential ideas" relevant to the decline in biodiversity were excluded from the overall results reported to COP 11, reveals the largest differences among education levels. Here we find a clear trend from less educated to more educated, with the less educated groups agreeing more than groups with Bachelor's and graduate degrees that "essential ideas" were missing from the final results. It should be noted, however, that WWViews participants as a whole felt a great deal of ambivalence about the comprehensive inclusiveness of diverse ideas in the results (Score = 4.13). In sum, though, the survey data seems to indicate a great deal of satisfaction with the deliberative process regardless of education level. However, because of the participants' ambivalent responses to Statement 10 and the fact that the

survey itself is not designed to reveal subtle internal power/knowledge dynamics of the deliberative process, we should view the final WWViews results with caution.

Despite the above findings, the educational significance of WWViews should not be underestimated. Events such as WWViews on Biodiversity have the potential to educate groups not usually afforded the opportunity to learn about issues such as biodiversity decline and its associated policy implications. In general, participants believed they increased their capacity to "judge about biodiversity issues" and increased their knowledge about biodiversity (Figure 2). Prior to the event the average score on knowledge about biodiversity was 3.04 (1 = highly knowledgeable and 7 = no knowledge) and after the event it was 1.85. A similar increase in participant's perception about their ability to clearly judge biodiversity issues occurred (3.48 to 2.29). Perhaps more significant was the result that these differences were more pronounced among the less educated; especially among those with bachelor's degrees (Figure 2).[87]
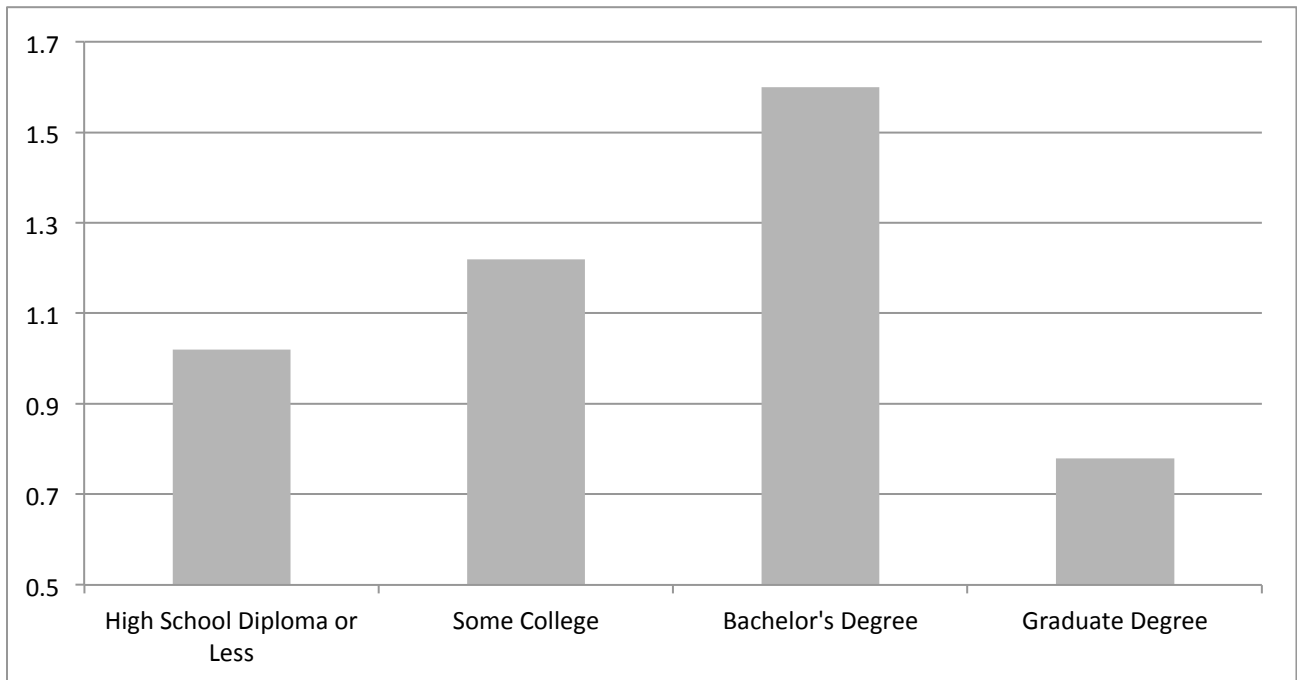
Figure 2 - An assessment of the degree of change in knowledge about biodiversity among different education levels from before WWViews and after WWViews. Participants indicated on a scale of 1 (totally agree) to 7 (totally disagreed) their impression of the following statement before and after WWViews: "I have sufficient information to judge about biodiversity issues." The numbers above indicate the degree of knowledge gain as derived from subtracting the average pre-survey score from the average exit survey score.

Participation in Environmental Organizations

On the applications at each of the sites, we asked potential participants whether they were active or passive members of environmental organizations. We defined an environmental organization as "a non-governmental organization that works actively and politically to promote sustainable development and to promote environmental protection." For all sites combined, 28.8% of the participants were either active or passive members of environmental organizations. It is difficult to find reliable data that assesses the percentage of U.S. citizens involved in environmental

organizations. Nonetheless, a 2010 Gallup Poll found that 17% of U.S. citizens claimed active involvement with environmental organizations during the previous year; however, it doesn't provide data on passive membership.[88] The 2005 World Values Survey reported that 6.1 % of U.S. citizens were active members and 9.9% were inactive members of environmental organizations (total of 16%).[89] While a complete explanation of the figures on active engagement in these two polls is beyond the scope of this document, two observations seem relevant here. First, the Gallup poll asks respondents if they have been active in a group that works to protect the environment in the past year, while the World Values Survey asks respondents whether they are an active member, inactive member, or not a member of an environmental organization. It seems reasonable to assume that the more restrictive criteria in the latter question would yield a smaller number of "active" individuals than the first question. Second, accurately assessing environmental participation is a moving target. Although not conclusive, the benchmarks used here are useful for making a rough comparison, and better than no information at all.

If we follow the Gallup poll as a guide, environmental representation at WWViews is somewhat closely aligned with national trends (especially if we assume that at least 10% inactive membership in the World Values Survey can be legitimately added to the 17% active engagement in the Gallup Poll). At the Washington DC site, 17.9% of the participants, almost matching the Gallup poll, reported active membership in environmental organizations, while another 17.9% claimed passive membership. Phoenix was well under the Gallup poll mark at 6.6% active membership, with 17.1% of their participants claiming passive membership. However, all sites exceeded the World Values Survey total of 16% for both active and passive membership (Boston = 26%, Phoenix = 23.7%, and Washington, DC = 35.8%; only active data is available for Denver, where 6.7% of participants fell into this category).

Another pre-survey measure asked participants if they were "actively involved in an association or organization focusing on environmental protection." Figure 3 shows the distribution of responses to this statement, which indicates that 44% (categories 1-3) of participants are involved in environmental organizations in some capacity. This question is very close to the Gallup poll question, although the latter asks about activism in the previous year and therefore is more limiting. The large gap, however, is a very strong indicator of over-representation that is qualitatively consistent with the other indicators. Based on this data, environmentalists are over-represented in the WWViews process regardless of whether we accept the Gallup Poll or the World Values Survey as a baseline.

20.00%

18.00%

16.00%

14.00%

12.00%

10.00%

8.00%

6.00%

4.00%

2.00%

0.00%

Totally Agree | Agree | Moderately Agree | Neither Agree or Disagree | Moderately Disagree | Disagree | Totally Disagree
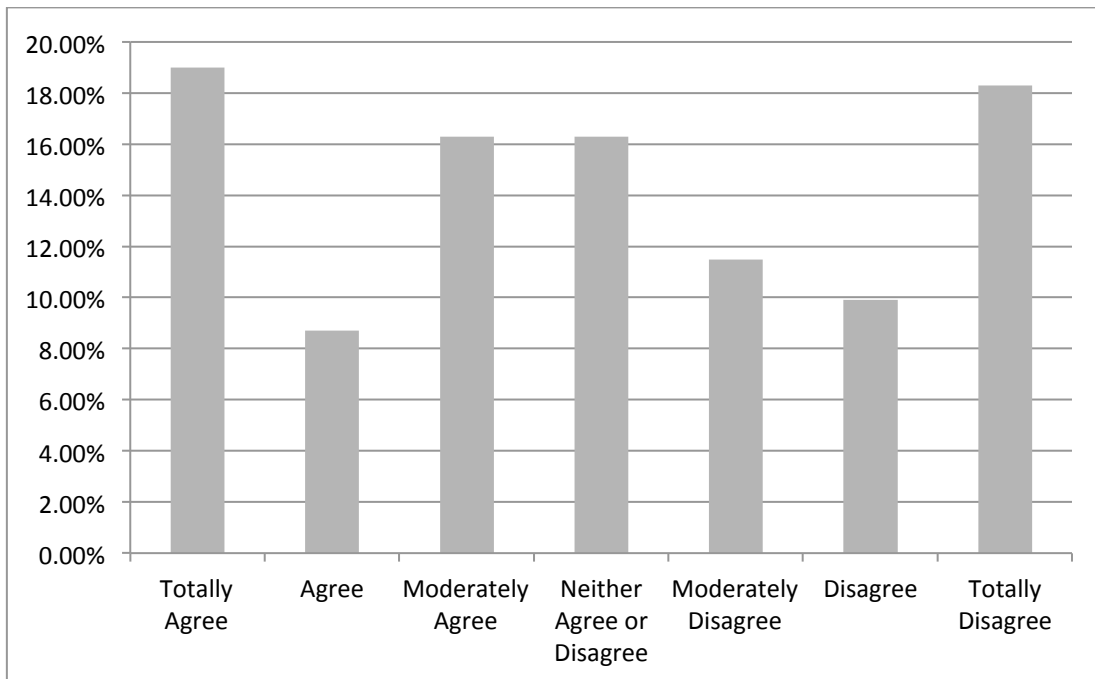
Figure 3 – Distribution of responses by participants to the following statement: "I'm actively involved in an association or organization focusing on environmental protection."

As with over-representation of highly educated and left-leaning participants, over-representation of environmentalists is problematic for an efficacious deliberation. In addition to the likelihood that votes will be more environmentally friendly than would be the case for a more balanced group, an overrepresentation can distort the actual conversation at the tables that is the hallmark of deliberation. It is not surprising that events such as WWViews on Biodiversity attract people with environmental concerns. In general, advocates for a particular cause, and the more active members of the citizenry, are more likely to show up than non-advocates. Also, as we pointed out earlier for education level and political orientation, some demographic groups are less likely to apply or show up for pTAs. As a case in point, in Phoenix and Washington DC, 23% of the applicants invited were either active or passive members of environmental organizations. However, a greater proportion of these applicants showed up than other demographic groups, as they accounted for 29% of participants at these two sites. These finding have implications for pTA recruitment strategies, which will be addressed later in this report.

Reassessing Credibility

Given the self-selection bias and the problem of less educated participants deferring to the expertise or confidence of more educated participants that is evident in WWViews on Biodiversity, why should citizens and policymakers heed their results? The judgment to dismiss the deliberative results of a biased sample of participants rests on a clear and simple rationale: the participants are a statistically skewed segment of the jurisdiction from which they were selected, which undermines the claim that diverse and balanced views are reflected in the results. Despite this finding there is value in the results of such a deliberation, which we elaborate on below. And it is important to remember that the reported deficiencies are potentially rectifiable, as will be discussed later in the report.

Table 6 - Polls vs. Deliberation (WWViews)					
Dimension	*Study Characteristics*	*Polls*	*Focus Groups*	*WWViews*	*Comment*
Representation	Random sample	yes	no	no	WWViews sample size is smaller
	Participant self-selection	low	medium	high	Active self-selection by WWViews participant (application required); passive self-selection by poll respondent (answer telephone and agree to complete poll)
	Statistical validity	yes	no	no	WWViews aims to represent diverse views on the issue
Quality	Participant Information	none	limited	extensive	WWViews participants receive written and video briefing materials based on scientific consensus, with some attention to dissident views
	Deliberation	none	limited	extensive	Diversity of participants adds credibility to results
	Social learning	none	none	extensive	Mutual engagement in argumentation supports shared learning
Impact	Leading indicator[90]	no	no	yes	WWViews can provide insight into the evolution of public sentiment if more citizens become informed over time
	Intended purpose	utilitarian	utilitarian	educational	Polls are used for such strategic purposes as marketing products to consumers, candidates to voters, and election night coverage to viewers. While deliberative results may be used for strategic purposes, their primary intended purpose is to educate policy-makers and citizens generally in order to strengthen democracy.
	Transmission to policy making	Institutionalized	Not institutionalized	weakly institutionalized	Polls frame political issues in terms consistent with the status quo; strength of deliberation ties to policy making varies widely.

An important starting point is to differentiate public opinion polls from deliberations. Deliberations operate in an environment dominated by public opinion polls, which are the product of an "integrated industry reaching so deeply within our politics that its influence can no longer be untangled from the functioning of our broader political system."[91] As a consequence, expectations for understanding what the citizenry thinks are shaped by the specific model of polling, and are often applied to deliberations despite important differences between them (see table).

One difference is that a public opinion poll characterizes the sentiment of a complete population at a specific point in time, and does so by interviewing a random sample selected from that population in order to establish the statistical validity of the results. What the respondents know about the subject of the poll and how they have developed their views are normally not considered in generating or reporting the results. The objective of a deliberative exercise, on the other hand, is to learn what ordinary citizens think about an issue in circumstances where they have

become informed about it. This learning process for the participants includes sustained conversation with a range of their citizen peers who have engaged the same informational materials (briefing packets, videos, etc). This is valuable because an informed citizenry is normally deemed essential to democracy, and by most accounts the U.S. citizenry is poorly informed.[92] Representation is also important in deliberative exercises, but the purpose is to incorporate a diversity of views into the conversation (thus helping inform it) rather than to establish statistical validity.[93]

Another difference is that most users of polls have utilitarian purposes, such as understanding what undecided voters think so that effective appeals for their votes can be designed. The primary intended users of deliberative results, on the other hand, are policymakers, and the main purpose of learning about citizens' views is an educational[94] one, i.e., gaining an enriched understanding of citizens' thinking about important issues rather than a snapshot of the entire population's opinion at a particular point in time.

The starting point for interpreting deliberative results, then, is to recognize that in most respects they do not aim to provide the same type of insight as a public opinion poll, nor are they generally conducted for utilitarian purposes of advancing the strategies of specific parties in a public issue.[95] Because most deliberations do not aim for a statistically valid random sample, there are inevitably discrepancies between the population at large and the participants in a deliberation regarding relevant sociopolitical categories such as gender, income, and political orientation. What considerations might come into play in judging the implications of these discrepancies for the results of the deliberation?

One is that the process brings different views into direct engagement even in situations where there are obvious gaps in who participates, such as the minimal presence of people to the right of the political center. If a quarter of the participants are members of environmental organizations, for example, then three-quarters are not. This and other types of diversity among the participants are likely to bring different understandings to the table, and there is good evidence that in WWViews on Biodiversity they did: when asked "Were different and opposing views presented and discussed at your table?" 93% of the U.S. participants responded affirmatively.

Second, the types of political categories such as "liberal" and "conservative" that are common in public discourse are themselves imperfect, and can be seen as instruments of politics as well as devices for measuring it. For example, a World Values Survey from 2005 using the same "Left" "Right" labels as our exit survey question, but providing a 10 point scale instead of the 5 point scale in the Gallup poll cited earlier based on "Liberal" "Moderate" and "Conservative" categories, is less lopsided. In this poll, American political orientation leans slightly to the left. A larger concentration in the middle than in the Gallup poll suggests that Americans will gravitate there when labels are de-emphasized.[96] The label "liberal" however, has been actively promoted as negative by conservatives and rarely defended by its adherents, which may account in part for the lower percentages on the left when these particular labels are emphasized.

The utility of the conventional labels is thus uncertain, but even if they provide a useful conceptualization of political orientation in general, they do not apply effectively to all issues. A recent Pew Research Center study confirms the results in the polls cited here in showing that there is

a significant conservative bloc in the U.S., but within the rest of the political spectrum people's positions on social and environmental issues vary in unexpected ways.[97] Issues involving technology and conceptions of progress are a case in point. The controversy over embryonic stem cell engineering, for example, pits high tech advocates against a disparate opposition comprised of religious conservatives and technological critics. Neither side in this matter would fit comfortably into conventional liberal - conservative political categories, and strategies for addressing the consequences of declining biodiversity frequently coalesce around similar configurations of organic and technologically modest approaches vs. dramatic interventions (e.g., genetically modified organisms) to improve on the natural systems that have been eroded.

A third consideration in assessing the value of deliberations with a politically-skewed participant pool can be illustrated most dramatically by noting the experience of countries in the global south. Many such countries where WWViews has been held are rarely if ever polled about issues such as biodiversity and climate change, so one virtue of deliberations is generating systematic insight into the views of ordinary people where practically nothing has existed before. If there is a discrepancy between the population as a whole and those in the deliberation, this seems relatively unimportant (although not irrelevant) compared to the fact that a good faith effort with some diversity of participation, informed deliberation, and meaningful connection to a global project is the means for developing these views. Perhaps more important in such contexts, however, is that WWViews builds democratic and participatory habits in places where these have been marginal for most of their modern history.

This recalls an observation about the value of deliberative institutions by Horst and Irwin, who were focused on Europe rather than the global south: "We would suggest that the most important function of these [deliberative] institutions is not the specific production of consensus-statements, nor other inputs to the policy-process, but their embodiment and performance of an important nation-forming political ideal."[98] While democratic and participatory habits in the modern polity are by no means as foreign in Europe and North America as they are some countries of the global south, the contrast between the two helps clarify that creating or sustaining and adapting these habits has similar value in both settings. In this light, an imbalanced deliberation can make an important contribution to decision making by building or sustaining democratic practices, even if the deliberation is not sufficiently credible in its particulars to impact public policy.

The final point follows from the one just made: world wide, there is practically nothing in contemporary policy discourse that gets close to the informed discussions among ordinary citizens on urgent issues that pTA and deliberative democracy make possible. Deliberations are far from perfect, but they are uniquely democratic in comparison to the predominant means of making policy. As a practical matter, deliberations have developed tools for constructively addressing current flaws in the policy process, they have generated some practical outcomes, and they have instilled a grounded optimism among participants and others involved in these events that is itself a refreshing contrast to the well-earned cynicism among the populations of contemporary polities.

With these as general considerations, can more specific translations be made of the WWViews results in the U.S. case? Weighting techniques are used by professional pollsters when their scientific samples are skewed,[99] which could in principle be deployed for purposes of making

the quantitative results of WWViews meaningful for a rough impression of the likely results had the participant pool been more balanced. Unfortunately, the data required to do this (tracking individual votes according to political orientation or other criteria) was not part of the project design, so weighting is a future prospect rather than a current option. The exit surveys give clues, however, that responses to the WWViews questions might not be as different with a balanced participant pool as the raw numbers suggest. Participants to the right of center were actually more likely to think that dialogue processes like WWViews should be continued in the future (a mean response of 1.35 on a 7 point scale where 1 is strongly agree, compared to 1.29 for the remainder of the sample); they were almost identical in concurring that the deliberation had significantly influenced their opinions (2.71 right and 2.73 rest of participants); and they were more inclined to report that the deliberation had enhanced their understanding of alternative perspectives (2.29 vs. 2.39). This adds validation to the WWViews method, and suggests that people heard and to some extent heeded one another, which would diminish the differences among them.

Although there are inherent issues of proper representation in the U.S. WWViews events, this is an issue that could be addressed with targeted recruitment, more rigorous standards for facilitators, and more opportunities for participants to provide personal recommendations beyond the voting format. Given the potential for empowering people and at the very least building capacity in our citizenry, the focus should be on providing more opportunities rather than using addressable deficiencies as an excuse to dismiss deliberative processes such as WWViews on Biodiversity.

Chapter 5

The Circulation of Ideas

"Over the course of the day, two of the Colorado participants—two middle school teachers—kept exchanging glances from across the room. Sometimes they'd point at each other and nod. At the end of the deliberation, they came up to me and said, 'Thank you. You have no idea. You just gave us our curriculum for the whole year. And can you put me in touch with the Science Cheerleader? She'd be perfect to come to our school to get girls interested in science. This was just great.'"

Sandy Woodson
Colorado School of Mines
Project Manager of WWViews in Denver
October 2012[100]

The main purpose of deliberations is to influence policy, but their performance in this regard is uneven, and many scholars are skeptical. In a review of empirical work on deliberative activities, Carpini, Cook and Jacobs call attention to the "suspicion that public deliberation is so infrequent, unrepresentative, subject to conscious manipulation and unconscious bias, and disconnected from actual decision making as to make it at best an impractical mechanism for determining the public will, and at worst misleading or dangerous."[101]

The broad concern in this chapter is the design for circulating the results of WWViews. DBT conceives this as comprised of two components, dissemination to policymakers, and media strategy that widely distributes the results for purposes of engaging the public and, ideally, demonstrating to policymakers that they are interested. In this chapter, media strategy is incorporated into a category we call "amplification" that includes not only short term media coverage, but sustained engagement of citizens through conventional media as well as (e.g.) social media, school curricula, and community forums.

"From the Worlds's Citizens to the Biodiversity Policymakers"

The focus of DBT's design for disseminating results to policymakers is captured by the subtitle "From the World's Citizens…" that was used in both of the results reports prepared for the COP meetings following the two World Wide Views projects, which suggests a more-or-less direct path from citizens to policymakers. National partners are directed to focus primarily on the COP 11 delegation from their country,[102] while DBT is primarily responsible for organizing dissemination at the actual convention.

Several factors shaped the dissemination to the national delegation in the U.S. and the wider relevance of the results. First, the very brief period between the deliberation (September 15) and the beginning of COP 11 (October 8) left little time to compile results that might have been shared with

the delegation. Even had such a report been available, in the week or two prior to the COP 11 meetings there would be very little time for delegates to integrate the results with their plans for the meeting, or even to schedule a briefing to receive them.[103] On the other hand, the urgency of dissemination to the delegation was arguably less for CBD than for the climate summit in 2009, because the latter was focused on striking a new climate deal, whereas the former was primarily concerned with implementing existing plans. Finally, the national question debated at the deliberation is particularly relevant at multiple levels and over a more extended time line, because it addressed the CBD goal requiring each Party to create an effective national biodiversity strategy and action plan with measurable targets. In the U.S., in fact, a White House advisory group recently completed a report that has many elements of what might be considered a national biodiversity strategy.[104] This provides a policy framework in which World Wide Views results could be shared with officials and stakeholders concerned with biodiversity policy at all levels of government around biodiversity strategy generally, rather than only with the COP 11 policy network. In the end, the main communication with the U.S. delegation for COP 11 was a press release that discussed the most significant results for a U.S. audience.[105] The engagement with delegates and others in the U.S. CBD policy network that had commenced more than a year previously, however, proved to be helpful at COP 11, for example in providing information and assistance in navigating the people and organizations that the WWViews team wished to engage in the dissemination process.

Despite the limited time between WWViews and COP 11, the sharing of results with policymakers at COP 11 lead by DBT was successful in important respects and a considerable improvement over the experience at the 2009 climate summit. DBT printed 3000 copies of the results report, nearly all of which were taken by attendees over the two week duration of the meeting. The inclusion of the CBD Secretariat in the project's Steering Group (along with the Danish Ministry of the Environment and DBT) established a formal link to decision making that Carpini and colleagues noted is frequently missing in deliberative exercises, and was given substantive meaning by the Secretariat's participation in a "side event"[106] as well as a "special event" organized by the Secretariat in which their Executive Director and the Japanese Minister of the Environment, among others, participated. These parties and others (e.g., the United Nations Development Program) endorsed additional deliberations for future COP meetings and pledged cooperation in integrating the results into the CBD decision-making process. Finally, participatory input such as WWViews was officially supported in the final decisions of the meeting, which called on "…Parties, relevant organizations and stakeholders to support and contribute to communication initiatives, such as the World Wide Views on Biodiversity, which combine the implementation of Strategic Goals A and E regarding mainstreaming of biodiversity, participatory planning, knowledge management and capacity-building."[107] Dissemination activities to date have thus succeeded in expanding the support of WWViews from the Secretariat to the Convention's Parties.

Sustaining Engagement

Capturing the perspectives of the broader national public around the kinds of complex social, scientific and technological issues that the World Wide Views on Biodiversity project represents is a critical mission for ECAST. Paradoxically, deliberative mechanisms like WWViews

involve a relatively small number of people by design. Both practitioners and scholars of participatory processes have been critical of this point.[108]

In response to these concerns and a recognition that even successful dissemination such as the experience at COP 11 is narrowly focused, WWViews amplification efforts cast a wider net and involve different networks, stakeholders and citizens. As the activities described below unfold, the goal is to sustain public interest and contact with the topic and with the decision points where biodiversity conservation intersects with local, regional, national and global biodiversity resource management. Amplification encompasses efforts to communicate the results of the WWViews citizen deliberation to decision makers and to engage a broader public in activities that expand popular understanding and debate about biodiversity governance. Following the lead of science policy analysts who make the case for "usable science" tightly coupled to social needs, we argue that amplification after public consultations like WWViews may be an essential step in effectively positioning citizen recommendations as inputs to decision making in a variety of contexts.

Recent evaluations of science-based decisions stress the importance of a research enterprise that establishes salience, credibility and legitimacy. In this context, **"usable science"** is research properly situated within an institutional and decision making context that involves users, ensures joint scientist and practitioner accountability, and develops "end to end" networks that link the research process with decision making.[109] In considering amplification of the core WWViews consultations through formal and informal networks, we wish to establish a connection between deliberative events and S&T governance, seeking policy impact but also cultivating social capital and deliberative democratic norms. Sustained engagement can be demonstrated not only by showing that citizen recommendations influence a particular legislative or regulatory process, but also by increasing the frequency of both formal and informal public dialog on the issue at different levels and in different contexts.

Lifecycle of a Decision-maker
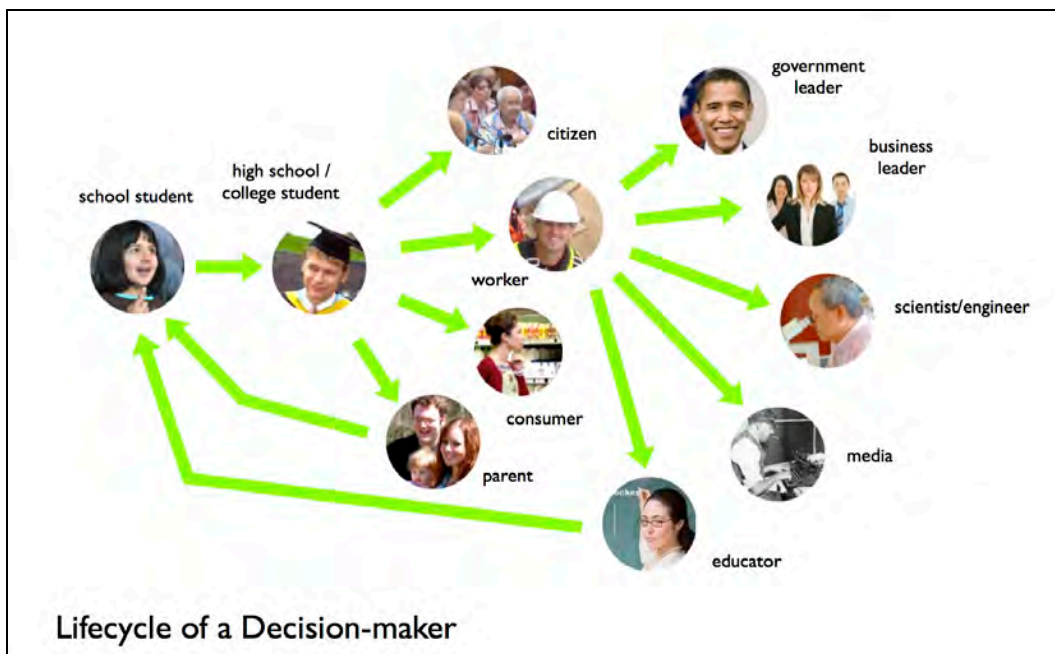
Drawing on the institutional expertise of a key ECAST partner, WWViews amplification involves collaboration with informal science education (ISE) institutions such as science museums, science centers, zoos and aquaria. ISE involvement with outreach activities can be seen as part of a broader shift in this community of practice's mission from one primarily focused on science education, or public understanding of science (PUS), to one of public engagement with science (PES), a mission frame that refers to mutual learning by experts and the public. Designing programs for PES involves a re-conceptualization of public audiences as not only learners, but as decision makers in society. PES motivates the design of programs for "people in many different roles [who] make choices that help shape socio-technological futures… [and] also influence the choices of others."[110] Bell of the Museum of Science, Boston represents these roles as a lifecycle and argues that there are multiple ways that informal science institutions intersect with the public at different points in as people transition through life's roles.

Amplification and the ISE context

The move from PUS to PES has a relatively recent history in the United States. In early 2011 under an NSF Pathways award (DRL 1010831, Dimensions of Public Engagement with Science, L. Bell), the Museum of Science, Boston, surveyed over 150 organizations and 201 projects to document the extent to which activities with PES characteristics are being conducted in the informal science education community. The data from this prior work demonstrate that program design, composition, content, and evaluation for PES activities are fundamentally different from those based on the predominant "public understanding" model. PES programs require different organizational supports and evaluation tools. In October 2010, the Association of Science-Technology Centers announced its intention to support a community of practice around public engagement with science to an audience of 130 people, signaling the growing interest in and institutional commitment to this approach.

The formal deliberations central to the World Wide Views model pose several provocative challenges for ISE professionals who wish to enter into or shape the development of PES activities in the United States. Formal models like WWViews demand different resources to fund and staff citizen recruitment efforts with regional demographics as targets. ISE staff requires training in event facilitation that builds skills more akin to those used by mediators rather than science communicators. The model also suggests a different role for scientists and engineers in the process, and for visitors the WWViews emphasizes minimal interaction with the science and engineering community and greater engagement by the recruited public. Lastly, the model has an explicit design and intent to reach policy audiences.

Amplification Activities

This section reports on early activities to acquaint the public with a range of issues at stake in the discussion of strategically preserving biodiversity in the United States. These issues not only involve biodiversity science, but also the social, legal and ethical dimensions of particular approaches that achieve preservation. ECAST's amplification efforts encompass efforts to build capacity for information exchange and professional development to foster sustained engagement with WWViews

results including the citizen recommendations along the US national question involving the creation of a national biodiversity strategy.

The activities outlined here may establish a basis for evaluating the degree to which network amplification following an otherwise isolated deliberative mechanism can build capacity for sustained engagement and whether this results in civic behaviors attributed to a deliberative democratic society in the US context. Activities discussed are grouped into four sections that describe efforts led by the Museum of Science Boston to **syndicate PES activities for the ISE community**; an initiative at the Marian Koshland Museum at the National Academies that **uses ICT to expand the national conversation about biodiversity conservation; a multi-site engagement with youth in zoos** led by the Consortium for Science Policy and Outcomes at Arizona State University; and an account of the ECAST network's efforts to **plug in to a major Informal Science Education (ISE) professional network** through a recent session presentation at the 2012 Association for Science Technology Centers (ASTC) annual meeting.

ECAST is doing a number of things to broaden the conversation that involve experiences and events created by host site collaborators at the Museum of Science and the Marian Koshland Museum at the National Academy of Sciences that could be adapted for use by informal science education institutions around the country.

Syndicating PES activities for the ISE community (Museum of Science Boston)

As members of the informal science education community, museum educators deemed it essential to create activities and products that would extend the deliberative and inclusive nature of World Wide Views for others who were not selected for the conversations. As described previously, support from the National Science Foundation allowed the MOS to hold two workshops that brought together over 40 informal science educators. During these workshops, colleagues from across the country brainstormed, recommended and gave feedback on three models of complementary public engagement activities intended to broaden the conversation beyond the formal World Wide Views deliberations: in-museum biodiversity activities, downloadable biodiversity quests, and policy forums adapted from the formal World Wide Views materials. Although these activities were first developed by and for use at the Museum of Science, they were designed to be easily shared and modified in an open-source manner, so that other institutions could employ them in ways that seem most useful in their particular settings.

The first category of products that were designed for use at science centers were in-museum experiences. Since so many science centers are repositories for natural history objects, they are themselves catalogues of biodiversity. Many of the people from informal science education institutions remarked that materials that would connect the overarching themes of biodiversity to objects in a given science center's collection would prove useful in their everyday work. In response to this call, Katie Behrmann from the Museum of Science created personal, always-changing in-Museum biodiversity tour experience (similar to the themed educator tours that the Museum offers to visiting school groups) intended to let visitors explore the Museum's exhibit halls and consider the interrelated nature of species as they walk through the galleries. Entitled "Choose Your Own Biodiversity Adventure", the experience begins with humans and then goes through a personalized

path of organisms in the museum's galleries with prompting questions and associations that engages the visitor to consider how biodiversity is important to human beings through resources such as food, shelter, and medicine and the interrelated nature of all species.

LOBSTER

Lobsters are important economic and ecological resources for humans.

How large can a lobster grow?

- To find out a type of species the lobster eats, visit the WHELK (P.2) in Natural Mysteries, Lower Level Green Wing. The whelk will be on the 2nd shelf of a glass case next to snails, barnacles and sea stars.
- To find out a type of species that shares a habitat with lobsters and occasionally gets caught in lobster nets, find the NORTHERN GANNET (P.2) in A Bird's World, Lower Level Green Wing. The Northern Gannet is a large gull in the Oceans and Bays section.

DANDELIONS

Dandelions have been used in western, Native American, and Chinese medicine. In Europe, dandelions were used in remedies for fever, boils, eye problems, diabetes, and diarrhea. In traditional Chinese medicine, dandelion was used to treat stomach problems and appendicitis. Native Americans used dandelions to treat kidney disease, swelling, skin problems, heartburn, and upset stomachs. Today we know that dandelion is a rich source of vitamins A, B, C, and D, as well as iron, potassium, and zinc.

What part of the dandelion is in the jar?

- To see which species pollinate dandelions, visit the BEES (P.1) on the Third Level. They are toward the end of the hallway.
- To learn more about a type of plant that grows better when planted near dandelions, visit the WILD BLACK CHERRY (P.1) plant in the Deer Diorama, First Level Green Wing. The cherry tree is growing near the large deer's back feet and are still green.

RED MAPLE

Red maple wood is used for furniture, veneer, pallets, cabinetry, plywood, barrels, crates, flooring, and railroad ties.

What other types of trees grow in this habitat?

- To find a species that feeds on red maple leaves and shoots, visit the ELK (P.2) on the wall in the Green Wing Stairwell between the Lower Level and First Level.
- To find a species that nests in the cavities of the red maple, find the EASTERN SCREECH OWL (P.2) in A Bird's World, Lower Level Green Wing. This small owl is located in Cities and Suburbs.

BEES

Bees are extremely important living things. Attracted to nectar and pollen produced by a huge variety of plants, bees are best known for their pollination. Bees provide human beings with many ecosystem services including wax, honey, and crop pollination. It is estimated that one third of our food supplies depend on bees for pollination. Aside from human beings, though, bees keep many other ecosystems in balance.

Can you spot the queen bee? How can you tell a queen bee from a worker or drone?

- One example of a tasty plant pollinated by bees is the BLUEBERRY. (P.3) Find the blueberry bushes in the Red Fox Diorama near the Science Live Stage, Green Wing, Lower Level. The bushes are painted in the background, covering the forest floor.
- To find an animal that eats bees, check out the BULLFROG (P.3) in Natural Mysteries, Green Wing, Lower Level. The bullfrog is on the top shelf of a glass case next to turtle shells.

WILD BLACK CHERRY

Found throughout the Eastern United States, this native tree not only provides delicious fruits both commercially and in the wild, but the wood from larger cherry trees is also used for furniture.

The first three organisms shown above are the starting points for the experience, lobsters (an example of food), dandelions, (an example of medicine), and maple (an example of shelter). The visitor will then go to one of the organisms described that are associated with the choice the visitor makes, being given the description of the association and where to find the next species in the museum, and continue this chain of associations until reaching another connection with humans later on. There are 55 organisms in the tour.

The booklet's instructions include the following text:

"At the Museum of Science, Boston, there are plenty of examples of biodiversity in many of the exhibits. Biodiversity means the number and different kinds (or species) of plants, animals, fungi, and microorganisms living in an environment such as a lake,a forest, a coral reef, or a desert. No species on Earth can rely on itself alone. Different creatures depend on each other for survival in all kinds of ways. Whether it is shelter, food, or transportation, species provide one another with plenty of resources. Sometimes we as human beings feel disconnected to other species, when in reality, every species is connected in some way. Human beings are no exception. Try to think about these connections as you journey on your very own biodiversity adventure through the museum's collections."

Since biodiversity naturally occurs outside, and many museum visitors are increasingly disconnected from the natural world, informal science educators also wanted the Museum of

Science to develop activities that would allow people to explore biodiversity in their own neighborhoods. To respond to this call then, the Museum created offsite guides for people to look for biodiversity out in communities and ecosystems beyond the science centers, using the platforms of colleagues at the Encyclopedia of Life and iNaturalist. This connects to the work many informal science institutions are doing around citizen science and a commitment by the MOS to combine elements of citizen science with dialogue around scientific and technological issues.

Led by MOS educator Don Salvatore, the MOS team developed five different experiences entitled biodiversity in a park, Biodiversity in a freshwater marsh, biodiversity in a field, biodiversity in a forest, and biodiversity in an urban setting. The activities allow visitors to download a field guide that leads them through an experience highlighting the connections between organisms in a given ecosystem, and then encourages them to upload their observations and reflections so that others can see them. People who participate in the downloadable tours learn the relationship between various species in these ecosystems and how to identify them. As with the Choose Your Own Biodiversity Adventure activity described above, each experience includes a relationship to humans. Participants' observations will be mapped online using GIS technology.

The offerings at the Museum of Science will culminate in a large-scale "Biodiversity Day" on Sunday, November 18th, similar to an indoor biodiversity festival, for the general public. It will have similar elements that appeal to anyone visiting a science center, but also include elements of deliberative conversations. This event will report the local and global outcomes of World Wide Views, bring biodiversity scientists to the Museum to share their work with the public and connections to human health through interactions and presentations, and will recognize people who have taken part in the activities described above, as biodiversity "champions/citizen scientists/stars", etc. WWViews participants from September, as well as people who have taken part in the downloadable biodiversity quests, will be invited to be part of the day for free. A primary motivation for bringing these people together with members of the general public is to include all of their perspectives in a forum-style conversation about biodiversity policy, inspired from the formal WWViews deliberations.

The third category of materials created for use by science centers is a public conversation forum called "Who Should Protect Biodiversity", created by Caroline Lowenthal of the Museum of Science staff. Adapted from the formal World Wide Views materials and the U.S. National Question, the forum leverages the presence of the scientists attending the science center to share their work and members of the public attending to be recognized for their participation in previous biodiversity-themed activities described previously in and out of the museum.

"Who Should Protect Biodiversity" assigns participants to form a team of different governmental and/or nongovernmental institutions to manage biodiversity issues in the United States. Options include Congress, the United Nations, U.S. federal agencies, industry, environmental advocacy organizations, and more. The Forum is free and downloadable for use by anyone, and a process for collecting data from participating science centers was created so that outcomes can be shared between institutions and with local museum audiences and stakeholders in the context of the global World Wide Views project.

Here is some text from the instructions in the downloadable Forum:

"This biodiversity policy forum is an opportunity for groups ranging in size from 2 or 3 people up to 100 or more to discuss the way biodiversity policy is managed in the United States. Participants learn the basics about biodiversity and the related policy issues. Then, through the forum discussion, they get the opportunity to consider the viewpoints of others on the topic of biodiversity. Finally, participants form opinions on who they trust to manage biodiversity issues using the information they learn, their background knowledge, and their values.

Hosting a biodiversity policy forum is a way to involve people with various backgrounds, ages, and experiences in a discussion about one of the most critical issues to the future health of our planet and our species. Despite its importance, biodiversity is a topic many people have not heard of. By participating in this forum, people will learn enough about biodiversity to start to take action to preserve it!"

ICT and the national conversation about biodiversity conservation (Marian Koshland Museum at the National Academies)

The Koshland Science Museum wove the theme of biodiversity into regular museum programming (both online and onsite) through the fall following the WWViews deliberations. A science café focused on the theme of biodiversity, contrasting research regarding protected areas with a study that measured the biodiversity-related benefits of small patches of habitat preservation in agricultural areas. As befits the science café model, lively discussion ensued amongst the audience and the researchers, although the conversation was focused primarily on tropical zones.

Each month, the museum hosts a 'web challenge,' an interactive, online activity. For the month immediately following WWViews, the web challenge was an online poll using the national question from the deliberations: *what (if anything) can or should individuals do to develop a biodiversity strategy in the U.S.?* This question was shared through the online citizen website SciStarter.com, and was featured on the homepage of *Discover Magazine*, as well as promoted through regular Koshland Science Museum channels. Responses were also solicited at the Biodiversity Day event organized by the Museum of Science, Boston in mid-November.

The online challenge included a poll that matched the multiple-choice portion of the national question. Participants were provided background materials online about biodiversity, as well as links to the WWViews website. ECAST members were interested to see how web-based responses differed from those of participants during the actual deliberations. Although response rates to the online poll have been low (n=148), they are mostly in line with the responses during the deliberation. Based on an initial analysis, one interesting variation is a wider range of views than were evident in responses to the same questions at WWViews. One question about reasons why respondents might or might not be interested in active engagement with biodiversity issues included a response indicating lack of interest because the Convention on Biological Diversity is 'misguided.' The only person to select this item came through the online poll. The online results also included higher percentages of responses to the prompt, "Other personal and societal issues are more important to me." Lacking data on the demographic characteristics of the online respondents, it is difficult to conclusively compare the online and face-to-face deliberations, but the results suggest

that further experimentation with online discussions may generate different responses and better understandings of the reasons for these variations.

Youth Engagement

Youth engagement was a major focus of the WWVIEWS process internationally. Voting across all the WWVIEWS themes was specifically separated to indicate youth recommendations. The principle objective of the Science, Policy and Citizenship Program on Biodiversity was to help high school age students who volunteered at the Phoenix Zoo and the Seattle Aquarium learn about the complexities of bringing science into the policy realm. Having teenage students think about global stewardship, corporate interests, environmentalism, the economic impact of regulation and international cooperation in the context of the need to protect biodiversity the project would equip them with a capacity to productively engage in a broad range of difficult science-meets-policy issues.

The program built on the successful pilot project conducted with students at the Thomas Jefferson High School for Science and Technology in Virginia[111] and adapted the information material and videos produced for the WWViews on Biodiversity project. It was conducted with teen volunteers at the Phoenix Zoo[112] and the Seattle Aquarium over a four-week period between September 24th and October 13th, 2012 overlapping with the COP11 meetings in Hyderabad.

Given a hypothetical but plausible political context[113], the participants were asked to deliberate and formulate their opinion with regards to whether or not the United States should adopt a national biodiversity strategy. Using briefing documents from the WWViews on Biodiversity and publicly available information, the project called for the teen participants to deliberate face to face with each other, then on-line with various subject matter experts[114], and then again face to face with each other, to formulate their consensus opinion and develop written and oral testimonies to three questions[115]. Participants then testified at a mock public hearing in front of a panel of local biodiversity experts[116] and stakeholders and provided justification for their consensus opinion and recommendations.[117]

Plugging in to ISE Professional Networks

On Sunday, October 14th, ECAST members visited the largest national conference of Informal Science Education (ISE) professionals to talk about the World Wide Views on Biodiversity deliberations. With 600 member institutions in over 40 countries, the Association for Science and Technology Centers (ASTC) annual conference brings together diverse program and exhibit designers and educators who work with the public in museums and science centers across the country and the world. In addition to promoting professional development in the field, ASTC supports science centers and museums in proactively addressing critical societal issues, locally and globally, where understanding of and engagement with science are essential.

In a double session entitled **Participatory Technology Assessment: Including the Public in Scientific Decision Making**, presenters gave a series of presentations and facilitated several rounds of group discussion to introduce attendees to the concepts behind the World Wide Views on Biodiversity process and give them first hand experience with the format of small group discussions. The session communicated a provocative example of a public engagement exercise

possessing a formal structure for involving a cross-section of citizens in targeted discussions with an explicit aim to reach policy makers. This type of activity is not frequently attempted in science center settings, and so session organizers wished to explore with the wider ASTC audience how ISE professionals view processes like WWViews and relate them to the kinds of programs that they would like to promote at their own institutions.

If policy for science aspires to cultivate a research enterprise that generates "usable" research in the service of complex issues like biodiversity, equal attention should be given to developing processes that articulate "usable public values" representing not only stakeholders and interest groups, but also the knowledge and experience of a diverse American public. Amplification of the deliberative results through public science centers, secondary and college curricula, and other channels can stimulate and sustain the public's engagement with the results of WWViews and create opportunities for their integration into policy networks, creating "usable public values". Sustained engagement will depend upon particular qualities of information flow and outreach network structure.

Chapter 6

Pathways to pTA

"As I go along with my work I formulate my thought, and from this struggle between what I want and the reality of the material – from this tension – is born an equilibrium."
Antoni Tàpies
Painting – Marble Worker's Sand with Six Footprints
1959

World Wide Views on Biodiversity started with high hopes for institutionalizing a practice that had been proven viable as a way of mobilizing citizen views on global issues in the previous project on global warming. These aspirations were met with success at COP 11 in Hyderabad, where the WWViews model was a good match for the heightened interest in broadening the awareness of biodiversity among the citizenry of the Parties and expanding participation in the Convention's decision making processes. Despite efforts to improve on the WWViews process, however, in some respects the results of the deliberation are vulnerable to the objection that a relatively narrow and skewed spectrum of the population in the host countries participated.[118] We therefore turn our attention in this concluding chapter to the lessons learned from the project, and to some near and medium term action items for improving both WWViews and ECAST.

Lessons Learned

The fact that Biodiversity was the second WWViews deliberation provided opportunities to *compare the issues addressed in these two global policy venues*, the institutional character of the two UN conventions, and the actual results. Exploring the similarities and differences in these and other dimensions can generate deeper insights about the validity and practical implications of the results. For example, the greater willingness of participants in least developed countries compared to those in other countries to take financial responsibility for the LDC's actions against global warming might be considered an anomaly in light of the statistical uncertainty of the WWViews data. With a similar response on a burden-sharing question in the second deliberation, however, the result seems more worthy of note. As the two global citizen deliberations indicate, the gap between expert and citizen assessment of the fair share of responsibilities between developed and developing countries, opens new perspectives on educational and policy approaches that might be related to COP negotiations.

Participants want to express their views in their own words. Some in the U.S. registered this sentiment in an optional comment space on the exit survey. A Washington participant captured this issue in particularly insightful terms when s/he suggested "Allow for written comments or additions on the voting sheets – would likely generate ideas 'outside the box' of your own questions. Otherwise, questions and strict answers can feel 'leading.'" In Phoenix several participants asked early in the day if they could write notes on their ballots, while at other sites participants included

notes without asking. The national question session that focused on participant recommendations came at the end of an intense day (one participant wrote that "…the social demands filled my brain up by 2 pm, but the day continued on for 3 more hours"), yet the discussions were vigorous and most tables were actively developing their responses during the entire period allotted for this part of the program. Like the participants who wanted to express their views, the expert panel that provided input on the national questions was interested to hear what they would say.

Input from very diverse quarters resonates with the *issues of credibility* discussed in this report. Daniel Kleinman placed particular emphasis on the need for a rigorous evaluation of deliberative results in his commentary on *Reinventing Technology Assessment* .[119] Carolyn Lukensmeyer has noted that America Speaks (a prominent U.S. convenor of deliberative events that she founded) initiated independent evaluations of its own deliberations after receiving input from policymakers and the press that such assessments would help them interpret the results of its deliberations.[120] Suhel al-Janabi of the Access and Benefit Sharing Capacity Development Initiative (a non-governmental project to facilitate sharing of benefits for genetic resources by users of such resources with their African, Caribbean and Pacific states of origin) called WWViews "an absolutely and truly exciting project" at the CBD side event, but also noted that "a problem of credibility and acknowledgement of these approaches" could be expected in some institutions, such as the European Union.[121]

The *amplification strategy* was initially developed in order to cast the net of participation and awareness of the deliberation beyond the immediate participants, and sustain involvement by all who are interested. Through its amplification activities, including development of a blog and experimentation with Twitter,[122] the U.S. team is also helping shape the role of the media by developing a framework within which interest can be supported if and when it develops. Media interest is very low for deliberations, biodiversity, and anything that happens on a Saturday (the day when both WWViews events have been held). The documentation of basic facts and results from WWViews, and the openness of social media and other forums to multiple venues and voices, eliminates the constraining expectation that the media should cover an "event" at an inconvenient time, in circumstances where the event is less interesting than the themes that it embodies, such as the interactions of experts and ordinary citizens in developing policy; and it provides the material that can support a diversity of stories that might be of interest to the media in relation to other events.

 An innovation in World Wide Views on Biodiversity was *active engagement in the U.S. with the CBD policy network at the outset of the project*. The evidence to date is that this approach effectively put WWViews on the radar of U.S. members in this network, and generated material support such as the expert review panel that contributed to development of the national question.

Be careful about quantification. Even when undertaken with recognition of its limits in particular circumstances, quantification can generate expectations of a precision that is neither expected nor possible, and can divert attention from what is unique and important in pTA. David Guston's general advice is especially pertinent: "Pragmatically, mechanisms to engage lay citizens in pTA activities do not have to be whole or perfect unto themselves, but rather they need to have characteristics that are distinct from and, in some useful dimensions, superior to other forms of public elicitation, e.g., opinion polls, focus groups, and deliberative polling."[123]

ECAST has come a long way. The vision at its founding was clear, compelling and inspiring. Since then, the network has expanded, the collaboration has intensified, professional and civic engagements have multiplied, with generally positive responses, and the network has played a critical role in the successes of the second global citizen deliberation in history. While some of the strongest and most innovative deliberative democracy organizations in the world are U.S.-based (AmericaSpeaks, Center for Deliberative Democracy, National Coalition for Dialogue and Deliberation), none of them focus on technology issues that have unique cultural and political dynamics. Science centers are a unique resource for sustaining engagement.

Action Items

- For World Wide Views

  - Make balance a priority in recruitment and facilitation. In recruitment, make membership in environmental organizations and political orientation primary screens in the application process. Accept fewer environmental members and left-of-center people than their proportion in the population because a higher proportion of those accepted are likely to show up for the deliberation. Relax the target for total number of participants for site hosts who can show this is the result of achieving a balanced participant pool. Invest more in training facilitators at the project manager seminar and at sites, so that they insist on a balanced dialogue and are prepared to add arguments from the information material that does not emerge in the table conversations.

  - Ask the Secretariat of the Convention on Biodiversity and other audiences of the next WWViews about their preferences for a format, e.g., how important are quantitative as distinct from qualitative results in relation to their goals?

  - Invite journalists to be participants in WWViews. One or two people in such positions will not significantly affect the participant pool, and concerns about expertise can be addressed by inviting journalists with public policy or human interest (as distinct from environmental) expertise and responsibilities.

  - Research on WWViews has been informal and responsive to the interests of researchers as they evolve. This should be changed toward a more formally organized mode of evaluation research. The research agenda and data collection should be closely coordinated with other processes that project managers are required to complete. For example, if sites are required to collect data on environmental organization membership and political orientation of applicants, mechanisms for reporting this data in a timely and reliable fashion should be established.

- Build the World Wide Views Alliance. For example, if the format of the next deliberation allows a national session, actively encourage national partners to develop national questions by providing training and networking opportunities.

- Incorporate emerging technology issues such as geo-engineering or synthetic biology into the next deliberation. These are critical issues, and will generate debate within CBD as well as media attention.

- For ECAST

  - Encourage the Obama Administration to develop the citizen engagement component of the Open Government Initiative during its second term.

  - Develop a strategy to encourage training in science centers for the skills needed to implement Public Engagement with Science.

  - Solicit input from business, government and nonprofit organizations about the ECAST mission and strategies for accomplishing it.

  - Establish and sustain a presence in the European Parliamentary Technology Assessment organization; build ties with partners in the World Wide Views Alliance through collaborative research and cooperative projects for the next WWViews deliberation (e.g., developing national questions).

  - Track and report events such as conference presentations, science cafés, and new ties. Prepare a protocol for tracking the resources (including in kind labor) required to conduct the next WWViews or other deliberation conducted by ECAST.

  - Connect participant recruiting with sustained engagement. For example, all applicants for a deliberation can be invited to subsequent events or receive results.

Like Antoni Tàpies struggling with the tension between his aspirations and the material for his painting, members of ECAST share bold visions of democracy and struggle with circumstances that are both challenging and promising. The goal for next steps should be a new equilibrium beyond the vision of *Reinventing Technology Assessment*, from which new challenges are sure to arise.

Endnotes

[1] Langdon Winner, Autonomous Technology: Technics Out-of-Control as a Theme in Political Thought, Cambridge, MA, MIT Press, 1977, p. 317.

[2] National Science Foundation, Scientists and Engineers Statistical Data System at http://www.nsf.gov/statistics/sestat/start.cfm; accessed August 9, 2012. Against this general picture of linear progress, it should be noted that some science and engineering fields have actually become less diverse in recent years.

[3] This is not new. Pamela Smith has documented how artisans in northern Europe played an early and key role in the intellectual shift that produced the Scientific Revolution (*The Body of the Artisan*, Chicago. University of Chicago Press. 2005), and working-class enthusiasts contributed significantly to botany in England before the field was professionalized (Anne Secord. Scientists in the Pub: Artisan Botanists in Early Nineteenth-Century Lancashire. *History of Science* xxxii, 1994, pp. 272-314).

[4] A stellar example of citizen science is the Alliance of Aquatic Resource Monitoring at Dickinson College in Pennsylvania, which works with citizen groups throughout the state to monitor watershed quality (at http://www.dickinson.edu/about/sustainability/allarm/). On community-based research, see K. Strand, N. Cutforth, R. Stoecker, S. Marullo, P. Donahue, *Community-Based Research and Higher Education: Principles and Practices*, San Francisco, Jossey-Bass, 2003.

[5] Brian Martin, ed, *Confronting the Experts*. Albany. State University of New York Press. 1996; see also Jason Delborne, Transgenes and Transgressions, *Social Studies of Science*, 2008, pp. 509-541. Climate skeptics who question the prevailing view that human activity is a significant contributor to global warming might seem a variation on this theme, but unlike dissident scientists they are backed by powerful forces that aim to preserve important aspects of the political and economic status quo. Naomi Oreskes and Erik Conway, *Merchants of Doubt*: *How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York. Bloomsbury Publishing Company. 2010.

[6] David Hess. *Alternative Pathways in Science and Industry: Activism, Innovation and the Environment in an Era of Globalization*. Cambridge. MIT Press. 2007.

[7] Until 2004 this Congressional agency was the General Accounting Office. We use GAO for both names in this report.

[8] Barack Obama, "Transparency and Open Government", January 21, 2009, at http://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment/, accessed November 2, 2012.

[9] Tom Kalil and Doug Rand, "Startup America Policy Challenge: Tapping Citizen Solvers to Drive Innovation", June 01, 2012, at http://www.whitehouse.gov/blog/2012/06/01/startup-america-policy-challenge-tapping-citizen-solvers-drive-innovation, accessed November 5, 2012.

[10] Richard Sclove, Reinventing Technology Assessment, A 21st Century Model: Using Citizen Participation, Collaboration and Expert Analysis to Inform and Improve Decision-Making on Issues Involving Science and Technology, Washington, DC, Science and Technology Innovation Program, Woodrow Wilson International Center for Scholars, 2010, at http://www.wilsoncenter.org/sites/default/files/ReinventingTechnologyAssessment1.pdf.

[11] Patrick Hamlett, Michael D. Cobb, and David Guston. *National Citizens' Technology Forum: Nanotechnologies and Human Enhancement*. (The Center for Nanotechnology in Society, Arizona State University, 2008).

[12] Loka Institute, "U.S.: Telecommunications and the Future of Democracy", 1997, at http://www.loka.org/USResults.html; D. Guston, "Evaluating the First U.S. Consensus Conference: The Impact of the Citizens' Panel on Telecommunications and the Future of Democracy." *Science, Technology and Human Values*, 1999.

[13] WWViews on Biodiversity and the COP 11 conference were completed just prior to writing this report, and many questions addressed here, and some different questions, will be addressed more fully in ongoing research. Our primary focus, however, is the status of pTA, and the research results to date on WWViews have generated considerable material for addressing this question and exploring implications for developing pTA and ECAST.

[14] Gregory Kunkle, "New Challenge or the Past Revisited? The Office of Technology Assessment in Historical Context." *Technology in Society* 17(2):175- 96, 1995.

[15] Hazel Henderson, *Creating Alternative Futures: The End of Economics"*, New York, Berkley Publishing, 1979, p. 330. Based on material originally prepared in 1973 for the Sub-committee on Methodology of the Technology Assessment Advisory Council of OTA.

[16] Rosemary Chalk, Public Participation and Technology Assessment: A Survey of the Legislative History of the Office of Technology Assessment, Washington, DC, Congressional Research Service, 1974.

[17] Sclove, op. cit., 2010.

[18] Sclove (ibid., p.8) has identified 16 nations including the United States that have drawn on Danish participatory approaches.

[19] B. Bimber, The Politics of Expertise in Congress: The Rise and Fall of the Office of Technology Assessment. Albany, SUNY Press, 1996.

[20] PL 94-484, in OTA 1995. op. cit.

[21] R. Margolis and D. Guston, "The Origins, Accomplishments, and Demise of the OTA" in G. Morgan, and J. Peha (eds.), *Science and Technology Advice to the Congress*. Washington, D.C., Resources for the Future Press, 2003.

[22] Sclove, op. cit.

[23] Chalk, op. cit., 1974.

[24] Phillip L. Bereano, "Reflections of a Participant-Observer: The Technocratic/Democratic Contradiction in the Practice of Technology Assessment," in *Technological Forecasting and Social Change,* 1997.

[25] Ibid.

[26] OTA reports were designed to be subtle and non-partisan which made it difficult for some in Congress to fully realize the cost benefits of utilizing the OTA. In 1995, when the OTA faced the threat of closure, it attempted to quantify its fiscal usefulness by singling out the specific savings. Office of Technology Assessment, *OTA Legacy* (a five volume CD collection). 052-003-01457-2. Washington, DC, US GPO, 1995.

[27] Bimber, op. cit.

[28] The U.S. GAO is an associate member of EPTA, but does not currently employ participatory approaches.

[29] Sclove, op. cit.

[30] Ibid.

[31] The full list of GAO's publicly releasable technology assessments is available at http://www.gao.gov/browse/collection/Technology_Assessment

[32] OTA-related activities, archives, updates and reports can be found here: http://www.fas.org/ota/

[33] AMENDMENT TO H.R. 2551:SEC. 211. There is appropriated, for salaries and expenses of the Office of Technology Assessment as authorized by the Technology Assessment Act of 1972 (2 U.S.C.471 et seq.), hereby derived from the amount provided in this Act for the payment to the House Historic Buildings Revitalization Trust Fund, $2,500,000.

[34] Executive Summary of Commission Report, *New Directions: The Ethics of Synthetic Biology and Emerging Technologi*es December 2010, at http://www.emory.edu/president/community/bioethics/bioethics-executivesummary2010.html

[35] See ExpertLabs: http://www.wired.com/business/2009/11/anil-dash-crowdsources-social-networks-to-inform-public-policy/

[36] Lorelei Kelly, "Congress' Wicked Problem: Seeking Knowledge Insite the Informaiton Tsunami", New America Foundation, 2012, at http://newamerica.net/publications/policy/congress_wicked_problem.
[37] And they appear to be higher than those in Japan, China, or Russia http://www.nsf.gov/statistics/seind12/c7/c7h.htm

[38] Links to more than 194 participatory tools and 238 participatory projects can be found at http://ParticipatoryDB.com

[39] http://www.scistarter.com features more than 500 curated examples of citizen science projects

R. Sclove, "Reinventing Technology Assessment: A 21st Century Model " Washington, DC: Science and Technology Innovation Program, Woodrow Wilson International Center for Scholars. April 2010, at
http://wilsoncenter.org/techassessment

[40] D. Cavalier, "Let's create a very public Office of Technology Assessment" *Science Progress*, Center for American Progress. July 2008. http://scienceprogress.org/2008/07/harnessing-citizen-scientists/

[41] In at least one instance (September 1993), a presentation was given at OTA suggesting that the agency look at these models, as parliamentary OTA's elsewhere in Europe were beginning to do pTA (Bereano, op. cit.).

[42] Sclove, op. cit.

[43] Richard Sclove, "Reinventing Technology Assessment", *Issues in Science and Technology*, Fall 2010.

[44] Daniel Lee Kleinman, "Rethink Technology Assessment", *Issues in Science and Technology,* Winter 2011.

[45] "Open to all: A new approach to technology assessment would supplement expert opinion with input from society." *Nature* 465 (7294): 10, 2010.

[46] Rosa, E. A., Tuler, S. P., Fischhoff, B., Webler, T., Friedman, S. M., Sclove, R. E., & Short, J. F. (2010). Nuclear waste: knowledge waste?. *Science 329*(5993), 762-763

[47] M. Roco, C., Mirkin, & M. Hersam, Nanotechnology research directions for societal needs in 2020: Retrospective and outlook (Vol. 1), 457. Springer, 2011.

[48] Participatory Technology Assessment in the 21st Century: Including the Lay Public in Scientific Decision Making at http://cspo.events.asu.edu/?p=799

[49] Citizen Science Plenary http://sciencesymposium.wvu.edu/events/c

[50] See Citizens' Engagement Program with High School Students at http://cspo.org/projects/highschooldeliberation/

[51] Center for Nanotechnology in Society's National Citizens Technology Forum at http://cns.asu.edu/nctf/

[52] USA Science and Engineering Festival at http://www.usasciencefestival.org/

[53] Presidential Commission for the Study of Bioethical Issues at www.bioethics.gov/

[54] For a description of the Lisbon engagement, see S. Davies, et al. 2012. "Finding Futures: A Spatio-Visual Experiment In Participatory Engagement." *Leonardo.* http://dx.doi.org/10.1162/LEON_a_00489 (Accessed October 24, 2012).

[55] World Wide Views on Biodiversity U.S. Launch at http://cspo.org/projects/wwvbio/us/

[56] World Wide Views on Global Warming (documentary film), Master Media, Denmark, 2009, at http://www.wwviews.org/node/236

[57] A. Agger, B. Jæger, E. Jelsøe, L. Phillips, "The Creation of a Global Voice for Citizens – The Case of Denmark" M. Rask, R. Worthington and M. Lammi, *Citizen Participation in Global Environmental Governance,* London, Earthscan, 2011, p. 48.

[58] B. Bedsted, S. Gram, L. Klüver, "The Story of World Wide Views" in Rask, et al., op. cit., p. 31.

[59] "WWViews Design" at http://www.wwviews.org/node/248, accessed November 4, 2012

[60] R. Worthington, M. Rask, B. Jæger, "Deliberative Global Governance: Next Steps in an Emerging Practice" in Rask, et al., op. cit., 2011, pp. 265-266. DBT reserves the right in consultation with individuals affiliated with Alliance members that it has selected to dismiss a member in the event that its participation becomes problematic (statement by Lars Klüver, Director, DBT, at WWViews Training Seminar, March 24, 2009, Copenhagen).

[61] Overall responsibility for management was shared between DBT, the Danish Ministry of the Environment, and the Secretariat of the Convention on Biological Diversity.

[62] Danish Board of Technology, *Manual for World Wide Views on Biodiversity*, Copenhagen, 2012, p.11.

[63] In an exit survey for WWViews on Global Warming, 87% of respondents selected the top two choices on a 7 point scale where 7 = "absolutely disagree" and 1 = "absolutely agree" for the item listing "To be involved in decision-making on climate change" as a motivation to participate. Sixty-nine percent reported that the event significantly influenced

their opinions, and 92 percent indicated they would participate in a similar event. Authors' calculations of source data files.

[64] B. Bedsted and L. Klüver, eds., World Wide Views on Biodiversity: From the World's Citizens to the Climate Policy-Makers, Copenhagen, Danish Board of Technology, 2009; B. Bedsted, ed., World Wide Views on Biodiversity: From the World's Citizens to the Climate Policymakers, Copenhagen, Danish Board of Technology, 2012.

[65] For the questions on the urgency of climate change and punishment of violators, for example, China was the main outlier. Only 51% of participants concurred that the issue is urgent and a deal should be struck. Another 11% selected the response "It is important, but it can wait a few years", and 29% selected "I do not know/do not wish to answer." Participants in two of the other rapidly growing and high greenhouse gas emitting "BRIC" countries also were less inclined than their cohorts around the world to see the issue as urgent (Russia, 67% and India [Delhi] 72%), but 98% of Brazilian participants selected the "urgent" response on this item. WWViews on Global Warming data are available at http://www.teknov2.tdchweb.dk/new2/index.php?cid=blank&gid=blank&ccid=blank&cgid=blank&question=blank&rec=0&lang=573&reclang=0.

[66] See the assessment in M. Lammi, P. Repo, and P. Timonen, "Consumerism and Citizenship in the Context of Climate Change" in Rask, et al., op. cit..

[67] Since the national session was an option, and even if conducted by national partners might be designed to produce quantitative rather than qualitative results, this change represented a partial shift from the original design criterion calling for both quantitative and qualitative results. For a critical account of the original project design that advocates more focus on deliberation and qualitative results, see Goldschmidt et al., "Deliberation or Voting? Results of the Process Evaluation of WWViews Germany" in Rask et al., op. cit.

[68] R. Worthington communication with B. Bedsted, November 14, 2012.

[69] J. Schneider and J. Delborne, "Seeking the Spotlight: WWViews and the US Media Context" in Rask et al.

[70] "Science centers" is the term used to describe institutions whose mission is "To connect people with science. Science centers give science a presence in the community and offer people of all ages and backgrounds the opportunity to ask questions, discuss and explore" (Association of Science – Technology Centers, at http://www.astc.org/sciencecenters/index.htm, accessed November 4, 2012). The types of institutions carrying out this mission include science museums, botanical gardens, and institutions open to the public that focus on specialized science issues such as industry or birds.

[71] David Takacs, *The Idea of Biodiversity: Philosophies of Paradise.* Baltimore, The Johns Hopkins University Press, 1996, pp. 41-99. While the term is scientific, Takacs devotes much of this work to analyzing the political and cultural motivations of its inventors.

[72] National Energy Information Center, U.S. Energy Information Administration, at http://www.eia.gov/oiaf/1605/ggccebro/chapter1.html. Accessed November 7, 2012.

[73] United States Congress, Office of Technology Assessment, *Technologies to Maintain Biological Diversity*, Washington, DC, U.S. Government Printing Office, 1987, p. 3.

[74] World Wildlife Fund, Global Footprint Network and Zoological Society of London, *Living Planet Report: Biodiversity, Biocapacity and Development,* Gland (Switzerland), WWF International, 2010, p. 12,

[75] Article 8 on In-situ Conservation, for example, contains 13 provisions requiring Parties to preserve biodiversity through practices such as protecting natural areas and controlling invasive species. The provision on protected areas requires Parties to "Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity." While most Parties have complied with these provisions, the absence of specific objectives to which Parties can be held accountable, and in many cases the shortage of resources for monitoring and enforcement in member countries, have limited their effectiveness. Faced with this situation, the CBD Parties have at times operated more like a framework convention, most notably developing the Nagoya Protocol in 2010 that established specific objectives and dates for meeting them in most of the areas covered by the treaty.Much of the argument in this paragraph is based on an interview with John Fitzgerald, Society for Conservation Biology, June 6, 2012.

[76] IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate

Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.

[77] Results for all countries and groups of countries are at http://biodiversity.wwviews.org/the-results.

[78] Bedsted, op. cit., 2012, p. 13.

[79] Complete results data for the U.S. and world are available in Appendix 1. Data for all sites in the world, including local sites in countries such as the U.S. that hosted more than one deliberation, as well as groupings by continent and type of country (developed, developing, etc.) are available at http://biodiversity.wwviews.org/the-results. DBT's report on the biodiversity deliberation (Bedsted, op. cit., 2012) analyzes responses to each individual question discussed by the participants.

[80] An item in a survey of U.S. participants asked them to locate their political orientation on a spectrum from Right to Left. Nearly all participants were in the middle to left range, while most data on the U.S. adult population as a whole indicate that more than half identify themselves as being in the middle to right range. It is therefore likely that the results exaggerate support for regulation and for other left-oriented responses for items that map onto a right-left framework of political orientation. This issue is addressed in greater detail later in this chapter.

[81] The environmental and resource transfer issues in the first and third questions mentioned here are reasonably evident. Concern about biodiversity loss, which is lower in developed than developing countries, reflects power relations in at least two senses. First, more people in developing than developed countries are dependent on the direct harvesting of natural resources for their livelihoods, much of which is earned outside the cash economy. Many scholars argue that these conditions bear the legacy of colonial and other exploitative economic relations between north and south. While others disagree, an argument that the north's past and current actions have absolutely nothing to do with the plight of people marginalized by ecological erosion in the south would assert a claim to segmentation of the experiences and histories of the affected societies that goes beyond stretching credulity. Indifference to the plight of the marginalized is thus about power to the extent that the beneficiaries have the option of ignoring the consequences of their actions for other people. A second power issue is about the future. The rich countries can within limits devise productive arrangements that "replace" the nature that human societies have diminished, and thus are in a better position to adjust to ecological changes in the short and perhaps medium terms.

[82]Hamlett, et. al., op. cit., 2008; Maria Powell et al., "Imagining Ordinary Citizens? Conceptualized and Actual Participants for Deliberations on Emerging Technologies," *Science as Culture* 20 (2011): 37-70; Jason Delborne, Jen Schneider, Ravtosh Bal, Susan Cozzens, and Richard Worthington, "Policy Pathways, Policy Networks, and Citizen Deliberation: Disseminating the Results of *World Wide Views on Global Warming* in the United States." Forthcoming 2013 in *Science and Public Policy*; Rask, et. al., op. cit

[83] Lydia Saad, "Conservatives Remain the Largest Ideological Group in the U.S.", *Gallup Politics*, January 12, 2012.

[84] U.S. Census Bureau, 2010 American Community Survey Table S1501.

[85] Ibid.

[86] James Druckman and Kjersten Nelson, "Framing and Deliberation: How Citizens' Conversations Limit Elite Influence." *American Journal of Political Science*. 47 (2003): 729-745; Jason Barabas. "How Deliberation Affects Policy Opinions." *American Political Science Review*. Vol. 98, No. 4 (2004): 687-701; H. Peyton Young, "Social Norms and Public Policy", The Brookings Institution, http://www.brookings.edu/papers/2007/10_socialnorm_young.aspx.

[87] A similar increase in knowledge gain among lesser educated participants, but slightly less pronounced, was evident on citizen responses to the following question: "I have a good overview of the issues, arguments and perspectives related to the topic 'biodiversity.'"

[88] Gallup Environmental Actions with Gallup Trends from 2000 (2010 data).

[89] World Values Survey 2005.

[90] Richard Sclove has used the term "leading indicator" to describe this aspect of deliberation in a presentation to the White House Office of Science and Technology Policy, Washington, DC, November 20, 2009.

[91] Thomas Fitzgerald, "Rethinking Public Opinion" in *The New Atlantis*, Summer 2008, p. 45.

[92] One respected researcher summarizes the evidence by observing that "the political ignorance of the American voter is one of the best-documented features of contemporary politics." L. Bartels, "Uninformed Votes: Information Effects in Presidential Elections." *American Journal of Political Science* 40, no. 1, February 1996, cited in B. Ackerman and J. Fishkin, *Deliberation Day*, New Haven, Yale University Press, p. 5.

[93] An important exception is deliberative polling developed by James Fishkin of Stanford University, which assembles a scientifically-selected random sample of participants in a deliberative exercise in order to construct a statistically valid comparison of their views before and after the deliberation. See "Deliberative Polling®" at http://cdd.stanford.edu/polls/.

[94] "**education…**Moral and mental discipline gained by study and instruction", *Webster's New American Dictionary*, New York, Books, Inc., 1961, p. 308.

[95] The specific focus here is polls about public issues, although much of polling is for private parties and other organizations (government agencies, nonprofit groups, etc.) seeking to understand the views of consumers, investors, donors, and potential members, among other categories of the population.

[96] Where 40% in the Gallup survey placed themselves in the categories to the right of center, only 27.2% in the World Values Survey were in the equivalent categories. The comparable numbers on the left were closer, 21% Gallup and 17.3% World Values. The biggest difference is that the 10 point World Values Survey scale creates two categories with no label in the middle, instead of the one category labeled Moderate for the Gallup poll, with 55.5% of World Values respondents selecting these spots compared to 35% for Gallup. Because 35.5% of the respondents chose the middle category (5) on the left, compared to 20% in the middle category (6) on the right, a total of 52.8% of World Values respondents are in the 5 left categories compared to 47.2% in the 5 right categories. (The World Values Survey is at at http://www.wvsevsdb.com/wvs/WVSAnalizeQuestion.jsp). The earlier point that those on the right were under-represented at WWViews still stands, but the imbalance using the World Values Survey benchmark is 2.39 to 1 (27.2% of Americans right of the middle category vs. 11.4% of WWViews participants), while it is 3.5:1 using the Gallup data (40% of all Americans vs. 11.4% WWViews).

[97] "Beyond Red vs. Blue: The Political Typology", Pew Research Center for the People and the Press, May 11, 2011 at http://www.people-press.org/2011/05/04/beyond-red-vs-blue-the-political-typology/.

[98] M. Horst and A. Irwin, "Nations at Ease with Radical Knowledge: On Consensus, Consensusing and False Consensesness" in Social Studies of Science, 2010, p. 115.

[99] Fitzgerald, op. cit., p. 53.

[100] "Broader Impacts: How WWViews Sparked Middle School Collaboration", *Thoughts and Stories from ECAST*, October 6, 2012, at http://ecastnetwork.wordpress.com/category/september-15-wwviews-event/colorado-school-of-mines/

[101] M. Delli Carpini, F. Lomax Cook, and L. Jacobs.. "Public Deliberation, Discursive Participation, and Citizen Engagement: A Review of the Empirical Literature." *Annual Review of Political Science* 7(1), 2004, pp. 315–344.

[102] Danish Board of Technology, *Manual for World Wide Views on Biodiversity,* op. cit., p. 51.

[103] The deliberation had originally been planned for the previous May, but had to be re-scheduled because fund-raising required to conduct the project took longer than originally anticipated.

[104] President's Council of Advisors on Science and Technology, *Sustaining Environmental Capital: Protecting Society and the Economy*, Washington, DC, Executive Office of the President, 2011.

[105] "Results from global citizens' consultation released at UN convention", October 12, 2012, at http://ecastnetwork.wordpress.com/category/september-15-wwviews-event/press-release/.

[106] Side events at UN conventions are essentially educational sessions with expert panelists on relevant topics, and comprise an important complement to the official proceedings.

[107] "Advance Unedited Copy of COP 11 Decisions", November 2012, at http://www.cbd.int/cop/cop-11/doc/2012-10-24-advanced-unedited-cop-11-decisions-en.pdf, accessed November 23, 2012.

[108] Delli Carpini et al., op. cit.

[109] D. Sarewitz and R. A. Pielke, "The neglected heart of science policy: reconciling supply of and demand for science." *Environmental Science & Policy* 10(1): 5–16. http://www.sciencedirect.com/science/article/pii/S1462901106001183 (Accessed November 11, 2012).

[110] L. Bell and C. Miller, "Preparing People for Anticipatory Governance: Lifelong Learning in Museums as Capacity Building for Decision-Making about New and Emerging Technologies", unpublished manuscript, 2012.

[111] See http://cspo.org/projects/highschooldeliberation/

[112] The number of teen participants at the Phoenix Zoo and Seattle Aquarium were 16 and 12, divided respectively into 4 and 3 groups.

[113] The context was as follows: The Executive Office of the President has requested the interagency panel on Biodiversity to present its recommendation outlining whether or not the U.S. should adopt a national biodiversity strategy and action plan. In response to that request, State Department's Division Chief for Biodiversity, who chairs the interagency panel and leads the U.S. delegation to the 11th Conference of Parties (COP11) of the UN Convention on Biological Diversity (CBD) in Hyderabad India in October of 2012, has asked the Consortium for Science, Policy and Outcomes to organize conferences across the United States to collect views from ordinary citizens.

[114] See http://www.sciencepolicyandcitizenship.org/ to view the on-line deliberation between the student participants and experts at Seattle Aquarium.

[115] The questions were originally developed for the national session for the WWViews on Biodiversity in the U.S.:

Should the U.S. develop a national biodiversity strategy and action plan along the lines envisioned in Aichi Biodiversity Target #17? If you agree, what should the U.S. include and exclude? How can the national action plan connect actions at the personal, local, regional, national and global levels?

What position you think the United States government should take on the Nagoya Protocol to retain its competitiveness objectives while adequately compensating developing countries for access to their indigenous knowledge and natural resources?

To what extent should the public, independent experts and stakeholders be involved or consulted on questions of biodiversity management, particularly when the interests of private companies are involved?

[116] In the case of the Seattle Aquarium members for the mock panel were drawn from the aquarium community, and included a moderator from NOAA. For Phoenix zoo the mock panel consisted of subject member experts from the zoo, Arizona State University and an executive from the private sector.

[117] See https://www.facebook.com/media/set/?set=a.10151118109828526.435659.145878903525&type=3 for images from the public hearing at the Phoenix Zoo.

[118] Germany is the country other than the U.S. that asked participants to indicate their political orientation. The data showed that the participant pool was slightly less skewed than in the U.S., but there was nonetheless a significant under representation of people who considered themselves to be to the right of the political center.

[119] Kleinman, op. cit.

[120] Interview with R. Worthington, November 7, 2011

[121] http://www.youtube.com/watch?v=0MfhyG2tXRI

[122] A U.S. volunteer gathered tweets from WWViews deliberations in five countries using the Storify website that helps users connect messages on common themes and stories, and posted the results on the ECAST blog ("Peer to Peer Policy: 21st Century Approach to Policy Making", at http://storify.com/ECASTnetwork/peer-to-policy-21st-century-approach-to-policy-mak?utm_source=direct-sfy.co&utm_medium=sfy.co-twitter&utm_campaign=&awesm=sfy.co_c9hf&utm_content=storify-pingback

[123] David Guston, "Participating Despite Questions: Toward a More Confident Participatory Technology Assessment", *Science and Engineering Ethics* 17, 2011, p. 692.

Appendix 1. Worldwide Views Results (U.S., Developed and Developing Countries)

"The percentages given here and on the results page at biodiversity.wwviews.org/the-results are calculated in the following way: Where more than one meeting has taken place in a country, equal weight is given to the results from each meeting, regardless of the number of participants when calculating the country percentages. The same principle applies to group categories, such as regions, developed/developing countries and the world total. The votes from each country are given equal weight when calculating the average percentages. At the online result page, comparisons are available between different WWViews meetings, countries, regions and other groupings. The total number of votes is listed for each answering option, and also available here, is a break out of young and adult votes. In total, there were 839 participants between 16 and 24 years of age and 2,165 participants aged 25 or older."

Source: Danish Board of Technology, at http://biodiversity.wwviews.org/further-information-on-the-results/.

Introduction to Biodiversity

(1.1) To what extent did you feel familiar with biodiversity issues, before joining WWViews?

Response	USA	Developed	Developing
Don't know / Do not wish to answer	0.0	0.4	1.2
I was already an expert on the subject	2.8	4.1	2.9
I knew a lot	37.4	28.8	16.1
I knew some	46.6	43.5	47.2
I knew very little	7.7	14.8	24.9
I knew almost nothing	5.5	8.5	7.8
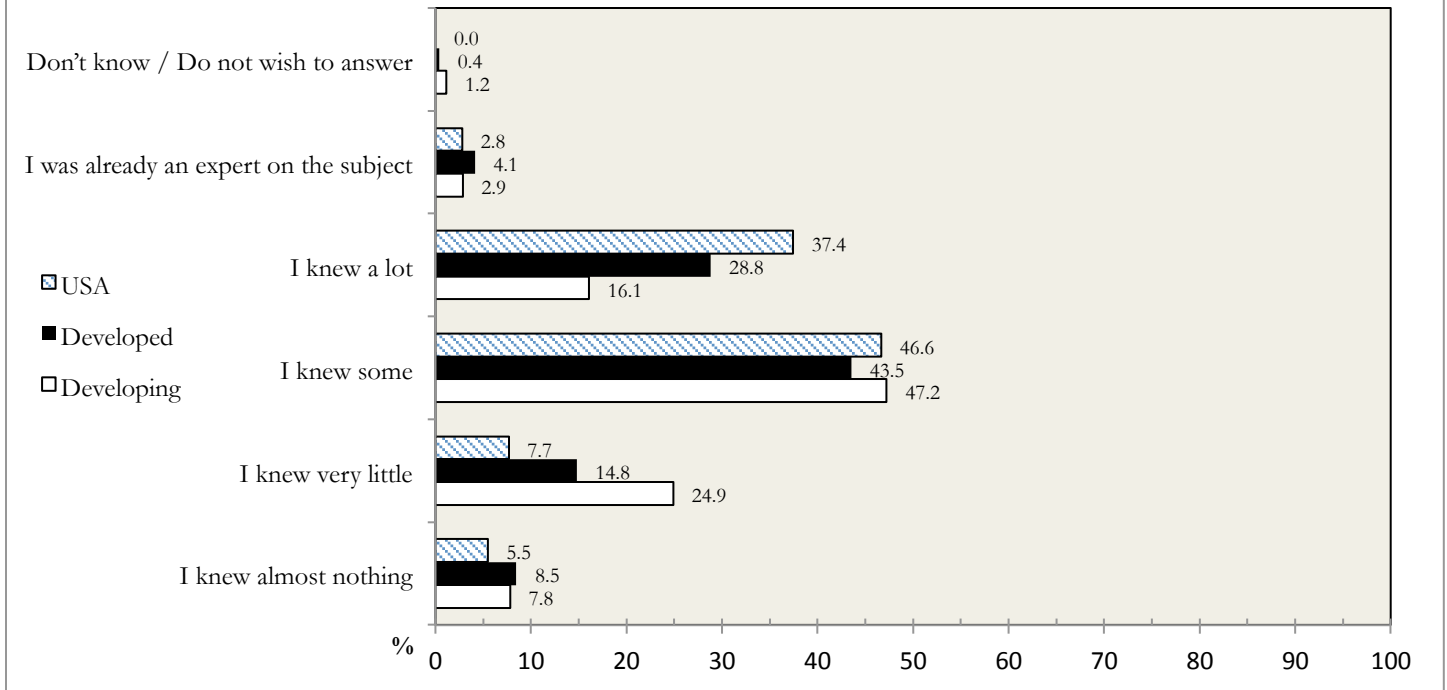
(1.2) How familiar do you feel now?

Response	USA	Developed	Developing
Don't know / Do not wish to answer	1.3	0.2	0.3
I am an expert on the subject	3.8	4.2	4.1
I know a lot	41.4	44.2	49.6
I know some	43.9	41.3	42.9
I know very little	8.6	9.6	2.2
I know almost nothing	1.0	0.5	1.0
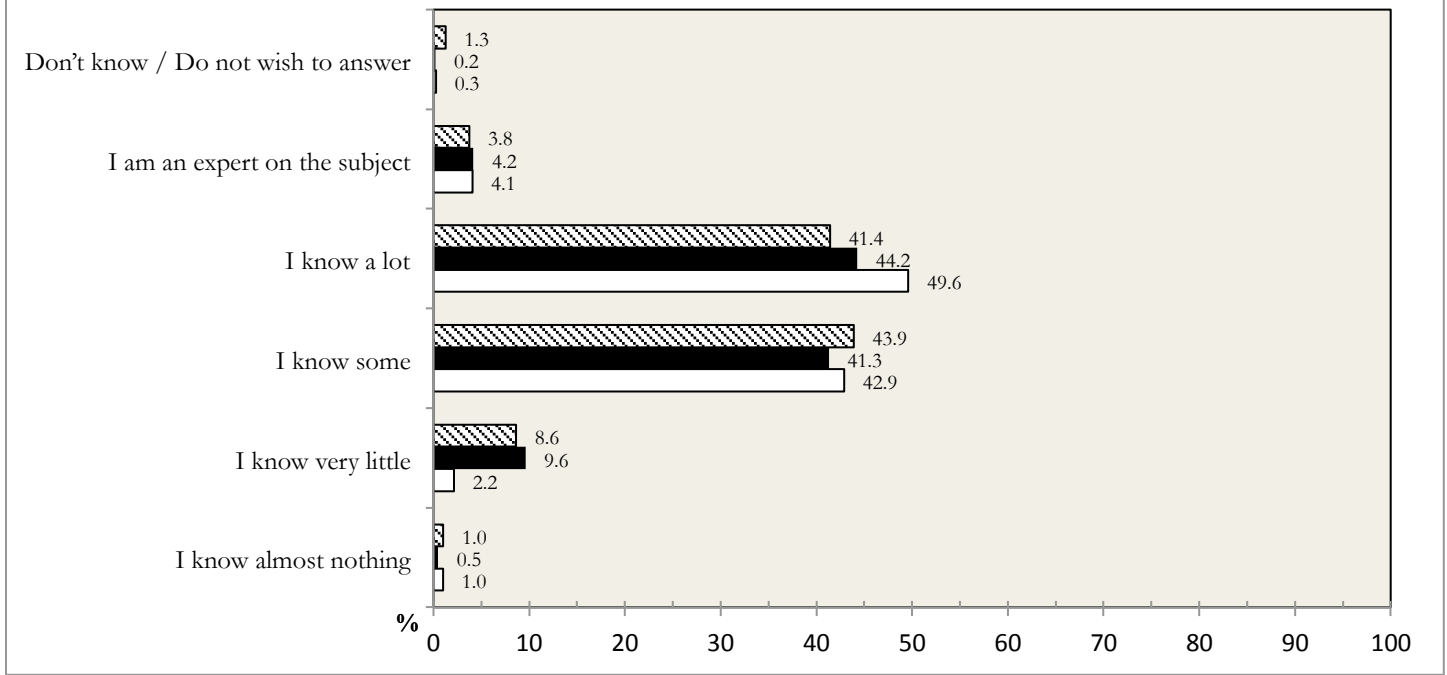
Introduction to Biodiversity

(1.3) Who do you think is seriously affected by biodiversity loss today?

USA
Developed
Developing

Category	USA	Developed	Developing
Don't know / Do not wish to answer	0.7	0.9	0.6
Nobody	0.4	0.6	0.6
Me personally	35.1	25.7	28.2
My home town/village	29.2	15.9	26.9
My country in general	37.1	22.5	48.2
Few people in the world	4.5	15.7	11.8
Most people in the world	92.9	86.6	83.2

% 0 10 20 30 40 50 60 70 80 90 100
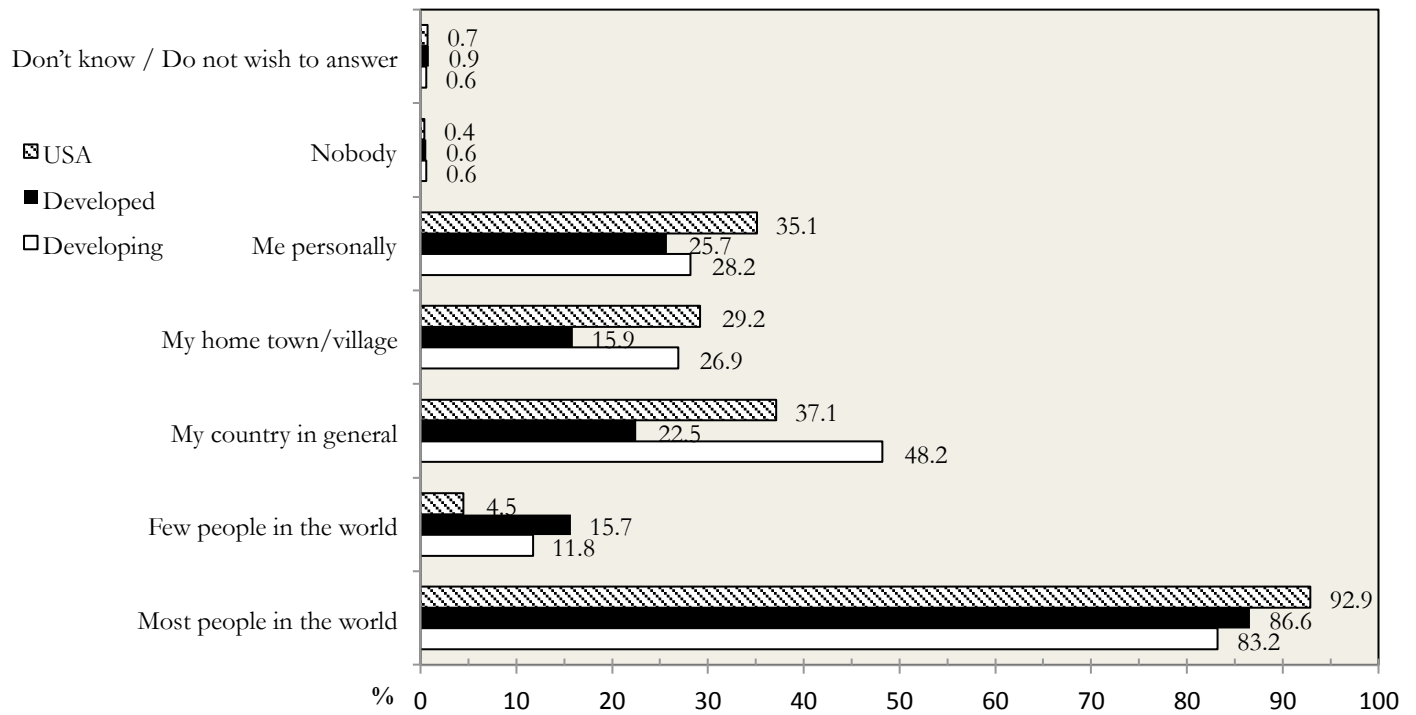
(1.4) Loss of biodiversity is one of many issues people may be concerned about. How concerned are you about the loss of biodiversity?

Category	USA	Developed	Developing
Don't know / Do not wish to answer	0.0	1.1	1.9
Not concerned	0.3	4.2	0.9
Somewhat concerned	15.0	31.4	19.3
Very concerned	84.7	63.4	77.9

% 0 10 20 30 40 50 60 70 80 90 100

63
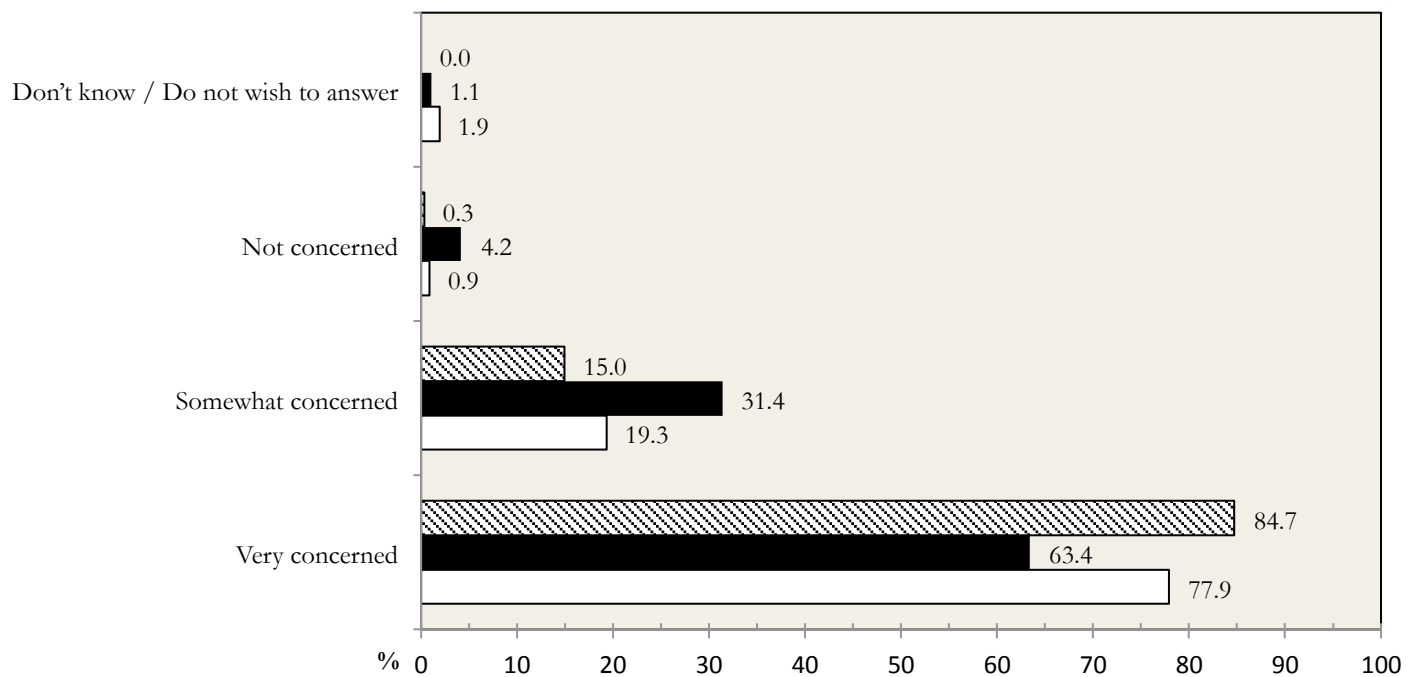
Biodiversity on Land

(2.1) If a conflict arises between existing economic interests and the establishment of new protected areas, what do you think should come first?

Legend:
- ☒ USA
- ■ Developed
- ☐ Developing

Don't know / Do not wish to answer
- USA: 6.3
- Developed: 7.4
- Developing: 2.6

Economic aims
- USA: 1.3
- Developed: 0.3
- Developing: 4.1

Economic aims unless the protected area is very important
- USA: 9.5
- Developed: 12.5
- Developing: 18.3

New protected areas unless very important economic aims are at stake
- USA: 45.2
- Developed: 49.8
- Developing: 44.3

New protected areas
- USA: 37.7
- Developed: 30.1
- Developing: 30.7

% (axis: 0 10 20 30 40 50 60 70 80 90 100)

(2.2) Which of these measures do you prefer to ensure the protection of nature areas in your country?

Don't know / Do not wish to answer
- 0.0
- 0.0
- 0.5

Nothing
- 0.6
- 0.3
- 0.7

Educate school children and the public by promoting biodiversity issues
- 86.7
- 76.8
- 71.3

Provide incentives to stakeholders (industry, farmers, NGOs, etc.) to engage in protection measures
- 70.3
- 67.7
- 48.8

Incorporate biodiversity issues in all other planning activities
- 57.8
- 61.3
- 50.7

Better enforce existing laws
- 32.8
- 36.6
- 49.8

Enact stricter national laws
- 36.6
- 35.0
- 36.3

% (axis: 0 10 20 30 40 50 60 70 80 90 100)

Biodiversity on Land

(2.3) Which general strategy do you think is most promising in matching the future demand for food with the aim to protect biodiversity?

Category	USA	Developed	Developing
Don't know / Do not wish to answer	6.8	5.9	4.1
Reduce the demand for more food, for example by eating more plants and less meat	58.6	61.1	19.3
Intensify agricultural production on existing farmland and thus avoid converting nature areas to new agricultural land	29.9	23.4	52.7
Expand the farmland by converting nature areas to new agricultural land, which could allow for less intensive and thus more biodiversity-friendly agriculture	4.6	9.6	23.9

%

Biodiversity at Sea

(3.1) Should incentives and subsidies that lead to overfishing be abolished?

USA
Developed
Developing

Category	USA	Developed	Developing
Don't know / Do not wish to answer	2.1	2.8	2.4
No, they should not be phased out	2.3	2.7	4.7
Yes, but they should be phased out slowly so all involved can prepare and adapt over time	33.1	34.7	51.5
Yes, they should be phased out as quickly as possible while providing some assistance or compensation to those who lose their income	55.2	50.9	32.6
Yes, they should be phased out as quickly as possible without providing some assistance or compensation to those who lose their income	7.4	8.8	8.8

%

Biodiversity at Sea

(3.2) Who should pay for the protection of coral reefs?

Don't know / Do not wish to answer
- 1.6
- 3.5
- 1.7

No payments should be made
- 2.5
- 1.4
- 0.9

Developed countries should pay the main part of the protection of coral reefs
- 24.6
- 26.6
- 27.3

All countries, both with and without coral reefs, should share costs
- 60.8
- 56.9
- 46.0

Countries with coral reefs should pay the main part of the protection themselves
- 10.4
- 11.6
- 11.6

%
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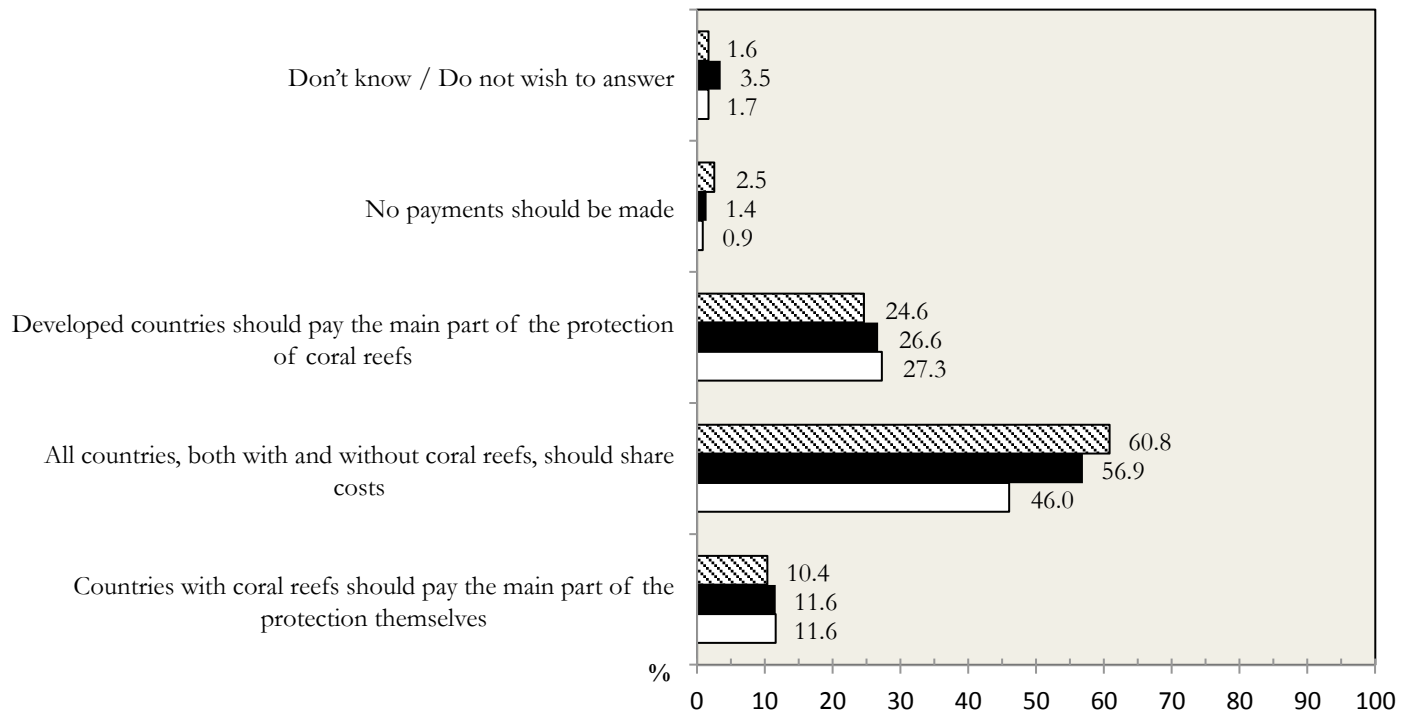
(3.3) Should a new international agreement be made to establish more Marine Protected Areas in the High Seas?

Don't know / Do not wish to answer
- 4.1
- 5.3
- 5.0

⊠ USA
■ Developed
☐ Developing

No
- 3.3
- 3.2
- 4.9

Yes
- 92.6
- 91.6
- 90.1

%
0 10 20 30 40 50 60 70 80 90 100
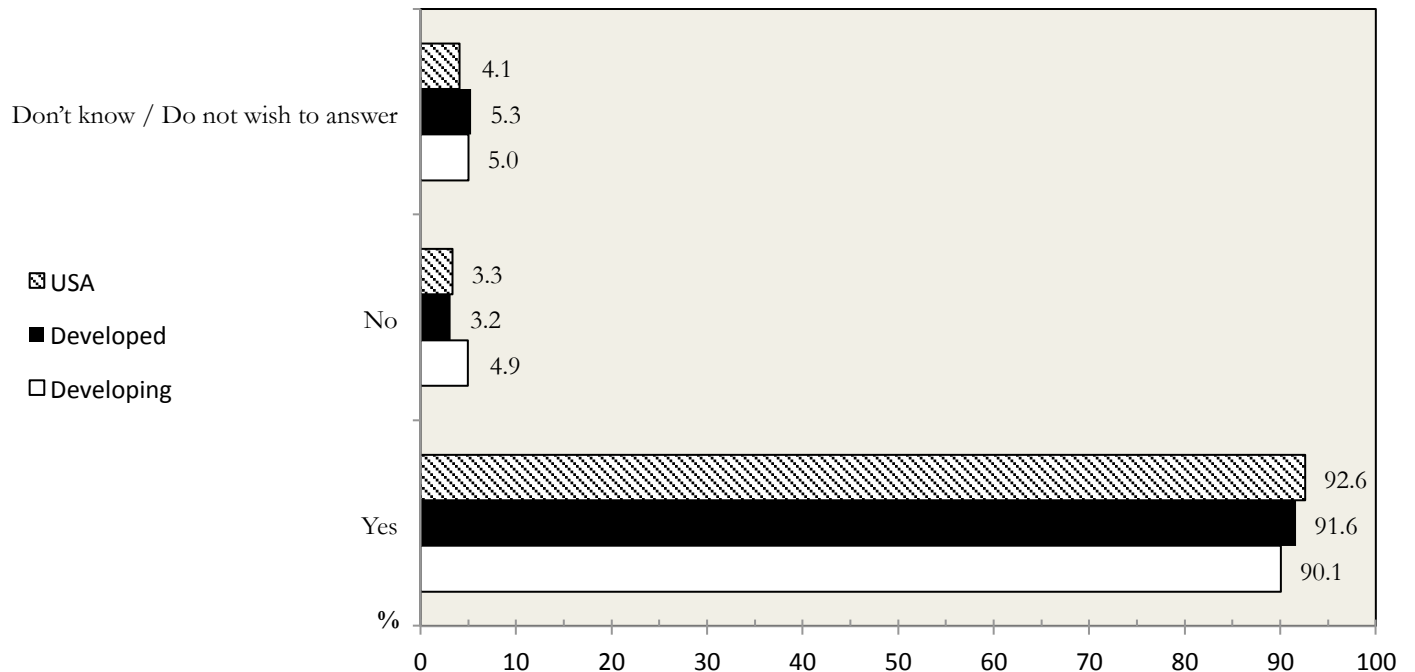
Burden and Benefit Sharing

(4.1) Who should supply financial resources for biodiversity protection in developing countries?

Legend:
- ☒ USA
- ■ Developed
- ☐ Developing

Don't know / Do not wish to answer
- 3.1
- 3.4
- 2.0

There is no need for financial resources
- 1.2
- 0.8
- 0.6

Commercial companies and consumers should pay rather than countries
- 23.3
- 24.4
- 6.3

Both industrialised and developing countries should be obliged to pay, but developing countries should pay the main part
- 8.0
- 9.0
- 13.6

Both industrialised and developing countries should be obliged to pay, but industrialised countries should pay the main part
- 61.4
- 59.9
- 71.3

Payments from countries should be made on a voluntary basis as it is done now, which means that only industrialised countries provide money
- 2.9
- 2.5
- 6.2

(x-axis: % from 0 to 100)

(4.2) Should users of existing species collections of animals, plants and microorganisms share benefits with the countries of origin if the species were collected before the Nagoya Protocol enters into force?

Don't know / Do not wish to answer
- 12.9
- 16.2
- 3.7

No
- 19.3
- 23.2
- 9.1

Yes
- 67.7
- 60.6
- 87.2

(x-axis: % from 0 to 100)

67
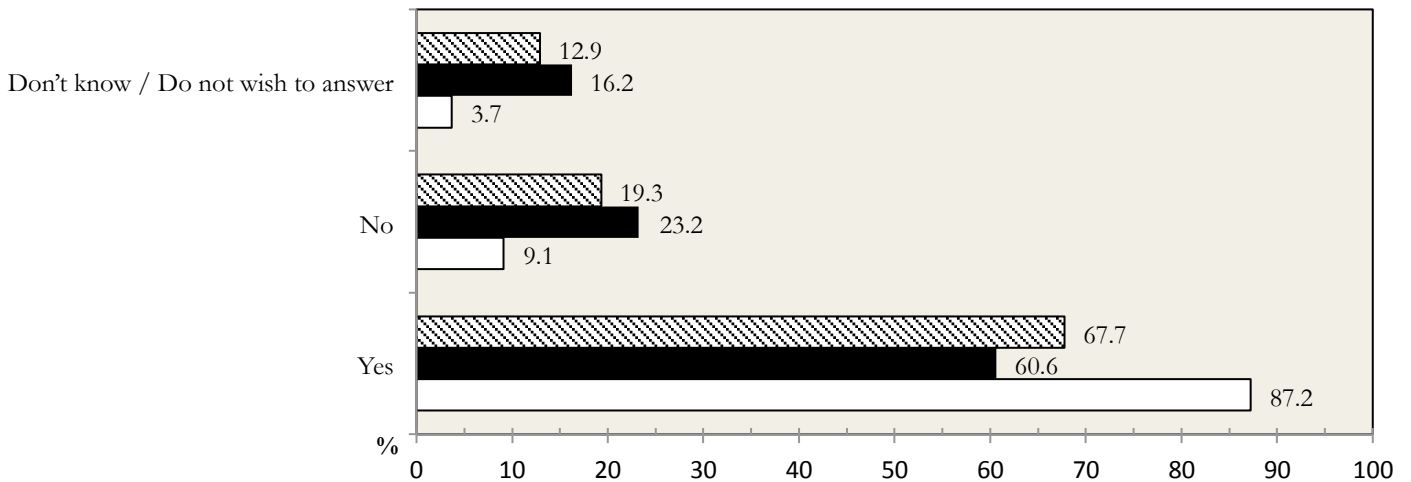
Burden and Benefit Sharing

(4.3) Should users of genetic resources from the High Seas pay a fee to global biodiversity for being allowed to use them?

	USA	Developed	Developing
Don't know / Do not wish to answer	11.5	7.0	3.7
No	7.1	7.7	10.4
Yes	81.4	85.4	85.8
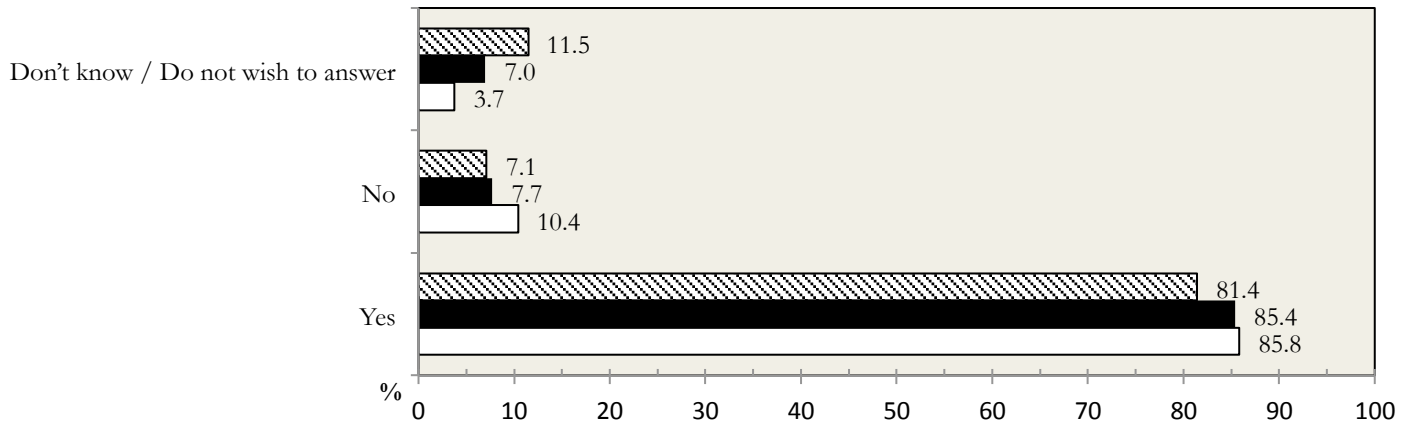
Evaluation Questions

(E.1) Were the briefing materials and videos balanced and informative?

USA
Developed
Developing

	USA	Developed	Developing
Don't know / Do not wish to answer	1.4	1.3	0.4
Not at all	0.6	8.0	1.4
No	6.3	5.1	2.2
Yes	62.0	60.3	56.1
Yes, very	29.8	32.6	39.9
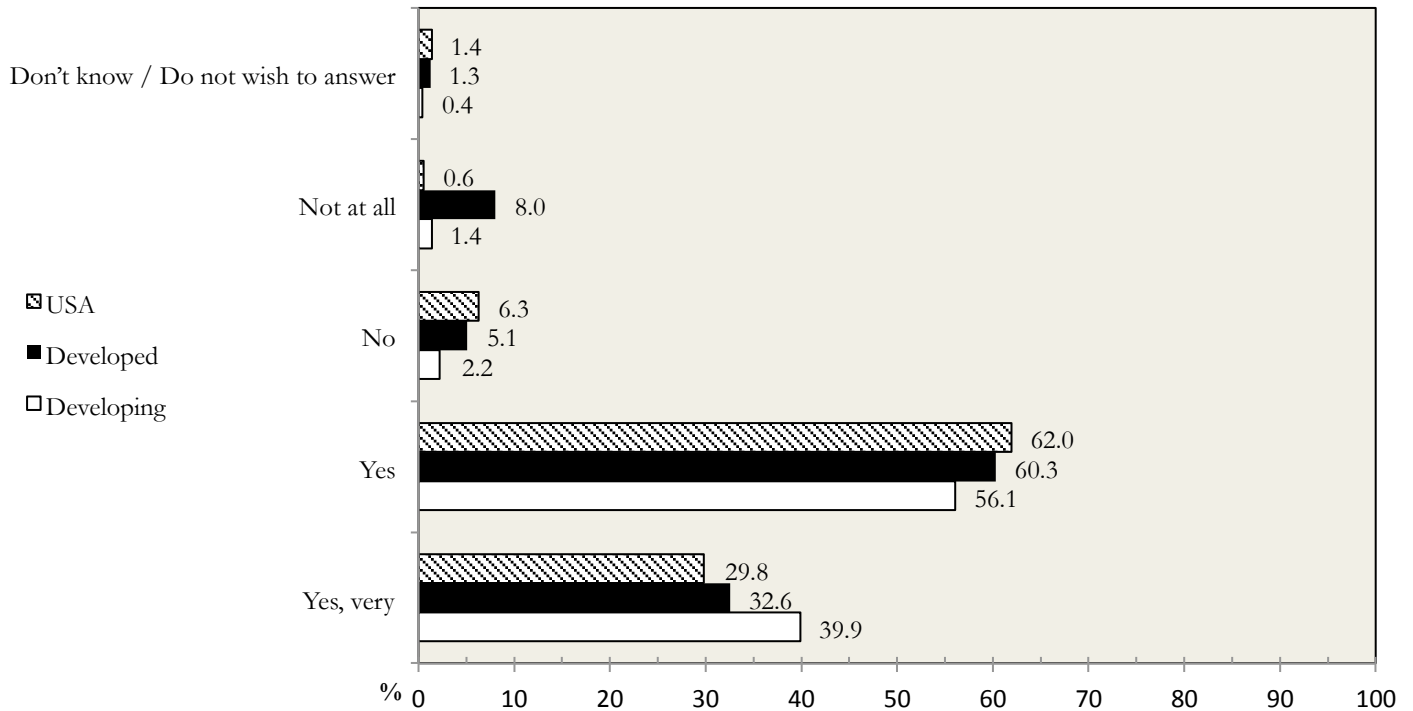
Evaluation Questions

(E.2) Were different and opposing views presented and discussed at your table?

Response	USA	Developed	Developing
Don't know / Do not wish to answer	0.0	1.1	0.8
Not at all	0.9	0.5	1.3
No	6.5	9.9	7.1
Yes	59.5	57.7	56.7
Yes, very	33.0	30.9	34.1

% 0 10 20 30 40 50 60 70 80 90 100
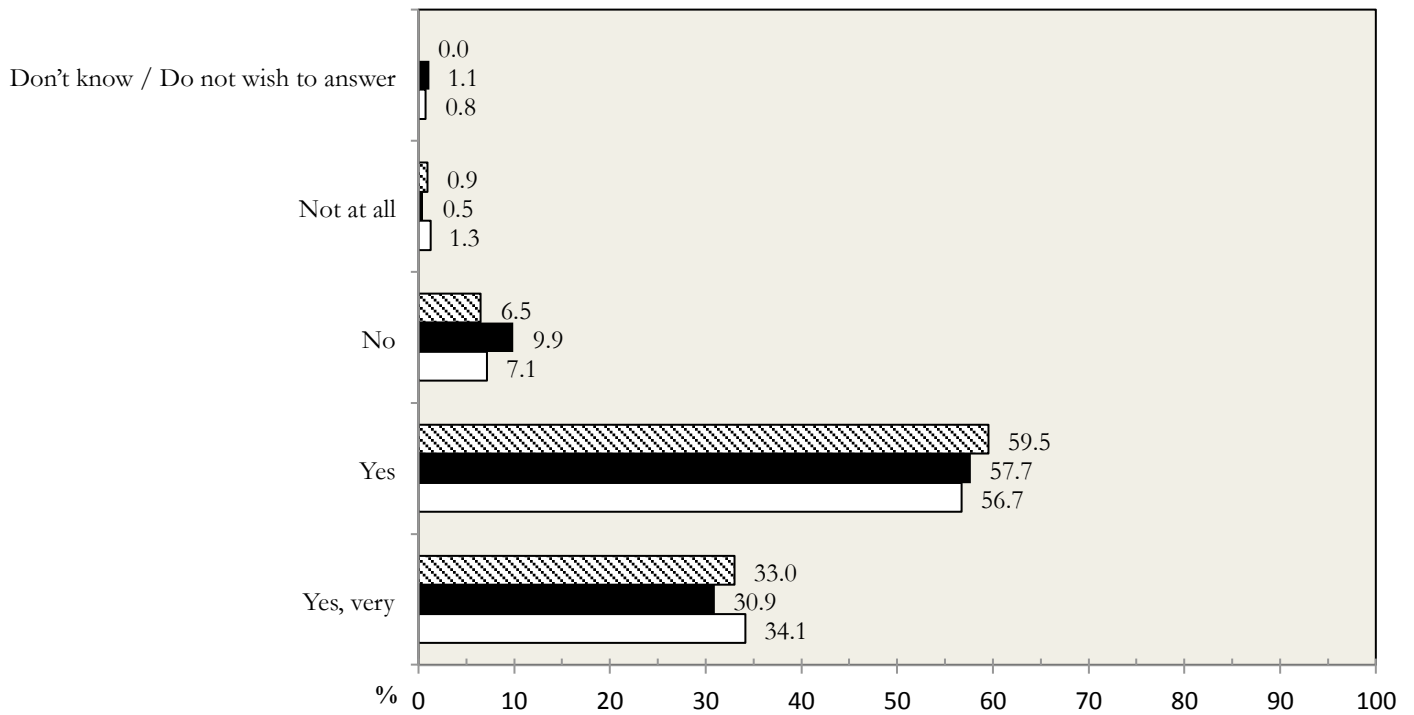
(E.3) Are you generally satisfied with the organization of the WWViews process in your country?

USA
Developed
Developing

Response	USA	Developed	Developing
Don't know / Do not wish to answer	3.9	4.9	2.3
Not at all	0.9	0.2	3.0
No	7.4	4.0	9.4
Yes	51.6	56.3	55.4
Yes, very	36.3	34.6	29.9

% 0 10 20 30 40 50 60 70 80 90 100
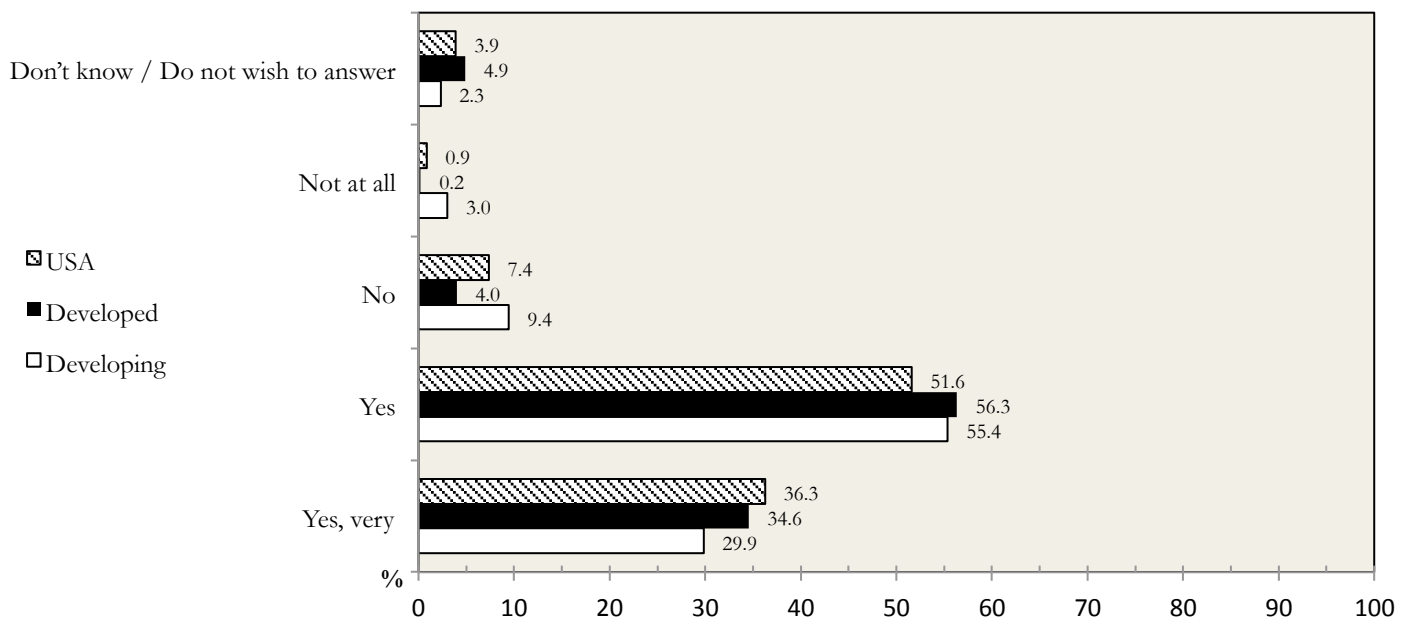
Evaluation Questions

(E.4) Do you believe that the WWViews results will be used in a meaningful way for political decision making on biodiversity?

Don't know / Do not wish to answer
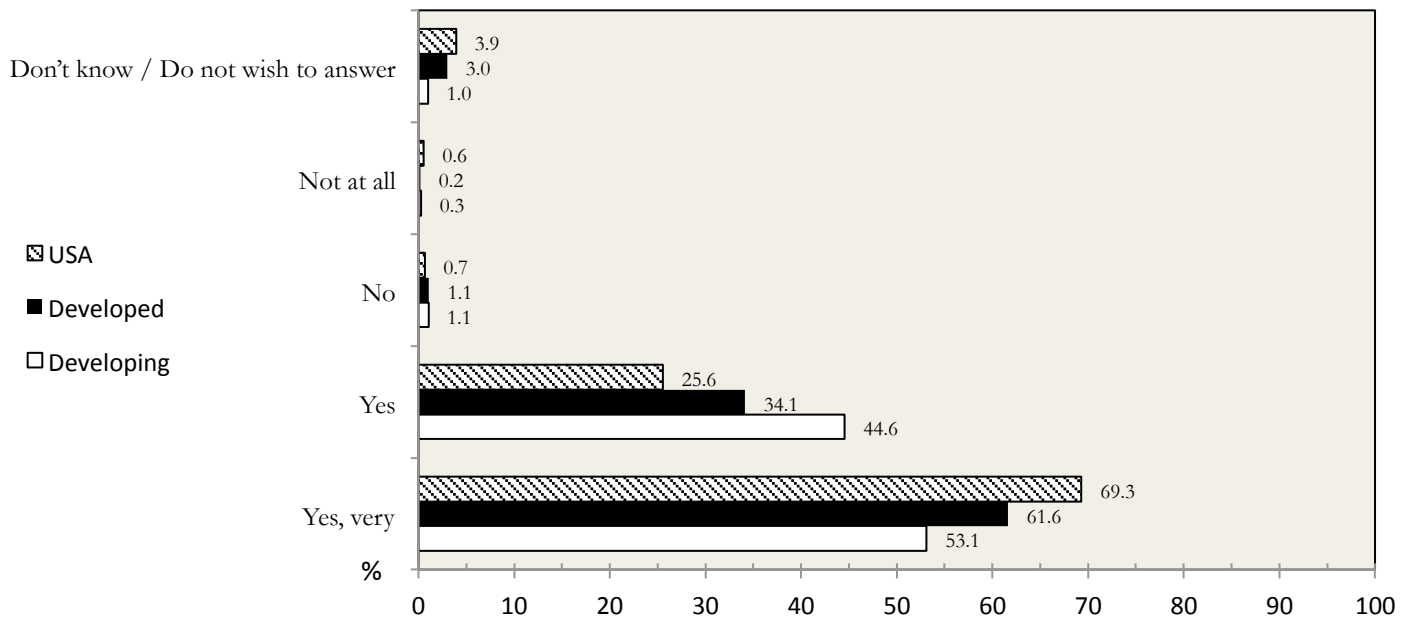- 19.9
- 15.0
- 6.5

Not at all
- 2.8
- 2.6
- 3.8

No
- 10.4
- 14.3
- 9.2

Yes
- 47.3
- 53.1
- 52.8

Yes, very
- 19.6
- 15.0
- 27.7

%

0 10 20 30 40 50 60 70 80 90 100
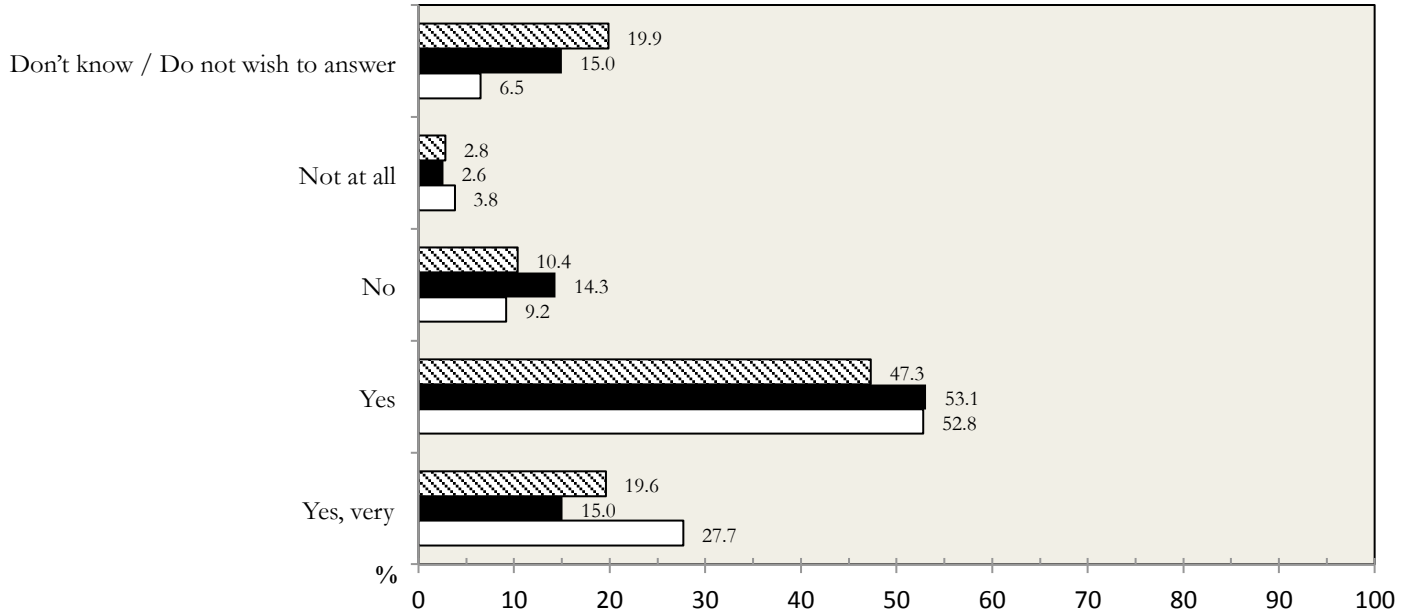
(E.5) Should global dialogue processes like WWViews be arranged in the future on different and/or similar issues?

Don't know / Do not wish to answer
- 3.9
- 3.0
- 1.0

Not at all
- 0.6
- 0.2
- 0.3

Legend:
- ☒ USA
- ■ Developed
- ☐ Developing

No
- 0.7
- 1.1
- 1.1

Yes
- 25.6
- 34.1
- 44.6

Yes, very
- 69.3
- 61.6
- 53.1

%

0 10 20 30 40 50 60 70 80 90 100

Should the US Adopt a National Biodiversity Strategy and Action Plan?

Four of the 34 sites in 25 countries where World Wide Views on Biodiversity was conducted on September 15, 2012 were in the United States, in Boston, Denver, Phoenix, and Washington, DC. At these sites, a session was added to the 4 sessions conducted worldwide to focus on an issue in the United States. Taking note of the current goal of the Convention on Biodiversity to establish an effective and participatory national biodiversity strategy and action plan in all countries by 2015, participants at these four sites were asked whether this should be done in the US, and to develop short statements providing a rationale and specific recommendations. These are included below.

Washington, DC

Table 1

The U.S. needs to have a national bio-diversity strategy that begins at the local level. Education of citizens from public schools to the local community with a focus on tangible results so people can see what works so it can be replicated. This can help to affect cultural change and how people think of how to be a global citizen. Technological innovations should be encouraged and shared to solve problems. The true costs of everyday products should be reflected in actual prices.

Start at the ground up with more visible effects that can be exported to help the nation, and world, as a whole.

Table 3

Incorporate biodiversity into a national education requirement.

This will be implemented in the following ways:
-National learning objectives
-Require volunteer service for graduation
-Leverage extension programs to provide the opportunities to volunteer & the curriculum

Table 4

A successful national biodiversity policy depends on a multi-faceted top-down & bottom-up approach, including:
-Congressional chairpersons of the pertinent committees & national agencies to develop a national policy
-Using traditional and non-traditional media to make biodiversity information readily available to heighten awareness and motivate across generations

-Preferably within a timeline for implementation and ratification tied to the next election cycle.

Table 5

We recommend a non-partisan and non-polarizing alliance or coalition be formed to specifically include non-indigenous and indigenous concerns and interests on biodiversity. This national alliance will engage in advocacy campaigns, political action, and encourage lifestyle transformation. An advocacy campaign could facilitate the creation and expansion of biodiversity habitat or other protected spaces and/or focus on education through ecoliteracy. Political action could entail engaging politicians who have voted against biodiversity action or creating a PAC. Target lifestyle choices could be reducing waste or reducing energy consumption.

Table 6

Table 6 recognizes the difficult political and economic climate in today's world. We still feel that a national biodiversity strategy benefits everyone. A healthy, beautiful, resilient community is our goal. Families and community & business leaders are the audience.

We lead with policy and recommend that decision-makers recognize formally that "biodiversity is important." Businesses & communities can follow with their own activities including gardens, events, and financial incentives.

Second, we focus on education and stewardship. A specific example is the Maryland Environmental literacy standard and a week-long program that incorporates "No Child Left Inside."

Finally, we see direct action as a way to include and engage our target audiences. Examples to consider:
-National Biodiversity Day
-National Day of Biodiversity Service
-National parks for Free Day
-Field trips
-Biodiversity gardens
-Business-oriented activities ("Disney Day")

As inspired by world Wide Views, we are recommending Sept 15 as "National Biodiversity Day."

Table 7

As the conservation of biodiversity is a very complex and multidisciplinary problem, with no one clear solution, it is necessary to invest more in basic research areas ranging from biology, ecology and energy, to sociology and economics. These results can be used to guide viable and effective strategies and improve education. Education and awareness is needed in the form of public outreach as well as formal education. Our two priorities are:

1. A national level mandate for environmental education starting at the elementary level and continuing on to higher education. One component would be the requirement of outdoors, hands-on learning.
2. To increase public awareness, a national grant program would be created for non-profits and community organizations encouraging outreach on biodiversity issues.

Table 8

We must enact a strategy that first and foremost provides a model for the rest of the world, takes national responsibility for damage we have caused and makes no exemptions for corporate interests. We suggest three specific actions:
1. Place all biodiversity protection under the EPA
2. Establish more marine protected areas
3. Introduce a consumer-friendly food labeling system that clearly shows the biodiversity impacts of each product (e.g. rainforest-friendly, ocean-friendly, biodiversity-farming-friendly). Labeling will <u>not</u> be voluntary.

Table 9

Emphasis of state-led development of:
1. Nation-wide standards for teaching biodiversity
2. Progress-dependent funding for local efforts
3. At the federal level, a "Joint Chiefs of Staff" for the environment
4. A public information campaign founded on consequences of inaction
5. Incorporation of the precautionary principle
6. An "environmental dashboard" of 5-10 indicators
7. Links biodiversity to the broader issue of sustainability

Table 10

A national biodiversity strategy is not just necessary, it's indispensable. Biodiversity affects all of us, in all aspects of our lives. We believe that food policy is the most relatable issue through which to reach people and change behaviors. We recommend partnerships between government agencies and food companies or local farmers that support sustainable food practices. By 2015, we want to have an education plan that teaches both children and adults about healthy meal planning and how to buy foods that support global biodiversity.

Table 11

We contribute 3 ideas/initiatives.
1. Use regional planning, especially land use, considering agriculture, regulations, and sustainable design with a social responsibility component, including public access to all EIS/EIAs.
2. A national campaign (e.g. littering/smoking) to raise awareness and feature critical biodiversity issues <u>to also</u> challenge to individual social responsibility
3. National education project

    a. Viral/internet based
        i. "My biodiversity plan"
        ii. Competition
        iii. Idea sourcing
    b. Illustrate biology
        i. Integrate into community projects
    c. Who? Multi stakeholder: NGO, gov agencies, business, citizens

Table 12

We support a National Biodiversity Strategy interpreted by local municipalities. This calls for a national focus on biodiversity conservation, preservation, and remediation. Local citizens and groups will work to inform and educate each other about the issues facing biodiversity. Business will be encouraged to practice corporate citizenship and will be offered the opportunity for incentives in return for funding education initiatives. At a national level, biodiversity assessments will be incorporated into planning, permitting and zoning processes already required by the EPA. Although the unification of the agencies responsible for biodiversity protection will be challenging to implement, the future of American biodiversity is at stake and worth the effort required.

Table 13

1. Education should be central in a national biodiversity strategy. Biodiversity should be included in national common core standards. Also, each state should develop biodiversity educational curricula, which includes field trip activities that connect students with local ecosystems and farmlands.
2. The fraction of protected land and sea area should be increased and should reflect diversity in ecosystems. Protected land can be used for designated wildlife preserves and educational purposes.

Action plan:
1. Ratify the CBD
2. Reverse subsidies that negatively impact biodiversity (for example, for intensive monoculture practices) to incentives for sustainable industries.

Table 14

We recommend the need for a national strategy that encourages and promotes:
1. A national K-12 environmental science curriculum
2. A new national narrative that recognizes the importance and value of biodiversity among those who haven't historically been motivated or understand the need for biodiversity
3. A national database for knowledge-sharing of best local practices that helps link value of biodiversity to creation of good green jobs

Table 15

Develop a national strategy that challenges states and counties to identify needs and challenges for biodiversity by a certain date. To do so, it will involve educational strategies at multiple age levels interconnecting and caring about the natural world using old ways and new technologies to make connections with our Earth. The purpose is to foster knowledgeable conversations about local/personal needs and challenges, and creation of innovative and adaptive solutions and understandings of our impacts.

Table 16

The federal government needs to set standards that apply across the country (may be adopted from CBD). At the Congressional District level, citizen advisory committees are formed to formulate strategies, state targets for biodiversity. These are presented to state governments who must formulate specific targets for states that go beyond federal standards. Initial money for this planning/organization would be taken from a reduction in farm subsidies. In the private sector, a business organization is created that would be given preferential treatment for government contracting that adheres to "exemplary" standards on biodiversity (must meet fed/state obligations)

Dissent over level of citizens' advisory committee and what the standards shall be.

Denver, Colorado
(table facilitator notes of recommendations)

Table 2 wants a national policy on biodiversity. The priorities should be as follows:

- Educating our public should be the primary focus of spending at this point - we should include biodiversity targets in public education for school age children, as well as in adult education through public campaigns. We would like to encourage direct government action as well as funding for private groups to spend on biodiversity education
- Maintaining and developing additional preserved lands
- Placing importance and value on biodiversity in future planning
- Supporting other nations in protecting their biodiversity.

Table 3

The US should NOT sign the treaty; it is the wrong time to launch a new, expensive program given budget constraints. Instead, there should be a national policy that adds biodiversity to the K-12 curriculum, developing public education programs with Public Service Announcements, and funding for scholarships for graduate education and research on biodiversity. There is a need for public education about the problems facing biodiversity on the planet.

Table 4

Though of course it is politically difficult, a push should be made by the UN and other actors to encourage the US to revisit and ratify the Convention on Biodiversity. The attempt itself could be enough to restart American interest in preserving biodiversity -- or at least would bring the subject back into public view.

Biodiversity initiatives should come from the highest levels of government -- both national and international. But if that is the sole source of action, such initiatives will certainly fail. Actors at all levels -- from small citizen groups to local governments to NGOs -- must be involved. World Wide Views on Biodiversity itself provides a model for such consciousness-raising. Very few participants in that effort come away without a greater appreciation for biodiversity preservation. How can other similar events be initiated? How can people be given the encouragement and opportunity to get involved?

Table 5

The recommendations formulated by the group were the following:

   1. Implementation of biodiversity education in K - 12 schooling, with a special emphasis on the impact of human activity on biodiversity.

   2. Expansion of protected lands and ocean areas.

   3. Encouragement of agricultural practices which really do (not just nominally) sustain or even improve local biodiversity.

   4. Empowerment of communities with respect to LOCAL decision-making regarding energy & resource policies.

   5. Poverty must be addressed effectively and productively nationwide.

   Dissenting Opinion:

   A national biodiversity strategy should be rejected on the following grounds:

   1. Any agreement regarding the actual issues can never be reached.

   2. Personal freedoms should not be curtailed.

Table 6

We strongly urge the United States Senate to ratify the Convention on Biological Diversity (CBD) as soon as possible and to ensure that the United States sends a delegation to participate in the October, 2012, conference of the 11th Conference of Parties that will take place in India. We

strongly encourage the delegation to make a commitment to meet 50% of the Aichi Biodiversity Targets by 2020. The United States, as the world's only superpower, can play a key leadership role by implementing many of the Aichi targets and encourage other countries to take their cues from American leadership.

We also want the U.S. Department of Education to provide and earmark funding to provide teachers and schools from K-12 to educate and raise awareness about biodiversity and how to prevent biodiversity loss on the planet. Finally, our delegation encourages public television networks to produce public information ads to raise more awareness among the general population about issues surrounding biodiversity.

Table 7

- We recommend that the US government "take effective and urgent action to halt the loss of biodiversity." [CBD's Strategic Plan]
- We recommend that defined goals with specific provisions and clear accountability measures be presented in order to facilitate this efficacy.
- On the subject of *Biodiversity on Land*, we recommend the US expand the percentage of protected areas and create incentives for decreasing meat consumption. In addition we recommend that urban planning include planting native plants and increased urban greenery.
- On the subject of *Biodiversity at Sea*, we recommend that the US government take a leadership role in cleaning up trash in coastal waters as well as high seas trash and further ensure the protection of important highly biodiverse coastal areas.
- We recommend that *sustainability ratings* be established or endorsed by the US government or affiliated institutions.
- On the subject of *Education*, we recommend the establishment of mandatory classes for students and representatives on the subject and importance of biodiversity and related fields.
- We recommend that the US government ratify the Kyoto and Nagoya Protocol and uphold the provisions laid out in CBD's Strageic Plan for Biodiversity and Millennium Development Goals.

Table 8

To address biodiversity loss, we need to confront three areas: citizen knowledge and involvement, enforcing and expanding current laws, and creating incentives and subsidies for protection of important areas. Citizens need to be educated through public service announcements about the urgency of biodiversity loss and through improved curriculum in schools that engages students, and we need to encourage involvement in service programs and community gardens to help people reconnect with nature. We must strengthen and enforce the Endangered Species Act, Fish and Wildlife, and preservation of national forests, parks, and wilderness areas. Increasing funding for research in best practices for restoration and preservation will also improve our approach. We should provide incentives and subsidies at local, state, and federal levels for businesses and organizations that work to achieve goals of biodiversity preservation. When we identify the most endangered hot zones for biodiversity loss, we must ban use of these areas by people until we can restore their health.

Boston, Massachusetts

Table 1

Our national strategy for biodiversity should include the following elements:

1. Both school-based education and public awareness campaigns
2. Reduction of existing subsidies for consumption and encouragement of sustainable lifestyles
3. Encouragement of local food production and distribution and reduction of use of oil and other resources
4. Active promotion of economic growth that does not harm biodiversity

Table 2

Our strategy would include a biodiversity census in order to identify areas of greater concern. It would also incorporate a review of economic incentives, disincentives, and subsidies. We recommend additional disincentives for those who degrade biodiversity within the US. Further, our strategy aims to heighten awareness of biodiversity issues and conflicts. We hope to empower citizens and instill a type of environmental patriotism – not only through education, but also through citizen engagement. Lastly, we recommend enforcement of regulations through an advisory board.

Table 3

A US biodiversity strategy and action plan must include the following aspects:

- Leadership at every level
- Education for awareness, participation, and ownership:
    - Public
    - In schools
    - Articles
- Financial incentives to transition from current practices to ones that promote biodiversity:
    - Jobs
    - Transportation
    - Land use – current and future planning
    - Business practices
- Infrastructure to increase and facilitate biodiversity and environmental practices

Table 4

The recommendation of our group is to include biodiversity conservation as an organizing principle within all public, private, and governmental organizations. As the conceptual framework for decision-making, a policy that is simple and easily enforceable will be the most effective. This policy includes improved fiscal accountability and responsibility of private environmental actors. We would also include this policy within the common core standards of public education to increase the

education of biodiversity for future generations. Ways to accomplish this policy would be to implement fines, tax credits, and federal funding for environmental actors. We would also update the endangered species act to be consistent with our current biodiversity goals. Future investments would include domain certification for all teachers and future funding for the development of an engaged community of citizen scientists. Also, ratifying the CBD would encompass much of our policy proposal as an alternative to our own proposal.

Table 5

We believe that the US should adopt a national biodiversity strategy and action plan envisioned in Aichi Target 17 implemented by educational and outreach activities such as:

- Native Plant Exchanges,
- Land Trust Watershed Projects,
- Mentors for Science for Preschool to College Students,
- Garden Clubs,
- Puppet Shows and Stories,
- Community Groups,
- Outreach to All via Media, Social Media, PBS, Radio, Facebook, Youtube
- Sponsorships of Educational Forums

Table 6

Incorporate biodiversity and how its parts interrelate into our public education system through the core curriculum and critical thinking skills. In addition, the education should continue to be prioritized in the greater communities through public awareness days, similar to Earth Day. At the same time, these principles of biodiversity should be integrated into EPA's mission statement.

Dissent: No national policy because our 50 states have differing priorities, concerns, and needs.

Table 7

Create broad-based support for biodiversity goals in the U.S. through education programs, job training, promotion, and advertising.

Adopt selected Aichi targets and charge the EPA to take the lead in coordinating efforts of federal and state agencies as well as private business to achieve them through a combination of regulation and incentives.

Table 8

In support of a national biodiversity strategy, we agreed that education—early, consistent, and long-term—is an important place to start—education of both youth and adults. Utilizing structures already in place, we thought there could be a great collaboration between agencies like the EPA, National Parks Service, Endangered Species Act, etc. To foster innovation, government and private

grants could be made available to develop technology and research that furthers biodiversity efforts. Finally, there could be a biodiversity trading scheme similar to the carbon trading scheme.

Table 9

Educational Strategy—National campaign: using (National) Social Marketing.

- Education—Create awareness to
    - Public officials
    - High school students
    - Universities
    - The community
- Alliances with existing environmental NGO's (local, regional, and national) to use adds on TV and other media
- Funding by polluters using the tobacco model

Table 10

1) Education on the importance of biodiversity through public awareness campaigns and school curricula, including financial, cultural, and global impacts.
2) Define responsibility with an existing government agency to be accountable for preservation of biodiversity, and act as a liaison for public and private sectors.
3) Reallocate subsidies and symbiotically integrate biodiversity-friendly programs into industry

Table 11

We see the National Strategy to consist of a two-pronged approach on biodiversity.

1) From the top down in terms of setting national guidelines and information on campaigns of recycling, etc.
2) And bottom-up in terms of small, local, and achievable projects, especially directed to and with school age children.

Table 12

We at table 12 hereby declare that the U.S.

- Ratify the CBD and develop a biodiversity strategy at the national level
- Craft a high level guiding principle at national level, requiring all new policies to consider biodiversity at both state and national level
- Create a forum like today's to create opinions and recommendations for state policies. Membership should include public, private, and government participation. These state level forums should elect representation for a national level forum, to form opinions and recommendations to inform national policy decisions.
- Create metrics to measure and analyze impact of actions/policies
- Develop statewide biodiversity curriculum (with standards) for K-12 science education

Phoenix, Arizona

Table 1

Create a Policy that:
- Incorporates in curriculum K-12 with an emphasis in social responsibility.
- Developing activities and projects with the focus on biodiversity sustainability
- Sanctions, ei; for overfishing
- Create social awareness of the importance of biodiversity and the impact of our individual actions
- Create a national policy that regulates the compliance of these laws and compromise at a national and global level
  - Generate good strategies, to market biodiversity
- Businesses, government and citizens should be accountable, therefore all need to work together
- We ALL have to live together in this world and should work together to do the things that provide sustainability for the biodiversity

Table 2

Action plan priorities
- Urban gardens
- Meatless Mondays
- Home gardens
- Local sustainability
- Permaculture
- Make sustainability the focus (rather than only economics)

Table 3

Biodiversity action plan
- Implement biodiversity into the current school curriculum and across all subjects
- Create an incentive program for community biodiversity and involvement
  - Examples
  - Subsidies for alternative energies university service learning grants
- Collaboration
  - Local business
  - Local govt
  - Citizens
- Increase or charge the users of items affecting biodiversity
- Tax or fine businesses that outsource
- Consider taxing "necessary" resources
  - Electricity
  - Gas

Table 4

At the national level the U.S. Should sign international treaties on biodiversity and increase incentives that promote biodiversity and gradually decrease incentives that harm biodiversity. At the local level, there can be space for deliberation that links to state and federal levels, and include biodiversity research in state education standards as well as community outreach.

Table 5

Agrees there should be national strategy
- Education – a three prong approach
  - K-12 standards include biodiversity across the curriculum
  - Adult/community education informal (encourage grassroots movement)
  - Educate government functionaries on how they can include biodiversity into their policies.
- Local development
  - At the planning level have informed planning that includes and increases to limit local biodiversity loss of encourage native species growth of better manage local resources

- Federal Policy
  - Create national regulations that support BD
  - Ensure trade rules consider limiting biodiversity loss
  - Create a national policy surrounding land use that increases our overall land size of national protected areas.

Table 6
- Ratify CBD
- National policy
  - All states territories, nations within, including all citizens, entities doing business within the US
  - Support: global, national, local
  - Deals and goals established on national level and implemented at state and local levels
- Goals and research
  - Education on BD
  - Citizen stakeholders
  - Emphasize incentive and more than sanctions
  - Preservation of resources

Table 8

- Citizens should lead
- Get documents implemented at the state level, take to national level
- Reproduce the process in other states; invite other states not yet far along
- Educate the farms and ranchers, large (and owners developers (commercial)) on their activities and impacts on biodiversity

- Do grass roots education and organizing and develop written, detailed resolutions with support of experts in academia, professions and organizations.
- Implement educational content at the national and state levels
- Educational outreach at the community bodies and comm. (illegible) + vocal levels
- Then take it to education communications and state board of education

Table 9

The national strategy for biodiversity will consist of each state developing a unique plan of action on biodiversity that includes state and local government, citizens and prominent private sectors in the local area. The plan of action should include an implementation plan with specific targets and timelines each state will comply with mandatory annual reporting revision and review.

Table 10

Establish a National policy to protect and sustain, wherever possible, the species diversity within US borders. The importance of establishing a baseline is paramount. Federal agencies should cooperate to identify the biodiversity assets of our nation (i.e., an inventory of species and their eco-systems).

- Identify the class of species and eco-systems at risk
- Instruct the National Science Foundation to fund R&D program in biodiversity
- Instruct the USDA to develop an action plan on the impact of agricultural policies and practices on biodiversity
- Instruct Dept of Interior to collect data on species stress and loss, including fish and wildlife
- Instruct the Dept of Energy to lead a public awareness campaign on the benefits of biodiversity.

All Americans need to understand and adapt to the new appreciation for the importance of biodiversity, and consider consuming fewer resources.

Table 11

- Starting in K-6 educating on impacts of depleting biodiversity [illegible]
- Shift subsidies from monoculture AG to small, organic, multi-crop farms.
- Hold corporations and their executives responsible for the depletion of biodiversity
- Promote community forums to raise awareness of biodiversity issues
- Allocate funds to purchase land and make it a protected area
- Revitalize cities through urban agriculture and landfill diversion of food waste
- Exploring and promoting alternative fuels i.e. Hemp, solar, renewable wind, algae, geothermal

Table 12

- Strategies
  - Inform public about biodiversity- education strategies empirical information
  - Set a research target for documenting biodiversity

- Entice people to learn about why care for biodiversity. Why it's a threat in local communities.
- More nature reserves/ yearly targets.
- Establish new environmental protection laws/strengthen existing laws
- Establish harsher penalties for serial polluters
- Strategy for making agriculture industry more biodiversity friendly
- Strategy for making production systems less wasteful- more biodiversity friendly

- Action Plan
  - Use PSAs and social media
  - Video and documentaries on biodiversity (benefits and consequences of loss)
  - Use partnerships with PBS, XIGOS, e.g. Nature conservancy, National Geographic etc...
  - Inc. Financial support for biodiversity research to universities, organizations, e.g. NSF
  - Develop K-12 programs with environment education associations
  - Create a panel of experts to develop biodiversity needs and priorities
  - Local community support
  - Biodiversity energy star label
  - Positive financial incentives incorporated info farm support program

Table 13
- Shift
  - Views beyond one human life span
  - Views on connection (instead of individualism)
- Method
  - use social media
  - Town halls
- Shift
  - From monocultures to polycultures
  - (social media)
  - (Agriculture)
- Shift
  - (national policy)
  - From institutions focused on one kind of species to biodiversity
  - Equitable exchange information, techniques, technology, money organic/natural capital/resources

- **Table 14**
  - We the table of 14 have come together in consensus to address the issue of biodiversity. We have urged that a national policy is necessary to set basic requirements (for example 8% of land preserved, or x% of funds towards action and research by each state) but the direct actions need to be state specific with the input of the expert scientists.
  - For our development aid that the United States gives out, we agree that a separate fund should be established to acknowledge our responsibility as the stewards for our world's oceans, forests, and life on this planet.

Table 15
- Goal- What

- Know appreciate build awareness and protect U.S. Species
- Connect national with [local, global strategy]
- Goal- How
  - Biodiversity curriculum led grade school
  - Biodiversity inventory- with civic science component to increase awareness and "buy in"
  - "Big read" - national network of local groups reading and conversing
  - Local points of contact- for valid info at species- coordinated across government levels
  - Policy and program inventory- national strategy earns what works and fills gaps

Table 16
- Actions education Policies
- NEPA
- CWA
- CAA
- ESA
- Research
  - Inventory
    - Threats
    - Existing resources
  - Technologies
    - Conservation
    - Clean energy
  - State laws
- Restoration
- Improved waste management
- Reduced toxicity technologies
- Educational program