

Responsible participation by Scientists and Engineers in International Political Process

MJ Peterson

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A combination of interconnection between societies so strong that governments and peoples alike assume humanity now lives in a condition of globalization and increasing prominence of scientific and technical matters in everyday life has created need for scientists and engineers to participate in international as well as national debates about solving problems, applying technologies to particular purposes, and avoiding or minimizing serious harm. While participation in international debates requires sensitivity to cultural, organizational, and economic differences between societies, it resembles participation in national debates because scientists and engineers can take any of several roles, the political institutions through which cooperation is organized affect the process and outcome of debates, and features of the problem at hand affect the implementation of policies or standards adopted in international forums.

I. The potential roles of scientists or engineers.

Policy-makers and others concerned with a particular issue seek any or all of several types of expert advice depending on how well the issue is understood and how urgent addressing it appears to be. Expert advice may consist of:

- 1.) trend-spotting, the documenting of observable changes in physical processes or conditions;
- 2.) theory-building, the development of causal explanations for the observed changes;
- 3.) theory-testing, the organization of experiments or the acquisition of additional data for testing the explanations,
- 4.) communicating, the presentation of trend-spotting, theory-building, and theory-testing in terms understandable to policy-makers and other non-scientists, and
- 5.) applied-policy analysis, the development of detailed programs for addressing a problem.¹

¹ Typology of expert advice taken from Lawrence E. Susskind, *Environmental Diplomacy; Negotiating More Effective Global Agreements*, 76-77. New York: Oxford University Press, 1994.

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Trend-spotting and theory-building are typically most prominent early in consideration of an issue when governments and others are trying to understand the problem. Results confirmed by theory testers feed into the negotiation phase, where communicating and applied policy analysis come to the fore as governments develop their programs for coordinated action. Trend-spotting continues as agreements are implemented. If new observations call existing causal models into question, theory building and theory testing will be revived. In any event, communicating and applied policy analysis will be needed for discussions of improving compliance with the agreement or amending it to better address the problem.

Some scientists participate directly in the policy making process because they serve as government officials. A few individuals with scientific training have taken up careers in politics and risen to top national positions; these include Margaret Thatcher, Prime Minister of the UK in 1975-1990, and Angela Merkel, Chancellor of Germany since November 2005, who worked as research scientists, and Mahmoud Ahmadinejad, President of Iran since August 2005, who completed a degree in civil engineering. A larger number of scientists and engineers hold civil service positions in national ministries or other agencies with responsibility for developing or implementing policy on particular issues. While working for their particular country, government employed scientists and engineers can become involved in international cooperation either as a member of their country's delegation to an intergovernmental conference or organization or as their country's participant in a transgovernmental network of peer officials assuring coordination of their respective governments' efforts on some problem. They may even be lent temporarily to an intergovernmental organization or another government's counterpart agency.

Scientists and engineers employed by private organizations – business firms, universities, professional associations, testing institutes – can become involved in policy discussions through an advisory role. These scientists and engineers do not participate in making decisions, but their comments influence agreements by indicating what goals are or are not feasible given the current state of scientific or engineering knowledge and by suggesting the most efficacious means of action to reach the goals. Eight such roles exist:

1. Member of an expert advisory body created by an intergovernmental organization. Intergovernmental organizations (IGOs) dealing with areas where technical or scientific information is important for policy coordination frequently rely on standing or temporary expert advisory committees. Their role publicized widely when the Intergovernmental Panel on Climate Change (IPCC) was awarded the Nobel Peace Prize in 2007. The IPCC was created by the World Meteorological Organization (WMO) and the UN Environmental Programme (UNEP) in 1988 to help policy-makers by issuing periodic reports summarizing the increasing number of research results in atmospheric science and assessing the current state of knowledge regarding gaseous emissions and their effect on world climate.² The Codex Alimentarius Commission, an expert body maintained jointly by the UN Food and Agriculture Organization (FAO) and the World Health Organization (WHO), develops recommendations regarding the safety of food, food additives and preservatives, and methods of processing food.³ The UN General Assembly's Committee on the Peaceful Uses of Outer Space (COPUOS) has a scientific and technical subcommittee that works on promoting international cooperation in use of space technology

² See its website at <http://www.ipcc.ch/> (accessed 4 June 2009). The process used to write reports is summarized in the diagram at <http://www.ipcc.ch/ipccreports/index.htm> (accessed 4 June 2009).

³ Information about the Commission and the Standards it has developed is available at www.who.org/codex

and advises its parent Committee on the technical implications of policy decisions, such as the rules for marking launchers and objects placed in space that appear in the Registration Agreement.⁴ The precise extent to which experts can operate as fellow professionals following the best practices of expert reasoning in formulating recommendations varies considerably. This is strongly influenced by the composition and terms of appointment to the particular advisory body. The variety of composition can be appreciated by looking more closely at two expert bodies involved in international cooperation on food safety. The UN Codex Alimentarius Commission works through subcommissions and committees given the task of developing recommendations on particular topics. Most of them have a mixed membership, drawing members from the technical services of national agricultural ministries, other government agencies, and major food processing firms. Inclusion of industry-employed scientists is controversial, inspiring complaints from leftist commentators that subcommissions and committees simply endorse industry desires. In contrast, the Committee on Toxicological Effects of Additives includes only research scientists serving as individual experts.⁵ One-time committees established to produce a particular study, such as the group producing the WHO-FAO Study on Diet, Nutrition, and the Prevention of Chronic Diseases in 2003,⁶ are more likely to be drawn from universities and research institutes.

IGOs structure expert advisory committees in several ways, with the particular structure selected with an eye to having a body that will be accepted as a credible source of the particular type of expert advice needed. The structure depends much less on the type of advice than on the political dynamics. Sometimes an international secretariat serves as a filter, commissioning studies from groups of scientists likely to have some bias owing to their employment affiliation, aggregating the results, and presenting recommendations for the governments. Enforcement of and amendment of lists of endangered species for the Convention on International Trade in Endangered Species (CITES) relies on advice from scientists working for various environmental groups. Governments respect the professionalism of the particular scientists, but also rely on the Secretariat's incentive to identify good information as a way to correct for the likely bias. When different sets of potential expert advisers appear to have different bases, governments can build in corrections by including members of each set in the advisory body. Alternately, they may establish a two-step process in which scientists serving as individual experts lay out trends and suggest theories while applied-policy analysis is undertaken later by scientists serving as government designees and selected to ensure participation from every region of the world.⁷ In the Convention for Protection of the

⁴ M.J. Peterson, *International Regimes for the Final Frontier*. Albany: State University of New York Press, 2005. Also see www.un.org

⁵ Jean Pierre Dobbert, "Food and Agriculture" in Oscar Schachter and Christopher C. Joyner eds., *United Nations Legal Order*. Cambridge: Cambridge University Press, 1995.

⁶ Diet, Nutrition, and the Prevention of Chronic Diseases, WHO Technical Report Series 916, available at www.who.int/hpr/NPH/docs/who_fao_expert_report.pdf (accessed January 18, 2011). Background is provided in Nishida et al, "The Joint WHO-FAO Expert Consultation on diet, nutrition, and the prevention of chronic diseases," *Public Health Nutrition* 7 (1A): 245-250 (200x).

⁷ Though scientists and engineers believe good science or good engineering is the same everywhere, governments, particularly of developing countries, often want to hear from "their own" scientists. As Wilbert Chapman of the US Fisheries Service explained when proposing a regional committee to assess tuna populations and develop management regulations for the Inter-American Tropical Tuna Commission in 1945, "[we need] to gain the facts in conjunction with the Latinos so they will believe them." As cited in MJ Peterson, "International Fisheries Management" In Peter M. Haas, Robert O. Keohane, and Marc A. Levy (Eds). *Institutions for the Earth* (pp 249-305). Massachusetts Institute of Technology, 1993

Stratospheric Ozone Layer, the scientific assessment body deals with ongoing trend-spotting while the technical assessment body handles the applied-policy analysis needed to develop substitutes for any additional chemical substances identified as ozone-depleters.

The terms of appointment help define an advisory group's work, and their significance can be seen by contrasting the Codex Commission with the WHO Committee on International Surveillance of Communicable Diseases, which is responsible for proposing revisions to WHO's various sets of regulations. Unlike the Codex committees, where members are designated by individual governments, members of the Committee on International Surveillance are appointed by WHO's Director-General and their work is governed by a WHO staff regulation stating that the members serve the WHO exclusively and may not request or receive instructions from any government.⁸ Experts drawn from government service are clearly acceptable to the government sending them. Even the experts employed outside government are unlikely to be strong critics of their country's political regime. They are also likely to be relatively senior, known to government officials and fellow scientists alike, since it takes time to establish credentials as an expert in a particular area. Some governments apply more direct "political litmus tests" and recommend only persons known to strongly support the government's position on the matters addressed by the IGO expert body. Other governments are broader in their tolerance. Governments of smaller countries, particularly those in the "low" and "middle" income levels of development, may have limited choice because of the scientific or engineering communities in their countries are relatively small.

2. Member of a national expert advisory body. Even when an IGO or international conference has its own advisory bodies, individual countries often have national expert advisory bodies able to provide the country's delegation with information and suggestions on the topics being discussed internationally. This is particularly likely in the larger and wealthier countries with large scientific and engineering communities. In the USA, much scientific advice is provided through the National Research Council, which draws upon experts in particular fields as government agencies seek advice.⁹ In the United Kingdom, the Royal Society maintains a similar process of convening expert study groups.¹⁰
3. Nongovernmental organization (NGO) or social group representative at an intergovernmental organization or international conference. As IGOs and international conferences have become more open to expressions of opinion from NGOs, transnational social movements, or – in the UN Commission on Sustainable Development – members of particular social constituencies like farmers, labor, women, and youth, some scientists and engineers have represented NGOs, constituencies, or other entities. While these representatives cannot speak at meetings or introduce formal proposals, they can follow proceedings and present opinions and ideas to the national delegates who negotiate and adopt the declarations, action plans, or other documents issued by the IGO or conference.
4. Member of NGO or social group communicating ideas and information to their country's officials participating in a transgovernmental network. Though the members of transgovernmental networks seldom gather for formal meetings, their ongoing interactions often inspire NGOs, social groups, and

⁸ José E. Alvarez, *International Organizations as Law-makers*. Oxford: Oxford University Press, 2005, p. 246.

⁹ Information on the National Research Council and its procedures is available at <http://sites.nationalacademies.org/nrc/PoliciesandProcedures/index.htm>.

¹⁰ Information on the Royal Society's activities is available at www.royalsociety.org/policy.

business firms to link up in their own networks to coordinate information provision and policy advocacy with the various national members of the transgovernmental network.

5. Member of private standard-setting body. Individual engineers are more likely than individual scientists to serve as a member of a private standards-setting body or of one of the technical committees drafting recommended standards since most of these efforts relate to standards for physical products or production processes.
6. Leader of a professional association. National and transnational professional associations typically avoid involvement in political controversy for three reasons: to avoid tensions among members holding different political views, to maintain their social role as experts, and to avert difficulties with the government in countries where traditions of allowing private self-organization are weakly established. Occasionally, however, professional associations do take stands on matters clearly within the domain of their expertise that have become the subject of international policy debate. When debate over climate change intensified in the USA after release of the IPCC's Third Assessment in 2001,¹¹ both the American Meteorological Society and the American Geophysical Union issued statements supporting the Assessment report of scientific consensus that human-caused greenhouse gas emissions were increasing atmospheric temperatures to the point of inducing global warming.¹²
7. Participant in a scientific or engineering epistemic community seeking to exert influence transnationally. An epistemic community is a group of scientists or engineers who share substantive expertise on some matter, a common way of acquiring and assessing empirical evidence about the state of the world and the causal processes that produce that state, a belief that international cooperation is needed to address the problem, and a particular proposal for organizing that cooperation. An epistemic community operates differently from economic interests and other politically active groups because of its distinctive patterns of developing and amending policy proposals. These patterns are not set by the calculations of material interest that typically motivate economic interests or the broad normative propositions that motivate many other sorts of groups; epistemic communities are guided by their scientifically established understandings regarding causes and solutions of the problem at hand.¹³ Before establishment of the IPCC in 1988, atmospheric scientists worried about global warming had gotten together on their own and sought media attention for their research and concerns.
8. Public Intellectual/Citizen Advocate. Individual scientists and engineers can also enter policy debates directly as public intellectuals or citizen advocates addressing the general public – including any elected or career government officials in the audience – through mass media or blogs.

¹¹ Intergovernmental Panel on Climate Change, Third Assessment Report, 2001. Available at <http://www.ipcc.ch/ipccreports/tar/vol4/english/index.htm>. (Accessed 4 June 2009).

¹² American Meteorological Society, "Climate change research: issues for atmospheric and related sciences," February 2003 available at www.ametsoc.org/POLICY/climatechangeresearch_2003.html (accessed January 18, 2011); American Geophysical Union, "Human impacts on climate," December 2003, available at www.agu.org/sci_soc/policy/positions/climate_change.shtml (accessed June 2009).

¹³ The characteristics and workings of epistemic communities are discussed in Peter M. Haas, ed., Knowledge, Power, and International Policy Coordination, *International Organization* 46(1) pp. 1-35 (1992).

II. Political Dynamics Scientists and Engineers Need to Understand

The Political Process

Modified by adjectives, the word “politics” has been applied to activities ranging from competition for influence and superior managers’ attention in the workplace (“office” or “workplace” politics), through participation in political parties’ efforts to win elections (“electoral politics”), through participation in legal organizing activities (“conventional politics”) through participation in sometimes-legal, sometimes-illegal protest activities intended to force a government to change policies (“contentious politics”) to participation in efforts to overthrow a government (“revolutionary politics”). The unadorned noun “politics” is generally used to denote processes of using formal political institutions to make collective decisions that define social goals and the means by which those goals will be attained. Defined in this way, the political process is best understood as characterized by several phases with alternate paths and feedbacks that frequently create a continuous loop of cycling through the phases as goals are redefined or means shifted.¹⁴

In the usual order of presentation, the phases of the political process are:

1. Demand formulation. The political process starts outside the public realm, in individuals’ or groups’ perception that some concern, issue, or problem requires society-wide attention because individual or group action cannot address it effectively. An individual or group that believes it can handle something effectively with its own effort and resources will not define that matter as “political;” it will simply deal with the matter itself. Individuals or groups will raise political demands whenever engaging the centralized administrative and enforcement structures of government appears necessary to satisfactory action on the matter. Matters get on the international level agenda, and are addressed by groups of governments or by IGOs when enough governments are persuaded that the matter deserves group or IGO consideration.
2. Agenda setting. While any individual or group can come up with a political demand, securing attention requires persuading others that the demand deserves attention from the relevant political institutions. Here it is important to distinguish between items gaining public attention in the sense of being reported in the media, discussed on blogs, or talked about among family, friends, and neighbors. Real and imagined details of celebrities’ personal lives receive considerable public attention, but seldom inspire political demands because no one thinks they require some decision out of government. Large electrical power outages are reported, but inspire political demands only when restoration of the grid takes longer than people think is reasonable. Similarly, the high post-World War II growth of human population was discussed among demographers and environmentalists as a “population explosion” for several years before the government of Malta asked in 1962 that it be added to the agenda of the UN General Assembly.

Many demands never reach the agenda of actively considered political concerns. Some fail to reach the agenda because they appeal to very few others; some fail because of opposition from influential persons or groups who use their influence to keep the demand off the agenda. Over time persistent demanders can gain more attention, gain support from those who were initially indifferent, or even weaken opposition to considering the demand, but this does require more effort. At the international level, demands advanced by major countries or groups of countries are more likely to

¹⁴ The clearest statements of this conception include John Kingdon ; Reference to discussions.

secure attention than demands from small countries. Similarly, non-state actors like multinational corporations, large nongovernmental organizations based in the industrial countries, and transnational advocacy coalitions with members in major countries find it easier to gain attention than those active only in one or a few countries or lacking sufficient resources to maintain up-to-date websites, send members to IGO meetings, or engage in protests in major cities where they will get international media attention.

3. Consideration. Inclusion on the agenda is followed by active consideration of the issue. This can involve any of several activities, including asking advisory bodies for data about conditions and advice about the feasibility of possible courses of action, during which goals are defined and various means for their attainment are suggested. The discussions and negotiations that form the largest part of consideration in an international organization or conference are particularly challenging because governments are concerned with developing proposals that will simultaneously attract enough support from other governments to be adopted in the international body and from enough government agencies and private actors at home to be accepted and implemented.

Consideration usually leads to decision-making, but the shift to decision may be delayed if no proposal attracts sufficient support. Supporters believing they will be able to secure more support if they have more time to negotiate or to persuade can “mark time” by sending (or returning) the matter to a committee or by commissioning more studies. Within countries, legislative committees, special commissions of inquiry, requests for advice from scientific or technical groups, public hearings, and procedures for securing public comments on proposed policies can all be used to create delay. Proposals can also be “buried” – deferred by opponents expecting to prevent a decision by diverting the discussion to a legislative committee or to some advisory body where opponents predominate and can be relied upon to avoid the matter. Internationally, IGO secretariats, ad hoc commissions, and advisory bodies can fulfill similar delay or burial functions.

4. Decision. Decision is the moment of determining what proposal, if any, will be adopted as policy. In formal organizations, decision involves some explicit, pre-defined, voting procedure specifying the amount of support required to consider the proposal adopted.

In parliamentary countries, where the prime minister and other heads of government departments are the leaders of the political party or coalition of political parties that won the most recent legislative election, this link of the executive and legislative branches normally assures the government of a majority for any proposal it puts forward. In countries where the executive branch leaders and the legislature are elected separately, different parties may control each and the executive face a much harder time getting proposals accepted. Within intergovernmental organizations, proposals are not brought up for a vote until supporters are confident that they have enough support to get them adopted.

5. Implementation. Unless the decision specifies doing nothing, it needs to be implemented – followed by actions that turn the words of the decision into a real world outcome. Opponents and lukewarm supporters can undermine a decision at the implementation phase through inaction; some opponents may go further and act contrary to the terms of the decision. Even inaction can effectively nullify a decision if it is sufficiently widespread.

The opportunities for weakening a decision afterward through inaction, slow action, or incomplete action are even greater at the international level where implementation is typically done by individual governments' officials rather than a strong, centralized regional or global agency. This is true even in the European Union, though the EU does have better procedures for monitoring national action and more ways to prod member governments into action than other IGOs.

6. Review. All policies are projections resting on assumptions that implementation will follow and that the particular set of actions endorsed in the decision will produce the desired outcome. Review is the process of continuously or periodically assessing the extent to which implementation has occurred and to which the actions taken are contributing to attainment of the goal. Consciousness that even complete implementation may not lead to goal attainment is particularly strong among students of international environmental politics, who routinely distinguish between "compliance with" – governments and others carrying out the actions prescribed – and "effectiveness of" – the actual environmental improvement gained from those actions – an environmental agreement. Reviews revealing weak implementation are likely to trigger efforts to get laggards to perform better, even including follow-up decisions strengthening incentives to implement. Reviews revealing little progress towards stated goals despite considerable implementation are likely to trigger reconsideration of the policy itself. When explicit follow-up decisions revising implementation schemes or adopting new policies are desired, action shifts back to agenda-setting if there is wide disagreement on the need for follow-up decisions or a new policy, or to consideration if there is. Tacit changes can be produced more easily, through shared interpretations of rules or understandings that certain actions can be omitted.

This summary of the process might suggest a neat linear process from demand formulation to review. Actual politics is far messier: the process can stall in any of the phases. If it does, revival may require shifting back into previous phase to re-start the process. The various ways the process can stall and the pathways through which it might be restarted and indicated in Figure 1.

Each intergovernmental organization or standards-setting bodies has procedures for taking up, considering, and deciding on policy questions. Though the exact agenda-setting and decision making procedures vary from organization to organization, they can be divided into a number of generic types, each with features that influence how the political process plays out. Understanding the implications of these generic features and identifying which features have been combined to what effect in the rules of a particular organization are essential to effective participation in it.

Rules for Agenda-Setting

In most IGOs, agenda-setting is bounded by the limits of the organization's mandate. These limits can be geographic – the European Union, the African Union, the Organization of American States, the Arab League, and the Association of Southeast Asian Nations all operate among a regionally defined set of member states. They can be substantive – each of the UN Specialized Agencies, Offices, and Programs addresses particular issues; only the General Assembly has authority to deal with any sort of international question.¹⁵ They can be a combination of both – the Antarctic Treaty Consultative Parties deal with

¹⁵ United Nations Charter, 1945, Article 10.

questions arising from management of activity on the Antarctic continent or islands and seas south of the 60 degree S latitude line.¹⁶

Many IGOs have an open agenda: each member state has the right to propose as many agenda items as it wishes. Some IGO bodies establish a deadline so that items are proposed before the session of meetings starts; others allow items to be proposed during the session. Where such a rule prevails, the nominal agenda is usually longer than can be handled at the current session because of time constraints. Items that interest few other member states are accordingly ignored or put off until a later meeting. The items that are left form the IGO's effective agenda and move on to the consideration phase.

Rules for Decision

Each international conference and intergovernmental organization has its own decision rules. These specify a.) how much support is required for adopting a decision and b.) whether that decision is a recommendation that member states may take up or ignore as they choose, or a binding decision that they are expected to follow.

Rules defining the amount of support needed can vary in two ways: by the number of votes each member state may cast, and by the size of the majority needed for adoption. International conferences and most IGOs operate under a one state-one vote rule in which every member state casts a single vote. Some IGOs, including the World Bank, the International Monetary Fund, and the European Union, use systems of weighted voting in which member states have varying numbers of votes. The number of votes assigned to a particular member may be based on population size (as in the EU), relative size of the national economy (as in the World Bank and the International Monetary Fund), or any other criterion that the member states agree to use when setting up the organization.

IGOs and international conferences can use any of several rules defining the size of the majority required to adopt decisions:

- unanimity: all members must support the decision;
- consensus: all or nearly all members must either support the decision or at least let the decision be adopted even though they are not fully persuaded;
- supermajority: a majority larger than 50% plus 1 of the votes cast: two-thirds (typically defined as 67% of the voters) and three-fourths (75% of the voters) are the most commonly used supermajority rules, but others have been adopted in particular organizations;
- simple majority: a majority consisting of 50% plus 1 of the votes cast;
- veto: a majority rule modified by an additional requirement that certain members vote with the majority: the UN Security Council where any one of the five Permanent Members (Britain, China, France, Russia, USA) can stop a decision by a negative vote is the most prominent use of this rule.

¹⁶ Antarctic Treaty, 1959, Article VI.

Combining variation in the number of votes each member state casts and in the number of votes needed for adoption yields 10 logical possibilities:

	unanimity	consensus	supermajority	simple majority	veto
1 vote per state					
weighted voting					

Weighted voting and supermajority can be combined to produce rules balancing extra voting rights for larger or wealthier members with assurances to smaller or poorer members that the largest vote holders will not be able to adopt major decisions on their own. The IMF requirement that decisions to change quotas (the amount of money each member state commits to the fund) require that 85% of the votes be cast in favor. This rule is usually described as favoring the wealthiest members because it allows the USA (16.74% of the votes) or France, Germany, and the UK together (15.57% of the votes) to prevent change. Yet, it also means that any coalition of members able to muster more than 15% of the votes can do the same. Japan's 6.01% give East Asian members a good start towards blocking, and if all developing countries voted together, their cumulative percent of the vote would also suffice.¹⁷ In the European Union, the European Council, the executive body of member states, and the European Parliament both distribute votes among member states on a weighted basis. In the Council, this is done by giving each member state's representative varying numbers of votes; in the European Parliament this is done by giving each state represented by a different number of members holding one vote each.¹⁸

The impact of different voting rules becomes apparent in the following examples of decision-making in a hypothetical IGO having 20 member states:

Distribution of votes	Majority required	Number of supporting members needed
one vote per state	simple	11
same	2/3s majority	14
same	3/4s majority	15
same	unanimity	20
States 1-5 hold 5 votes each; States 6-10 hold 3 votes each; the rest hold 1 vote each (60 votes total)	simple (31 votes)	Least: 7 (states 1-5 and any 2 of states 6-10) Most: 17 (states 11-20, states 6-10, plus any 2 of states 1-5)
same	2/3s majority (40 votes)	Least: 10 (states 1-5 and 6-10) Most: 18 (states 11-20, states 6-10, plus any 3 of states 1-5)
same	3/4s majority (45 votes)	Least: 15

¹⁷ Distribution of votes among IMF members updated in January 2011. Available from <http://www.imf.org/external/np/sec/memdir/members.htm> (accessed 18 January 2011)

¹⁸ See chart of EU vote distribution on the last page.

		(states 1-5 and 6-10 plus any 5 of states 11-20) Most: 19 (states 11-20, states 6-10, plus any 4 of states 1-5)
same	unanimity	20

As the table indicates, the size of the majority needed for adoption is important because it determines the number of members who must be persuaded by a proposal. A typical UN-related organization has at least 150 member states. In an IGO that size, 76 members are a simple majority, 101 are a 2/3s majority, and 113 are a 3/4s majority. The larger the majority required the harder supporters of proposals have to work on attracting support. This usually requires modifying proposals to meet others' objections, and may – if disagreement is strong – mean watering down proposals by removing any element inspiring serious objection. However, a strong sense of urgency to address a problem and a willingness to try new approaches can permit escape from the dynamics of “least common denominator” politics.

III. Scientists and Engineers in International Level Policy-Making Processes

Operating in or with IGOs.

The opportunities for influencing decisions open to scientists and engineers in advisory roles as members of expert committees or representatives of NGOs and social groups vary considerably across IGOs. These opportunities will be greater when any of four conditions are present, and particularly wide when all four exist:¹⁹

1. Most member states have political cultures and ideologies receptive to self-organizing by, and comments or suggestions from interest groups, social movements, and individual citizens and these impulses are carried into the IGO. States vary considerably in their receptivity to NGO activity. Though both the fascist and Leninist regimes that sought to control all aspects of national life have disappeared, some governments still seek to channel group, movement, and citizen activity. One device for exercising such control is through creation of nominally independent but actually government-guided organizations (known to students of politics as “government-organized nongovernmental organizations” or GONGOs).
2. The particular IGO forum dealing with the problem has already developed formal rules or informal practices encouraging nonstate actor observation at meetings, contact with the secretariat and national delegations, or holding their own “parallel forums” (a common practice at UN-sponsored global conferences) for developing joint statements issued to the media and to conference participants.
3. The particular IGO is part of a “family” or “system” of related IGOs and takes cues from another IGO in the system that uses expert advisory committees extensively or allows representatives of nonstate actors to observe meetings and communicate with the secretariat or national delegations;

¹⁹ Drawn from discussions in Robert W. Cox and Harold Jacobson, *The Anatomy of Influence: Decision-Making in International Organization*. New Haven: Yale University Press 1974; Ernst B. Haas, *When Knowledge is Power*. Berkeley: University of California Press, 1990; Dennis Dijkzuel, *The Management of Multilateral Organizations*. The Hague: Kluwer Law International, 1997.

4. The IGO's secretariat has discretion to establish expert committees and/or ability to choose who will be invited to observe meetings or communicate with the organization, and uses that discretion to foster such contacts.

Because they typically meet only once, international conferences do not use expert advisory bodies. However, the process of getting governments to agree on holding a conference may be assisted by an expert committee created by an IGO, national expert bodies, or a transnational epistemic community. IGOs, with their continuously functioning secretariats and decision-making bodies meeting in regularly scheduled repeated sessions, have more scope for using expert advisers and advisory committees. Expert bodies are very common in IGOs dealing with issues or problems that member states' governments regard as technical. They may be developed in other IGOs for answering particular technical questions that arise in the course of considering other issues.

Operating in or with networks

Epistemic communities, transnational advocacy coalitions, and social movements tend to prefer network organization over bureaucratic hierarchy. Their members are linked together more by shared ideas – political ideologies, moral values, visions of the good society – and shared concerns about particular issues than by superior-subordinate relations and job descriptions. As private entities rather than government agencies (or “nonstate actors” in the parlance of international relations scholars), networks gain entrée into international policy processes through contacts with IGOs, contacts in the governments of particularly influential states, or both.

IV. The Impact of Problem Characteristics on Policy

Whether decisions, implementation and review occur in an organization or a network determines how they proceed, but has little effect on the ease or extent to which they succeed. Ease of proceeding and degree of success are affected far more by certain characteristics of the problem or issue itself. The most important characteristics are the type of cooperation involved and the geographical extent of the problem. The extent to which different preferences on the matter parallel or cut across preexisting political alignments or economic connections may also affect the likelihood of stalemate in the decision phase or success in implementation.

Public choice theorists routinely distinguish between two types of cooperation.²⁰ Collaboration arises when member states agree on a common goal but different ways of reaching the goal offer each participating state a different net gain. For example, governments can easily agree on the general goal of reduce air pollution because the health and other benefits are clear today. However, a decision to reduce air pollution by focusing primarily on sulfur emissions will require states using bituminous (“soft”) coal as their major fuel to make greater changes in economic activity than states using natural gas. The states facing high costs will prefer focusing on some other type of emission or else seek “compensation” for their higher costs through such related devices as loan programs or longer periods of time for reaching the agreed emissions limit. Coordination arises when states agree on the goal and do not face significant differences in net gain

²⁰ E.g., Kenneth Oye, “Cooperation under Anarchy,” *World Politics* (1985).

from a particular and obviously effective method of reaching it. Agreement on the goal will be followed by rapid convergence on the method.

The geographical extent of the problem, whether considered in terms of the benefits to be provided to participants or the undesired outcomes to be avoided, influences how many states need to be involved. Some problems, such as maintenance of the stratospheric ozone layer or avoidance of additional human-induced atmospheric warming, need to be addressed globally. The greenhouse gasses that yield atmospheric warming are produced in all countries (though about 80% came from 25 countries in 2005²¹); reducing total emissions requires not only that current large emitters cut back but that current small emitters also limit their increases. While the chloroflourocarbons (CFCs) and freons that contributed the most to ozone depletion in 1990 were manufactured by a few large chemical companies in industrial states, the combination of higher cost for the less-damaging substitutes and easily-diffused manufacturing technology for CFCs and freons meant that only a global agreement to halt CFC and Freon use could prevent shifting production to other countries. Other problems, such as management of a river watershed, affect a particular region and can be handled by the states in that region. A few problems require cross-regional cooperation among a large number of states, but less than global cooperation, because some countries provide neither sources of nor solutions to the problem. This pattern characterizes efforts to assure safety of ocean navigation and prevention of pollution from ships; states that have no ports and register no ships do not need to be involved.

Existing political alignments and economic connections affect the way governments perceive problems. In the 1970s the USSR was eager to discuss the problem of long-range transboundary air pollution in the UN Economic Commission for Europe because it was one of the few issues on which opinions were not frozen into the Cold War rivalry. Developing country worries that environmental issues will be used to justify decisions that would limit their prospects for development have been a constant theme in international environmental negotiations and a strong reason for their insistence that environmental issues be handled in forums operating under one state-one vote rules.

Implementation and review are very sensitive to the resources applied to those phases of the process. Implementers, whether IGOs, transgovernmental networks, national administrative agencies, or private entities, need money, equipment, and personnel to perform their tasks adequately. Governments' reluctance to establish autonomously-funded IGOs has kept most implementation in the hands of national agencies, with all the unevenness that results from the wide variation in size and funding of administrative agencies around the world. This is true even in the European Union, where the EU's revenues are defined shares of the tariff and value-added tax (VAT) revenues collected by the member states. Administrative unevenness occurs even in the EU, though it is less noticeable there than in other parts of the world because most members have relatively large and relatively well-funded administrative agencies.

Both implementation and review depend on the competence of the persons carrying them out. This has been acknowledged internationally in the proliferation of capacity-building programs to help developing countries train experts and administrators in scientific and technical fields. Intergovernmental organizations also face capacity problems. The combination of norms calling for recruitment of IGO staff from a wide selection of member states (most elaborately formalized in the UN system specification of "desirable

²¹ Calculated from the World Resource Institute's data on greenhouse gas emissions by type and source country at http://earthtrends.wri.org/pdf_library/data_tables/cli3_2005.pdf (accessed 25 June 2009.)

ranges” from each member state in the hiring of professional-level staff), practices of allowing member governments to “ earmark” particular positions for their own nationals, and the existence of small professional communities in many states often means that technical competence comes fairly far down the list of criteria for hiring. The general problem of balancing among multiple criteria in hiring is shared by governments and other sorts of organizations as well. However, the obstacles to change seem to be greater in IGOs than elsewhere, partly because member states pay close attention to the nationalities of staff and perhaps because scandals produced by incompetence in IGOs usually receive little public attention because they seem so remote from citizens’ daily concerns.

Maintaining competence, securing implementation, and having good review are enhanced whenever governments and private stakeholders can observe events and assess the extent of implementation and the amount of progress toward goals using widely-agreed measurements of success. In many technical fields, there are agreed physical measures, such as % of different gasses in the atmosphere or parts per million of contaminants in water, in which case the main problems of implementation review involve timely and honest provision of data. Success in containing contagious diseases can be assessed with timely reports of additional cases – continued or accelerating increase in new cases indicating spread and decrease in new cases indicating containment.

Chart: Allocations of Votes in European Union Institutions

Member country	Votes in Council	members of Parliament	% of EU population	population (2005)
Austria	10	18	1.67%	8.2 million
Belgium	12	24	2.14%	10.5 million
Bulgaria	10	18	1.57%	7.7 million
Cyprus	4	6	1.63%	0.8 million
Czech Rep.	12	24	2.08%	10.2 million
Denmark	7	14	1.10%	5.4 million
Estonia	4	6	0.28%	1.4 million
Finland	7	14	1.06%	5.2 million
France	29	78	12.37%	60.6 million
Germany	29	99	16.84%	82.5 million
Greece	12	24	2.26%	11.1 million
Hungary	12	24	2.06%	10.1 million
Ireland	7	13	0.84%	4.1 million
Italy	29	78	11.93%	58.5 million
Latvia	4	9	0.47%	2.3 million
Lithuania	7	13	0.69%	3.4 million
Luxembourg	4	6	0.10%	0.5 million
Malta	3	5	0.08%	0.4 million
Netherlands	13	27	3.30%	16.3 million
Poland	27	54	7.80%	38.2 million
Portugal	12	24	2.14%	10.5 million
Romania	14	35	4.40%	21.6 million
Slovakia	7	14	1.10%	5.4 million
Slovenia	4	7	0.41%	2.0 million
Spain	27	54	8.77%	43.0 million

Responsible participation by Scientists and Engineers in International Political Process

Sweden	10	19	1.83%	9.0 million
UK	29	78	12.24%	60.0 million
needed to adopt	a majority of states casting 232 votes			
Total EU27	345	785		490 million

Votes and population from European Union, *The European Union: A Guide for Americans* (2006), p. 4.

[Note: If approved (its future was uncertain in June 2009), the Treaty of Lisbon specifies that after 1 August 2014 adoption of decisions taken by Qualified Majority Voting will require yes votes from 55% (15) of the member states having 65% of the EU's combined population. A blocking vote (opposition sufficient to keep supporters from meeting the population criterion) will need to include negative votes by at least 4 states.]

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