
Monitoring Change: Citizen Science and International Environmental Treaty-Making

Katharine Harvey

Introduction

The relationship between science and policy is a frequently discussed topic in international negotiation literature (Susskind 1994, Jasanoff 1996, Skodvin and Underdal 2000). Although there is general consensus among negotiation experts that science helps policy-makers understand the technical aspects of global environmental degradation, it is not always clear what role science should play in treaty negotiations about environmental issues. Negotiation experts identify two primary functions of science in international policy-making: 1) to help policy-makers identify problems that require international attention, and 2) to inform policy-makers about the impacts of possible policy solutions to address the problem (Andresen 2000, Backstrand 2003). Recognizing the important contributions of science to treaty negotiations, several environmental treaty regimes have internalized these two functions and established committees or panels dedicated to addressing relevant scientific issues. Most notably, in 1988, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) to evaluate and report on related scientific research to help policy-makers understand the complexities of climate change.

Although the use of science is institutionalized in some environmental treaty-making processes, this paper argues that too often environmental policy-makers fail to use science to monitor and evaluate the impact of their policy actions. These monitoring and evaluating responsibilities are frequently left to non-governmental organizations (NGOs) and under-funded government agencies that often do not have formal channels and procedures for communicating their findings to policy-makers. This process inefficiency makes it difficult for international treaty-making bodies to use ongoing scientific research to convince national policy-makers to strengthen their governments' responses to environmental degradation.

Furthermore, currently science has a clear mandate to inform policy-makers about the technical aspects of environmental degradation, but it is not mandated share that same information with ordinary citizens. This distinction is noteworthy given the influence that citizens in democratic societies can have over the policies adopted by their governments.

To address these insufficiencies, this paper will begin by presenting roles for science in international environmental negotiations and use them to explain proposed shortcomings in the current environmental treaty-making system. The paper will then introduce the concept of citizen science and assert that there is a role for citizen scientists in the treaty-making process. Using the IPCC as an example, this paper will recommend changes that

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environmental treaty-making bodies could make to incorporate monitoring, evaluation mechanisms and citizen science into their frameworks. Finally, this paper will discuss challenges and opportunities that such changes might present.

Roles for Science in International Environmental Treaty-Making

An extensive amount of academic literature addresses the role of science in the international environmental treaty-making process (Susskind 1994, Wapner 1996, Andreson 2000). While the relationship between science and policy-making is often debated in academic circles, there is general consensus about how scientific knowledge is currently used in negotiations. Arild Underdal writes, “knowledge is a necessary tool for diagnosing problems as well as for prescribing effective cures” (Andreson, 2000: 3).

This paper does not dispute the roles that science currently plays in environmental treaty negotiations, but it proposes that the roles science *should* play embody three basic functions: 1) assess the problem 2) inform policies that address the problem and 3) monitor and evaluate actions taken (Figure 1).

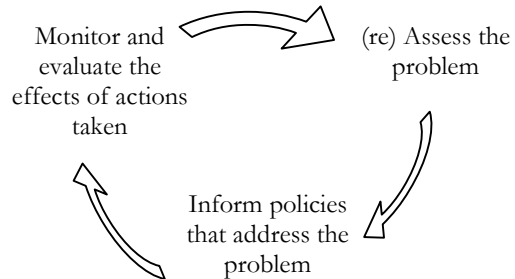


Figure 1: Roles for Science in International Environmental Treaty Making
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Assess the problem

Science is often used in treaty negotiations to help policy makers understand and evaluate the nature, scope, scale, impacts and predictability of changes to the earth’s ecosystems. From the United Nations Convention on the Law of the Sea to the Montreal Protocol, scientific data and analysis has helped policy-makers to understand problems with fisheries, climate change, long-range transboundary air pollution, ozone and various endangered species. WMO and UNEP acknowledged the importance of science in assessing the problem of climate change when they established the IPCC and mandated it to report on the range of reasonable opinions and scientific understanding of related topics (IPCC 2005b). In reality, the degree to which treaty-makers are influenced by scientific input varies from treaty to treaty because often government policy-makers are influenced by other political, economic and personal interests. Nevertheless, science is widely recognized as a useful tool for identifying and understanding the problems posed by environmental degradation (Andreson 2000).

Inform policies that address the problem

Once an environmental problem has been identified, science is used to inform policy-makers about potential actions that might be taken to mitigate the effects of that problem. The degree to which policy-makers adopt actions presented by scientific panels varies greatly, and like its assessment counterpart, is even more vulnerable to competition from other political, economic, and personal interests.

For example, for the IPCC to inform government policies, two working groups and several task forces were established to assess options for limiting greenhouse gas emissions, mitigating, and adapting to global climate fluctuations. In the IPCC consensus-based approach, summary reports from the working groups are subject to the scrutiny and approval of a larger Plenary body which includes government policy-makers and technocrats. Once approved, any of the reports may be used by policy-makers (and the public) to justify government proposals to address climate change (IPCC 2005a).

Monitor and evaluate the effects of actions taken

Scientific input can be used to monitor and evaluate the impacts of actions (or inaction) taken by government actors to address global environmental problems. In some cases, NGOs and individual governments are responsible for monitoring the effects of state actions adopted to fulfill national commitments posed by international environmental treaties. Occasionally NGOs and governments report back to treaty-making bodies on their progress, although more often than not, under the banner of sovereignty, government actors do not allow representatives from other countries to conduct assessments of their policy actions (science-based or otherwise). As a result, monitoring and evaluation components are generally left out of most international environmental treaties. (Susskind 1994, Wapner 1996)

In the case of climate change, the IPCC is not mandated to monitor, evaluate or build scientific consensus on the outcomes of implemented government policy actions. While it could be argued that such an opportunity is implicit in its prescribed mandate “to assess...the scientific, technical and socio- economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation” (IPCC 1998: Art. 2), this function is not formalized into a working group or task force.

Shortcomings in the Current System

The author of this paper believes that the interplay between the three different functions of science in treaty negotiations creates opportunities for constant re-evaluation and tightening of the scientific understanding of global environmental problems. In turn, better scientific understanding can provide impetus for improved policy responses. Without the contributions of post-policy monitoring and evaluating efforts, the full potential of scientific knowledge cannot be realized because government actions will not always be timely or appropriate. Without a process to build consensus about the science-based impacts of government policies, treaties that rely heavily on scientific input are at risk of compromising their relevance and effectiveness.

Furthermore, by targeting their assessments, reports and recommendations to policy-makers, the current international treaty-making system does a poor job of communicating its scientific assessments to the public at large and as a result, does not realize its potential influence over international environmental policies. This postulation is based on the frequently described relationship between policy, science and society in which both

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science and society can influence public policy and where it is assumed that science can inform both policy-makers and citizens (Figure 2).

In this scenario, citizens are not dependent on science to influence public policy, but nor are they immune from its influence. Similarly policy actions are not influenced by science alone but also by a conglomeration of societal factors including economics and politics. Often, economic and political interests are more vocal in domestic political processes and provide justification for decision-makers to opt for policies that do not provide the most effective solutions to environmental problems. Given these constraints this paper recommends that to increase the propensity of achieving scientifically and technically relevant environmental policy actions, scientific bodies in international treaty-making processes should maximize their influence and communicate their findings to citizens, in addition to policy-makers.

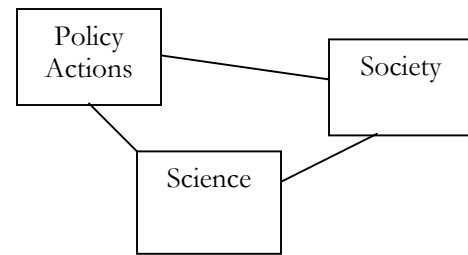


Figure 2: Society, Science and Policy Influence Model Harvey

Literature produced by academics and also by bureaucrats within treaty-making bodies themselves reflects various attempts to resolve the communication and relevance problems (IPCCb 2003, Barnseley 2005). Most efforts seem to focus on increasing public outreach through presentations and media outlets. Very few are centered on creating opportunities for public participation in the processes themselves. Given this paper's dual focus on improving implementation evaluation functions and providing more public participation opportunities, this paper deviates from the traditional proposals found in treaty regime reports and proposes mechanisms that engage citizens directly in scientific information assessment processes – namely processes that monitor and evaluate policy impacts.

Citizen Science and Environmental Monitoring

Citizen science, also referred to as “participatory science,” “civic science,” or “amateur science” is hardly a new phenomenon (Beierle, 1998, Clark 2001, Backsreand, 2003). In his comments to the Earthwatch Institute Annual Conference 2005, E.O. Wilson remarked that there has been “about 200 years of amateur science of very good quality, and it’s made its way into the literature. The result is that birds, above all, and to some extent flowering plants, are so well known” (Earthwatch 2005).

Projects around the world use citizen scientists to help monitor and gather data in their local communities on environmental issues from flora and fauna biodiversity to water and air quality. Some programs, like the United States Environmental Protection Agency’s (EPA) Volunteer Monitoring and Assessing Water Quality Program build connections between national scientific agencies and local citizens. In this program, the EPA trains citizen volunteers to perform specific tasks like screening for water quality problems and measuring baseline conditions and trends in their local communities. The volunteers

report their findings to EPA scientific bodies who then analyze the data and use the results to make policy recommendations to local, state, and federal legislative authorities (EPA 2005).

In another example, the Lab of Ornithology at Cornell University uses several citizen science programs to gather data about bird populations around the world. The Bird Population Studies program uses data gathered by citizen scientists to monitor the effects of climate change on North American bird populations. The director of the program notes, “One of the phenomenal abilities of the citizen-science approach is the ability to collect data across a huge geographic area that has very different climates and habitats...We have so much data—all of North America basically—that we can actually look at where the effects of global warming are and to what extent the effects vary across the continent” (Gallagher 2003).

Citizen scientists are particularly effective at monitoring the effects of climate change action (or inaction) in their local communities by observing and recording changes in local biodiversity, ambient and aquatic temperatures, precipitation amounts, and seasonal cycles (such as the date of the first frost or first spring flowers). On its website, EPA enumerates the benefits of using citizen scientists in their Monitoring and Assessing Water Quality Program, “Volunteer monitors build awareness of pollution problems, become trained in pollution prevention, help clean up problem sites, provide data for waters that may otherwise be unassessed, and increase the amount of water quality information available to decision makers at all levels of government” (EPA 2005).

The Director of Cornell’s Bird Population Studies program notes that “For me, the primary reason for having citizen-science projects is to collect data, followed closely by the educational value to participants, who learn about the process of science” (Gallagher 2003).

Indeed, this paper posits that engaging citizens in environmental science assessment processes will increase the salience of problems associated with global environmental degradation in the public conscience. Through the public policy influence model such changes could motivate more meaningful policy actions by government actors.

Proposed Changes to the International Environmental Treaty-Making System

This paper proposes to extend the mandate of scientific input in international environmental treaty negotiations to include monitoring and evaluation of the scientific impacts of government actions adopted to address global environmental problems. This new mandate requires the creation of treaty-related bodies responsible for assessing the changes that new government policies have on the environment. These new treaty bodies are not intended to evaluate specific governments’ policies, rather they would function like the IPCC and build consensus on the scientific impact of world government policies as a whole. These newly created bodies would report their findings to policy-makers and

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citizens alike so that they may be used to provoke public dialogue about government actions (or inaction).

This paper also proposes to expand the targeted audiences and participatory opportunities for science-based assessments and reporting from primarily policy-makers to the public at large. This proposal is to be taken in conjunction with previously mentioned initiatives by environmental treaty regimes to make their findings more accessible to the general citizenry in both developed and developing countries. It is also derived from an assumption that scientific bodies involved in environmental negotiations want to provide the most relevant scientific information possible so that governments may adopt effective policies that mitigate adverse impacts of environmental degradation on humans, habitats, and global ecosystems.

To illustrate forms that these proposed changes might take, this paper will use the IPCC as a model and prescribe modifications that address the aforementioned shortcomings.

Case Study: Intergovernmental Panel on Climate Change (IPCC)

In response to growing pressure from the international community to address the issue of climate change, in 1988 the WMO and UNEP created the IPCC to assess “on a comprehensive, objective, open, and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation” (IPCC 2005b). To achieve this objective, three working groups were formed to review and assess research being conducted in the scientific community on relevant scientific aspects of climate change. Working Group I assesses the scientific aspects of the climate system and climate change; Working Group II assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it; and Working Group III assesses options for limiting greenhouse gas emissions and otherwise mitigating climate change (IPCC 2005a). The working groups draft reports on their assessments, which must first be approved by group themselves and later by the larger IPCC Plenary, a group of national government representatives and government scientists. The working groups also submit a “Summary for Policy-Makers” to the Plenary. Upon final approval, the summaries and reports are made available to the public.

While the IPCC framework is often cited as a model for other science-intensive treaty regimes, it is not without criticisms. Bert Metz, Co-Chair of Working Group III, stated that while the IPCC does a good job in the areas of consensus building, scientific integrity, and independence, it does a mediocre job in the areas of comprehensiveness, policy relevance, and involvement and a poor job in accessibility and communication (Metz 2005).

To achieve the proposed monitoring and evaluating mandate, this paper recommends the formation of a fourth IPCC working group that is tasked with monitoring the effects of actions taken by national governments to address climate change (Figure 3).

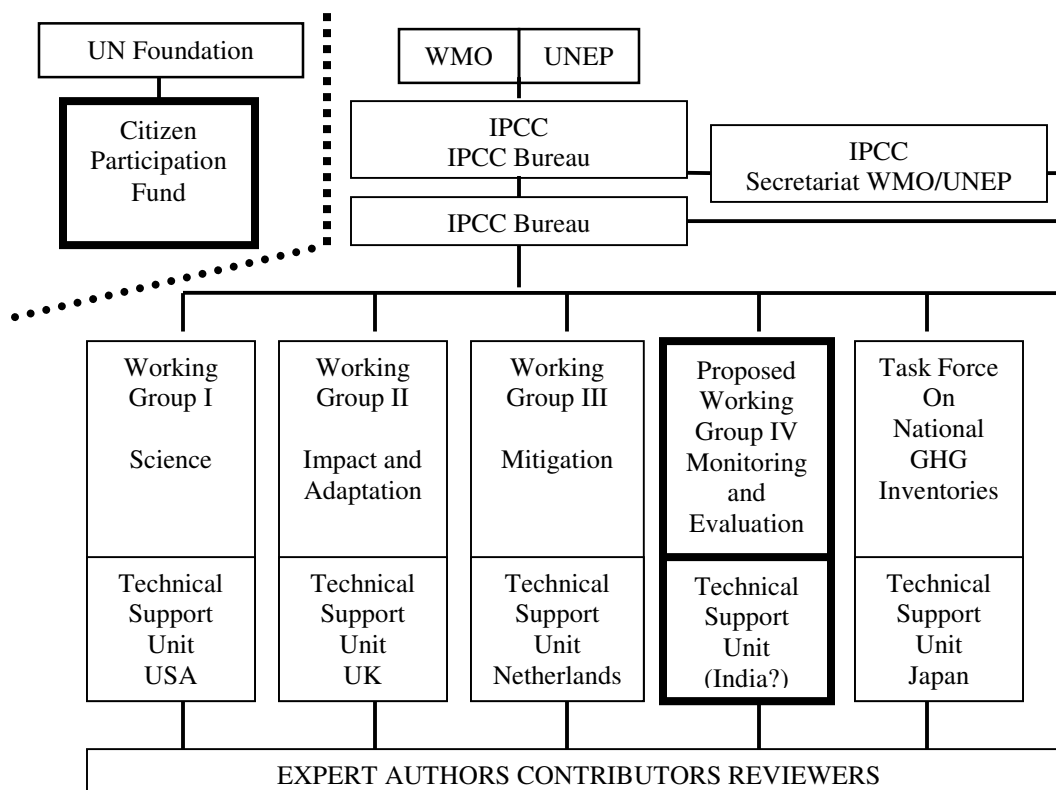


Figure 3: The Proposed Working Group IV

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The Mandate - Working Group IV will be tasked with assessing the impact of climate change mitigation actions taken by national governments on the scientific aspects of climate systems.

Like in other working groups, participants will be nominated by national governments or invited to participate by the IPCC Bureau. Participants will assess the available scientific research on the impacts of national climate change policies on related science and will also build consensus on technical and scientific aspects of the observed outcomes.

As with other IPCC working groups, Working Group IV will draft a report on its findings, which will be approved through the requisite consensus-based process. Additionally it will submit *two* summaries to the Plenary for approval by plenary members – a Summary for Policy-Makers and a Summary for Citizens. Both summaries should be made available on the IPCC website and disseminated through available public outreach outlets.

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Discussion about the leadership of this proposed working group will follow a formalized process of nominating and appointing a Technical Support Unit (TSU).

Additional Modifications: Citizen Participation Fund

Even with the addition public reports, such as the proposed IPCC “Summary for Citizens,” this paper asserts that there is still a missing element of citizen participation. To combat this shortcoming, this paper proposes that a Citizen Participation Fund (CPF) be founded under the auspices of the United Nations Foundation (Figure 3). The CPF would offer competitive grants for scientific research organizations to conduct studies on the scientific impact of government policies on global environmental degradation. The grants would be given for proposals from organizations that incorporate citizen science opportunities into research processes. Opportunities for citizen participation might include monitoring local bird and plant species, collecting water and air samples or recording temperature and precipitation patterns in local areas. The funds may be used by organizations to cover the costs of training citizen scientists and to provide materials for gathering, recording, and analyzing data.

Since many of the effects of environmental degradation are felt in the developing world, at least two-thirds of all funds would be granted to developing country research institutions, which may partner with institutions in developed countries to conduct the studies. To appease concerns about sovereignty, grants will not be issued to conduct research in another country without the sponsorship of the host country’s national research organization.

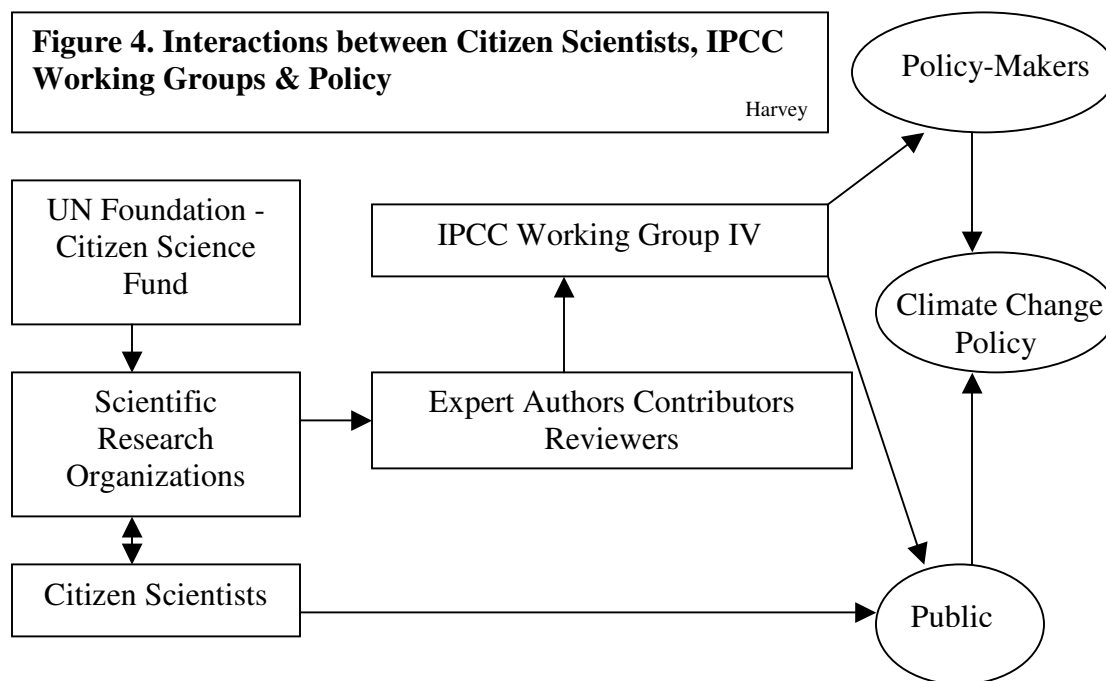
To maintain neutrality and avoid potential conflicts of interest, the CPF would be administered through the United Nations Foundation and may be used to support monitoring and evaluation projects in areas related to the Foundation’s biodiversity and climate change initiatives (United Nations Foundation 2005). Because citizen scientists are expected to be volunteers, this paper anticipates that the costs associated with incorporating citizen science into monitoring and data gathering process would be minimal and be limited to training materials for citizen scientists, some supplies (such as test tubes or notebooks), and perhaps data management software.

The CPF will solicit funds from private foundations with citizen science goals, like the Alberta Ecotrust Foundation or the Takagi Foundation for Citizen Science. It will also solicit funds from private foundations with environment, educational, and community participation funding goals. National governments will be asked to contribute money to the Fund, although their contributions are expected to be nominal.

Environmental treaty regimes will not be obliged to use the research that organizations produce using citizen scientists, but this paper theorizes that the research will be indistinguishable from other research on the same topic. A primary goal of this citizen science initiative is to engage the public in dialogue about the environmental problems that they monitor. The hope is that this level of engagement would make citizens more

inclined to read the scientific reports issued by treaty-making bodies, learn more about the issue and ultimately be more inclined to put pressure on their governments to take meaningful action.

In the case of the IPCC, this paper posits that citizen participation in IPCC research processes will contribute to increased citizen input and awareness of climate change and climate change related policy dialogue in their home countries. (Figure 4)



Challenges for the Proposed Modifications

General challenges raised by the proposed Working Group IV and Citizen Science Fund are likely to be similar to challenges posed by efforts to integrate monitoring and citizen participation into treaty-making process. Critics, particularly from national governments, are likely to point to the following areas of concern:

Sovereignty

The issue of national sovereignty will likely serve as a challenge in the implementation stage of the proposed changes. It can be argued that the reason that a monitoring system does not currently exist within the IPCC framework or in other treaty regimes is that nation states will not authorize foreign bodies to monitor and evaluate their actions.

This paper argues that the proposed Working Group IV and other institutionalized monitoring and evaluating mechanisms will not infringe on national sovereignty for several reasons. In the case of the IPCC, the consensus-based approval process allows nations to exercise some authority over the content of both reports and report summaries, a process that would continue under the proposed modifications. In all cases, monitoring

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of the impacts of government responses to environmental degradation will be conducted by established scientific organizations that are already regulated by national governments. Such institutions are likely to have an interest in maintaining their reputation for scientific integrity and their relationship with government funding agencies. These interests will provide sufficient motivation for participating scientific organizations to take an unbiased approach to their research. Finally, the purpose of the proposed monitoring is twofold 1) to assess the impact policies have on the science of environmental problems not to assess the characteristics of the policies themselves; and 2) to engage and educate citizens about environmental degradation and the scientific process - efforts that will not to distort the public policy process but that might contribute to more participatory decision-making and better long-term planning.

Involvement

This paper identifies two potential challenges related to involvement. The first is while the many environmental treaty regimes are dedicated to addressing the unique concerns and conditions of developing countries, some members might object to the enhanced involvement of developing countries in the environmental negotiation process, including the IPCC. Claims of sovereignty, objectivity, and fairness could be made by critics who are hesitant to support additional developing country participation. As with the issue of sovereignty, this paper argues that the consensus-based approach taken by the IPCC should appease critics because of the “veto” power that such approaches offer. Furthermore, while it may be idealistic, in principle, if a commitment was made by the members of treaty-making bodies to provide opportunities to address developing country concerns, then it is reasonable to provide opportunities for their participation in decision-making processes.

Scientific Integrity

Finally, critics of citizen science approaches may argue that the average public does not have the training, expertise, or background to be useful and objective participants in scientific monitoring processes. On a philosophical level, this paper postures that one of the roles of science is to contribute to the collective knowledge of humanity. Discouraging more active participation in scientific pursuits runs counter to that philosophy. On a more pragmatic level, scientific organizations worldwide, particularly non-profit scientific organizations, are competing for limited funds and the more citizens understand the work of scientific organizations, the more they are likely to support additional funding for science-based research. Finally, this paper believes that many scientists will confess that gathering large amounts of data is a time-consuming and often tedious task. This paper views the use of volunteer citizen scientists as a reasonable and economic way to relieve scientists of some of that burden.

Opportunities for the Proposed Changes

Commonalities also exist between some of the potential opportunities presented by the proposed Working Group IV, the Citizen Science Fund and efforts to integrate

monitoring and citizen participation into treaty-making process. Potential opportunities include:

Ripeness

After a period of destructive natural disasters worldwide, the general public is becoming aware of environmental issues, particularly climate change, and is trying to understand the potential impacts such issues could have on their lives. Nearly 40 years after the start of the international environmental movement, it is an opportune time to move on the public's attention and help citizens to push their governments to enact effective global environmental policies.

In the realm of climate change, the IPCC, which at one point was the focus of a lot of negative attention, is currently viewed as a credible organization that provides real assessments of the technical aspects of climate change. Therefore, it is also a good time to strengthen the capacity of the IPCC and push for the tightening of international climate change policies.

Communication

The proposed changes provide opportunities for treaty regimes to achieve increased internal and external communication. The CPF will facilitate external communication and allow research organizations to share their findings and interests with citizens in developing and developed countries alike. The proposal will also foster research initiatives between institutions in developing and developed countries. This will help build international channels of communication. Within the IPCC, the proposed actions will increase internal communication between working groups. Increased communication will lead to increased information sharing that, in turn, creates more opportunities for potentially valuable exchanges of ideas. New and innovative ideas may accelerate the pace of understanding the science behind climate change and lead to the generation of more responsive actions to address global environmental degradation.

Accessibility and Involvement

Due to technical and resource capacity challenges, many interest groups (in developed and developing countries) do not have access to environmental treaty-making processes and ongoing environmental research in their local communities.

The proposed changes will provide much needed opportunities for developing countries and citizens to access research processes and to understand the impacts that environmental degradation could have on their lives and the lives of future generations. Increased accessibility to decision-making processes and to scientific research will generate new opportunities for dialogue between citizens and their governments and also between developing countries and developed countries about options for addressing the impacts of global environmental degradation.

Concluding Remarks

Environmental treaty-making bodies, including the IPCC, currently use science to assess environmental problems and inform relevant policy actions, but most do not have institutional mechanisms for using science to monitor and evaluate the technical effects of government environmental policy actions. By incorporating monitoring and evaluation mechanisms, like a fourth IPCC working group, international environmental treaty regimes can build their capacity to proliferate scientific understanding of major global environmental problems. The widespread proliferation of scientific knowledge could lead to increasing societal pressure on governments to adopt more meaningful environmental policy actions. Mechanisms for citizen participation in environmental treaty-making processes, like the proposed Citizen Science Fund, will provide incentives for scientific organizations to conduct additional research on the effectiveness of national policy actions and engage citizens across the world in debate about environmental degradation.

Some critics might argue that the proposed mechanisms are too “incremental” and will not produce the kind of change proposed by this paper. This argument may have some credence but an incremental approach will be less likely to provoke regressive reactions from governments who are already hesitant about multilateral efforts to address environmental degradation. Moreover, a successful first step might provide opportunities for bolder actions in the future. In short, the proposed combination of monitoring and participatory mechanisms will facilitate global understanding of “common” environmental problems and hopefully allow science to contribute to meaningful changes in global policy approaches to environmental degradation.

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