

ENVIRONMENTAL CITIZENSHIP IN LATIN AMERICA

Climate, Intermediate Organizations, and Political Subjects

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Abstract: In recent decades, the impacts of climate on society and on human well-being have attracted increasing amounts of attention, and the forecasts that predict such impacts have become more accurate. Forecasts are now distributed and used more widely than they were in the past. This article reviews three cases of such use of forecasts in Latin America. It shows that in all cases, the users are concentrated in particular sectors and regions (agriculture in the Argentine pampas, fisheries on the Peruvian coast, water resources in northeastern Brazil) and that the forecasts are distributed not by government agencies but by intermediate organizations—semistatal organizations or nongovernmental organizations. It draws on the concept of environmental citizenship to discuss these cases and assesses them for such attributes of citizenship as equity, transparency, accountability, and promotion of collective goals. It traces the implications of these cases for the current era of global warming.

We would like to thank a number of people for their assistance. Without the generous and patient cooperation of the staff of the Asociación Argentina de Consorcios Regionales de Experimentación Agrícola, the Instituto del Mar del Perú, and the Companhia de Gestão de Recursos Hídricos, we could not have written this article. Our colleagues at the Center for Research in Environmental Decisions (CRED) and the International Research Institute for Climate and Society (IRI), both at Columbia University, gave useful advice and direction during the research reported here and during the writing of this article. Fernando Ruiz Toranzo, João Lúcio de Oliveira, Francisco de Assis de Souza Filho, Eduardo Sávio Passos Rodrigues Martins, and Francisco Teixeira also provided valuable assistance. In addition, we benefited greatly from the thoughtful suggestions of the people who commented on earlier drafts of this article: the journal's special issue editors José Jouve-Martín and Marianne Schmink, and Andrés Barragán, Elvira J. Bomsonne, Monique Borgerhoff, Marisol de la Cadena, Don Donham, Joe Dumit, Jelmer Eerkens, Cristiana Giordano, Laura Graham, Frank Hirtz, James Holston, Fabiana Li, Beth Rose Middleton, Suzana Sawyer, Kevin Welch, and Li Zhang. We are grateful to the U.S. National Science Foundation, which supported the research discussed in this article through Grants NSF SES-0345840 and CNH-0709681, as well as the São Paulo Research Foundation (FAPESP) and the Comitas Institute for Anthropological Study (CIFAS), which assisted the Brazilian portion of the research. Additional

Latin American Research Review, Special Issue. © 2011 by the Latin American Studies Association.

INTRODUCTION

Climate, one of the most pressing environmental issues, is one of the most global as well, because all nations experience the impacts of climate change, and because their actions influence the production and absorption of the greenhouse gasses that cause climate change. Discussions of climate change politics often group countries in Latin America and other regions by characteristics such as per capita gross national product, location, and principal types of ecosystems, so that Brazil is categorized with India, China, and Russia as emerging powers (Kasa, Gullberg, and Heggelund 2008), and Costa Rica with Papua New Guinea as small tropical-forest countries (Laurance 2008). These typologies may help explain the positions that different countries take on international climate agreements, but they do not clarify the internal dynamics of environmental politics. In this article, we compare cases from several Latin American countries to explore the ways that climate issues have expressed themselves in this region. The broadly parallel character of national political histories within Latin America since the end of direct colonial rule roughly two hundred years ago facilitates this comparison. We hope that the patterns that we identify promote further work on climate politics and environmental politics in Latin America and in other regions.

More concretely, we focus on three cases in Latin America in which there has been active use of climate forecasts in recent years. Each of these cases is concentrated in a particular economic sector in a particular region (commercial agriculture in the Argentine pampas, fisheries off the Peruvian coast, and water management in the semiarid northeastern Brazil). The forecasts in these three cases are primarily seasonal to interannual forecasts; they indicate whether an upcoming season or year is likely to be warmer or cooler, or wetter or drier, than usual. Such forecasts are associated with climate variability (the fluctuations of conditions in the atmosphere and oceans, which are a constant feature of our highly dynamic planet) rather than climate change (the human-induced shifts in concentrations of greenhouse gases, with their associated consequences of significant warming). The forecasts provide useful information to farmers, owners of fishing boats, and water managers in reaching decisions about their activities in the coming months. Although climate change is a larger and more pressing problem than climate variability, it is also a newer issue. Because forecasts of climate variability have been used for a longer period in Latin America than the forecasts of climate change, they can be studied more fully and can offer insights into important dynamics of environment and society.

This article suggests that the climate issues show with particular clarity that the present moment is one in Latin America (and elsewhere, although that lies outside the scope of this article) of growing attention to what can be called environmental citizenship—the position of individuals within political collectivities that are constituted in part through their connections to territories with specific environmental characteristics, such as topography, climate, biomes, resources,

support was provided by the Inter-American Institute for Global Change Research (Grant CRN-2031), which is supported by the National Science Foundation (Grant GEO-0452325).

and hazards. As environmental citizens, the individuals within these collectivities address the opportunities and risks within these territories and seek to obtain significant and valuable knowledge about the territories. A review of these cases reveals some important commonalities in the forms of environmental citizenship they represent. In particular, the cases show that access to climate information is mediated by a specific type of organization of restricted spatial and sectoral scope, which suggests that this particular component of the expansion of citizenship is different from the more universal and state-centered avenues that have been more widely considered in the past.

At a fundamental level, these cases show different views of the forecasts and projections that form a key element in addressing the challenges and opportunities of climate variability and climate change. Are these forecasts and projections simply an economic good, one that private or public suppliers might provide to households and firms? If so, what is the measure of their value, and what public support should be given to them? Alternatively, are they rights to which individuals are entitled? If so, on what basis may individuals claim this right, and how is the right to be protected? These questions—tied to the specific arena of climate—raise the fundamental issue of environmental citizenship: the relationship between individuals and collectivities in an era in which both individual and collective well-being and identity are tied to the environment.

ENVIRONMENTAL CITIZENSHIP

The concept of environmental citizenship refers to the broader idea of citizenship, one of oldest notions in Western political philosophy. The subject of lengthy debates for centuries, it had been discussed relatively little during the Cold War but has attracted increasing attention since the 1990s (Cohen 1999; Leydet 2006). Perhaps the one point on which most writers can agree is that questions of citizenship address the position of individuals within political collectivities; where their disagreements lie is the nature of this relationship between individuals and political collectivities.¹ A number of writers (Marshall 1950; Béland and Hansen 2000) note three dimensions of citizenship, although they characterize the dimensions in slightly different terms. The first, which we call the legal dimension, centers on the formal status of the citizen, defined by civil, social, and political rights, and considers the scope of personal autonomy and freedom of expression, as well as other freedoms that the law accords the individual.

A second, the procedural dimension, addresses the formulation of the law and other political institutions and considers the role of the citizen in shaping them, particularly through direct participation and through representative democracy in different forms and at different scales. The third, the identity dimension, examines the sense of membership in the collectivity itself; it addresses questions

1. This definition rests on another concept, politics, which is also the subject of extensive discussion; in this context, we suggest a distinction between political collectivities, often sovereign entities, and other social, cultural, economic, and religious collectivities while recognizing the often significant overlap between them.

of citizenship as an identity and considers the specific forms of incorporation into the collectivity. Feminist scholarship has played an important role in developing this dimension as a topic of discussion, although other forms of difference have increasingly attracted attention as well. The growth of the identity dimension has led to an increasing attention to the discursive and performative contexts in which citizenship is represented and contested; these contexts are the sites of the cultural constitution of citizenship, and so participation in these contexts overlaps with the forms of action that make up the procedural dimension. Until a generation or so ago, discussions centered on the state as the locus of citizenship; more recent work (Sassen 2006) has drawn attention to other political collectivities, including international and transnational entities at larger scales, ethnic communities, gender identities, and local and regional collectivities at smaller or crosscutting scales, and indeed discursive communities constructed through the media. In a sense, the legal, procedural and identity dimensions of citizenship bear a family resemblance to the familiar triad of *liberté, égalité, and fraternité*, the most widely remembered of the numerous slogans of the French Revolution, the historical event that marked a crucial moment in the transformation of the population from subjects within monarchies to citizens within republics (Ozouf 1997). It is worth noting as well the generally progressive character of citizenship, as most studies point to the expansion of citizenship to include more categories of persons within society and more aspects of social life and human well-being. This expansion often comes from pressure from those who are excluded (Glenn 2000;

Table 1 Dimensions of Citizenship

Dimension of citizenship: Name	Dimension of citizenship: Locus of concern	Dimension of citizenship: Name in Marshall (1950)	Attributes of dimension in relation to use of climate forecasts at a given point in time	Attributes of dimension in relation to trends of use of climate forecasts
Legal	Rights and freedoms	Civil	Equity of access to forecasts (by class and region)	Expanding access to forecasts (by class and region)
Procedural	Participation and representation	Political	Accessibility and openness of organizations that provide forecasts	Increasing accessibility and openness of organizations that provide forecasts
Identity	Membership and incorporation	Social	Use of collective goals for providing forecasts	Increasing linkage of forecasts to collective goals

Przeworski 2009), although it can also be the result of co-optation from above (Coleman and Davis 1983).

The study of environmental citizenship, linked to all three of these dimensions, emerges from the long-standing tradition of studying territorial and spatial aspects of citizenship. Some of these aspects are closely linked to the legal dimension, such as the right of the citizen to move freely within the territory of the collectivity and the obligation of the citizen to participate in the defense of the collectivity at times of war (phrased differently, this obligation can be understood as a limit to the freedom from such obligations that prevails during peacetime). Others are connected with the procedural dimension, such as the right of the citizen to participate in debates about the management of resources within the territory of the collectivity, particularly in the face of private or foreign ownership. Still others address the identity dimension. To offer one set of examples, different strands consider the specific status of indigenous communities, the role of the frontier in the formation of the collectivity, and the occupation of the full territory as a key task for the national community; these instances show the simultaneous differentiation of types of citizens and types of space, and the environmental dimension of the national imaginary as well. More broadly, the attention to environmental citizenship is consonant with other territorial contexts of reshaping of citizenship in Latin America now, whether focusing on the decentralization and the spatial scale of democratic governance (Willis, Garman, and Haggard 1999; Falleti 2005; Kauneckis and Andersson 2009), on the autonomy of indigenous (Yashar 1999) and African diasporic communities (Ng'weno 2007), or on the organization of peripheral urban settlements (Holston 2008). As these cases suggest, environmental citizenship, and the broader framing of spatial and territorial aspects of citizenship, share in the notion of a progressive trajectory of citizenship, in which it expands over time to include more categories of persons and more areas of rights, freedoms, and participation.

Although we focus in this article on climate issues, we see many other areas for the empirical study of environmental citizenship, understood as environmental issues in which individuals engage as members of political collectivities, rather than economic, social, cultural, or religious collectivities. These include management of resources such as forests, water, minerals, petroleum, and natural gas; control of protected areas; and land use policies in urban and rural areas. They also include domains in which nature is central to the identities of political collectivities (Orlove 1993, 1998; Coronil 1997).

The climate issues also bear a general similarity to other areas in which the expansion of scientific knowledge and citizenship are linked. As Beck has argued in his discussion of risk society—initially developed for advanced industrial societies (1986) but extended in later years to the entire world, including Latin America (2007)—citizens make claims on their governments to assure acceptable levels of risk and to draw on science and technology to this end, even though many of these diverse risks, such as pollution, industrial accidents, and identity theft, were paradoxically created by the application of science and technology. Although the specific risks and the details of the science and applications vary greatly, citizens come to believe that governments take steps to draw on medicine to address epi-

demics; to use microbiology to guarantee food safety; and to apply engineering, materials science, and geology so that buildings, bridges, and other infrastructure will not present dangers. The examples can be multiplied; a person would not drink water from a fountain, step into an elevator, or board an airplane without the belief (possibly diffuse and even unconscious) that some government entity was offering scientifically informed protection to reduce risks to tolerable levels. In this article, we seek to explore the ways that climate science is entering this broad realm of citizenship that includes science and technology, governance, risk, and well-being.

Our use of the term *environmental citizenship* overlaps with other uses by academic social scientists, principally political scientists, since the mid-1990s, but shows some differences as well. Many of these researchers have a strong normative, rather than empirical, orientation. They generally refer to a new form of engagement with environmental policy (broadly following the second dimension), sometimes linked to recent forms of moral utopianism associated with green parties and animal rights movements (Smith 1998), and in other cases associated with participation in local efforts to promote sustainable development (Dobson and Bell 2006). The empirical studies are generally conducted in advanced industrial societies such as England (Wong and Sharp 2009) and Sweden (Jagers 2009), in the present. In contrast, we examine cases with long historical roots and look at developing countries; rather than being normatively based, our work focuses on the aspects of environmental politics that are linked to issues of citizenship.

One aspect of environmental citizenship in the late nineteenth and early twentieth century in Latin America centered not on climate but on weather.² In the colonial period, weather information was not an element of citizenship at all but rather either was located in informal cultural knowledge within specific communities or was understood in religious terms as a sign of divine benevolence or displeasure. Although some private groups began to collect weather data for their own use, weather information became a part of environmental citizenship in the late nineteenth century with the rise of national meteorological services, linked to the International Meteorological Organization, of which the national meteorological services of Europe and the United States were already members. These services collected systematic records of weather throughout the territory of each nation and produced weather forecasts. Although the services vary somewhat from country to country in their location (some can be found within the military, others with ministries of agriculture, and still others are autonomous), they are generally similar in their relative aloofness; in the jealousy with which they guard their data; and in their reliance on other organizations such as news media, agricultural extension services, and civil aviation agencies in disseminating forecasts. There were important economic functions for these services, such as supporting aviation, promoting agricultural development, and anticipating

2. We draw here on the conventional distinction between weather and climate, which rests largely on the temporal scale. Weather is the condition of the atmosphere in a particular place on a scale of hours and days. Climate is the statistical average and range of weather in a particular place for a specified period, usually decades.

extreme events, and individuals had rights to the performance of these economic functions.³

These meteorological services also served a cultural or ideological task of promoting national self-knowledge. It became a right of citizens to live in a country where weather was regularly recorded; knowledge of weather, like knowledge of geography and demography, was part of a larger Enlightenment project of objectivity, rationality, and progress. This weather knowledge served both economic and ideological ends and became wholly naturalized. One may contrast the commonplace knowledge of Chileans that Arica, the northernmost city in the country, is very dry, gained from their visits to it or from stories and images of the dry, sandy desert in which it is located, with the scientific knowledge of the fact that no precipitation was recorded there between October 1903 and January 1918, the longest such interval for any weather station on the planet; the latter shows the importance of meteorological services in advancing environmental citizenship. This national character of weather is reflected in the weather information in newspapers and television programs; people want to know the temperature and precipitation, not only where they live or might visit but also throughout the country. There is thus a relative homogeneity in weather citizenship throughout Latin America: the right to national weather information, the limitations on openness and accessibility of national meteorological services, and the sense of weather information as part of a national identity. We will see a striking contrast in the form of climate citizenship in the three cases discussed here, as well as some differences in the emerging arena of climate citizenship in the era of global warming.

We now shift to a review of the three cases. For each, we consider the same set of topics. We open with a presentation of the national and regional setting, a summary of specific economic activities and climate issues for which forecasts are used, and a brief sketch of the earlier forms of governance of the economic activities. We include a historical overview of the pathways by which climate forecast delivery originated and unfolded. The first phase of these pathways consists of the founding and development of the particular organizations that disseminate forecasts and provide ancillary services; the second phase is the context and motivation that led these organizations to adopt the provision of climate forecasts as a service. We offer a detailed view of the third, current phase, the operation of these organizations and we look ahead to the fourth, emerging phase, one in which the organizations address issues of climate change. Presentation of the material in this fashion enables us to compare the cases in a final section and to trace the implications for environmental citizenship.

We examine these pathways to determine whether they represent a progressive trajectory of the expansion of citizenship to broader categories of persons within society and to additional aspects of social life and human well-being. We also seek to study explicitly the three dimensions of citizenship. Although we recognize the multifaceted nature of citizenship and the corresponding difficulty in reducing citizenship to simple observable attributes, we seek to treat the cases in as parallel a manner as possible. We have drawn on Swyngedouw's (2005, 1999)

3. In some cases, weather services were linked to the military and were much less open.

Table 2 The Three Cases

Country	Region	Sector	Organization	Acronym	Date founded	Date began distributing forecasts
Argentina	Pampas	Agriculture	Asociación Argentina de Consorcios Regionales de Experimentación Agrícola	AACREA	1957	1999
Peru	Coast	Fisheries	Instituto del Mar del Perú	IMARPE	1963	1997
Brazil	Northeast (Ceará State)	Water resources	Companhia de Gestão de Recursos Hídricos	COGERH	1993	1995

useful account of what he calls “the democratic deficit of governance-beyond-the-state.” For the rights dimension, we examine the equity of access to forecasts, paying particular attention to regional and class inequalities in such access; these are the features Swyngedouw terms *entitlement* and *status*. In some ways, access to climate information could be considered a right that citizens have, as such information allows them to pursue their economic activities more effectively and to protect themselves from hazards, much as citizens have the right to access to scientific information in these other areas. In the case of the procedural dimension, we look at the accessibility and openness of the institutions that provide forecasts, following Swyngedouw’s discussion of accountability and structures of representation. Regarding the identity dimension, we consider the ways that forecasts are linked to a sense of national identity and to goals that address the nation as a collectivity, drawing on Swyngedouw’s discussion of legitimacy.

CASE 1, ASOCIACIÓN ARGENTINA DE CONSORCIOS REGIONALES DE EXPERIMENTACIÓN AGRÍCOLA: AGRICULTURE IN THE ARGENTINE PAMPAS

The first case of the extension of climate information is centered on the Argentine pampas, the agricultural heartland of the country since independence. Exports of hides, wool, beef, and wheat from this region led the rapid growth of the country in the late nineteenth and early twentieth centuries and have continued to be important since. This economic weight, in turn, is linked to the political power of the region (for a good review of the agricultural history of this region, see Barsky and Gelman 2009).

A number of organizations have represented agricultural interests in the pampas and elsewhere. The Sociedad Rural Argentina, founded in 1866, was centered on the agrarian oligarchy of conservative wealthy landowners from established

families and British immigrants. The *Federación Agraria Argentina* dates from 1912, a time of economic downturn, when sharecroppers and renters working for landowners in the pampas went on strike, withholding rent and labor and pressing for reform of contracts; the organization that developed, now less militant, is still associated with small and medium-sized farmers. A third organization, the *Confederaciones Rurales Argentinas*, also owes its origin to an economic crisis, the Great Depression, which led older, smaller rural associations to join in regional federations, culminating in the national federation in 1943; its membership included large, medium, and small producers.

Several organizations were established in the mid-1950s, the tense political period that followed the deposition of Juan Perón, a nationalist and populist who had been president between 1946 and 1955. Perón promoted industrialization (partly subsidized by the transfer of wealth from agricultural production) and economic growth through a set of five-year plans and an active program of nationalization of key sectors (including grain trade); he also obtained significant political support through the expansion of social services, especially in urban areas. Although agricultural incomes increased during World War II and in the years after because of high demand and prices, there was little investment in agriculture. The rightward shift of the country and the expansion of the power of the military after the fall of Perón created a charged situation in which some large landowners saw an opportunity for increased power, but others, concerned with the broad political swings of the country, sought alternative solutions to the neglect of agriculture. The *Confederación Interooperativa Agropecuaria (CONINAGRO)*, founded in 1956, integrated many local agricultural cooperatives, including land settlement associations from the late nineteenth and twentieth centuries and fruit-, wine-, and dairy-marketing cooperatives from the twentieth century. The 1950s were a time of large technological progress in agricultural technology worldwide. This trend was reflected in the 1956 establishment of the *Instituto Nacional de Tecnología Agropecuaria (INTA)*, following the recommendations of a joint commission of the United Nations and the Argentine government, headed by the Argentine economist Raúl Prebisch, head of the UN agency Economic Commission for Latin America, who sought to encourage investment in export-dependent countries. The government accepted the commission's proposal to create a research and extension agency, to locate it within the Ministry of Agriculture, and to support it by a tax on agricultural exports. The institute capitalized on an existing network of experimental stations and sent many researchers abroad for training. As a result, it was very effective in transferring foreign technology to Argentine farmers and local entrepreneurs.

A nongovernmental organization that has played a strong role in dissemination of agricultural technology and management techniques is the *Asociación Argentina de Consorcios Regionales de Experimentación Agrícola (AACREA)*. Also established in the late 1950s, the organization represents a more technical approach to agriculture, focused on agronomic, economic, and managerial improvements in individual farms through the exchange of experiences among members rather than the more social or political approach undertaken by most of the other institutions in this sector. Eleven farmers in Henderson-Daireaux,

in the west of Buenos Aires Province, started AACREA in 1957. Pablo Hary, one of the founders and first president of the organization, learned about groups of French farmers exchanging experiences to enhance their practices: the Centres d'Études Techniques Agricoles (CETA). The first Consorcios Regional de Experimentación Agrícola (CREA) groups were organized after this model. Early goals of the organization included control of soil erosion and weeds, appropriate crop rotation, and regulation of grazing loads to avoid soil deterioration. After the first few CREA groups were founded, the national structure (AACREA, the association of individual groups) was established in 1960.

The institutional design of AACREA has important implications for the dissemination of information among members. Although members receive information from AACREA through its monthly magazine and, increasingly, through its Web site and online discussion forums, their main source of information is their local CREA group. A CREA group, the basic element of AACREA, involves several (seven to twelve) farmers from the same agroecological region who focus on the same production system (e.g., dairy, field crops). The group members meet periodically to share experiences. The goal is to improve decision making and to enhance the production efficiency of group members. Interactions among group members are supported by a technical adviser (typically an agronomist or veterinarian) who not only provides technical information but also coordinates the group.

Each group meets once a month, with an agenda prepared by the group's technical adviser. The agenda may respond to concerns or questions originating in the group or, alternatively, may include new information provided by AACREA's technical staff in the organization's headquarters. The structure of AACREA provides links that facilitate rapid dissemination of information. Eighteen AACREA regions within the country have been formed; each of these comprises groups with relatively uniform ecological and production characteristics. The activities of all CREA groups within each region are facilitated by a regional coordinator, who organizes a monthly meeting of technical advisers for all CREA groups in the region. During this meeting, group advisers can exchange experiences and learn about problems or innovations in other groups of a region. In turn, all regional coordinators meet once a month at AACREA headquarters in Buenos Aires, which again provides fluid exchanges between representatives from different regions. The AACREA structure, then, provides links that facilitate dissemination of information throughout networks and enable farmers to receive information from distant parts of the social system. In addition to the CREA groups, AACREA provides other sorts of training. Since the early 1990s, it has offered short courses for members and workshops to promote leadership skills.

The organization has a president (a farmer) who serves a two-year term. The president is assisted by a council, composed of one representative from each AACREA region. Full-time staff provides day-to-day management functions at headquarters. The association currently includes about 1,900 members, most of whom are male (women account for less than 5 percent of membership). A sample of 367 members showed an age range between twenty-three and seventy-nine years, with a median of forty-four. The education of AACREA members tends

to be above average, with most members having completed secondary education and at least some years at university. Each AACREA member pays an annual fee, which varies by the area that the member cultivates. These fees support the group technical advisers and the AACREA national structure, which includes the administrative and technical staff at headquarters. Other funding sources include contracts from the private sector (e.g., input manufacturers); advertising in publications and events; publications; and, to a small extent, grants from science-funding agencies. Although members were initially concentrated in the pampas, they are now found in many portions of Argentina. Moreover, AACREA supports the adoption of its model by farmers in neighboring countries (Bolivia and Paraguay).

In its early years, AACREA was essentially a private association of farmers that fostered the exchange of experiences among group members. From its initial focus on soil erosion, preservation of soil fertility, and weed and overgrazing control, it moved to other issues such as efficient fertilizer use and appropriate agronomic management. After some decades, it expanded to include emphasis on managerial techniques and, even more recently, on enhancement of group dynamics to facilitate the exchange of experiences and social learning.

In its statements, AACREA emphasizes its contributions to its members' economic and personal well-being. It states that its goal is the continual improvement of the farms and speaks also of the personal qualities and psychological well-being of the members.⁴ This emphasis on personal development reflects the broad acceptance of psychological language within Argentina (Plotkin 2001). Moreover, despite its technical focus and its choice to remain outside politics (indeed, part of AACREA's self-definition seems to be in contrast with other, more political organizations), AACREA emphasizes its contributions not only to the well-being and prosperity of its members but to broader, more collective goals, particularly national development and modernity. This link is present as well in its current vision statement: "We sow confidence, and we exploit ideas to build among all an Argentina that is possible" (AACREA 2009, n.p.).

Because climate variability is a major source of risk to production and income in agriculture, concerns about this issue have always been present in AACREA's activities. Nevertheless, a convergence of events in the late 1990s and early 2000s focused AACREA's attention on year-to-year climate fluctuations. The farmers and the AACREA staff had been exposed to information in print and broadcast media about El Niño events (particularly the strong 1997–1998 event), other climate phenomena, and improvements in the forecasting of climate variability. The farmers themselves commented in CREA meetings about the perceived greater frequency of extreme events, such as heavy rains or unusual wind patterns, and about seasonal changes, such as a later date of the first frost in the autumn or warmer winters. At the same time, AACREA had started to collaborate with scientists from the United States in pilot projects funded by National Oceanic and Atmospheric Administration to expand the use of seasonal climate forecasts by

4. "To promote personal development with an emphasis on openness to change and continuous improvement of the individual and the company" (AACREA 2009, n.p.).

developing applications for specific economic sectors. The end result was an institutional commitment to enhancing the use of climate information to support decision making in agricultural production. Indeed, this effort was one of three major programmatic lines endorsed by AACREA's leadership and announced during the organization's congress in 2004. The AACREA organization does not produce its own climate forecasts, nor does it endorse forecasts from any specific source. Often the way of disseminating forecasts is to publish an article in the monthly magazine describing expected climate conditions for the following three to six months and, if possible, the reasons that lead forecasters to expect such conditions. The article usually takes the format of an interview with a trusted regional expert (e.g., a professor of agroclimatology at the University of Buenos Aires, a researcher from INTA). So far, AACREA has not published the outlooks released by the Servicio Meteorológico Nacional (SMN) or interviewed that organization's experts. However, this relative lack of interaction is rapidly changing as a result of SMN-AACREA collaboration in joint research projects.

Farmers in the pampas receive short-term weather forecasts from the SMN, the only official source of weather forecasts in Argentina. In contrast, seasonal climate forecasts are not regulated, and there are multiple sources, from governmental agencies such as SMN and INTA's Instituto de Clima y Agua to private sources such as consultants or input providers. Moreover, AACREA has been highly interested in disseminating not only seasonal forecasts but also diagnostics of recent climate conditions (e.g., "¿Por qué rindió tan poco el trigo?" 2009). Although other organizations have a longer record in provision of climate information, AACREA has been particularly successful in delivering forecasts to farmers because of the technical advisers, whom farmers strongly trust and who assist the farmers in understanding the forecast and in developing specific plans on the basis of the forecast. Because AACREA farmers and advisers are familiar with approaches such as crop modeling and risk management techniques, they can use those techniques to translate expected climate conditions into likely agronomic and economic outcomes (e.g., crop yields, economic profits). Nevertheless, AACREA still has considerable work ahead to make the use of climate information a routine task.

In the past few years, AACREA has begun to address issues of climate change as well. This shift is a response to economic opportunities, such as the potential of agriculture to participate in carbon trading, and to growing attention to climate change in the national and international media.

CASE 2, INSTITUTO DEL MAR DEL PERÚ: FISHERIES ON THE PERUVIAN COAST

The second case of the extension of climate information is centered on fisheries off the Peruvian coast. The coast has been the political center of Peru since colonial times, as well as the most economically important region. Maritime fisheries grew in economic importance in the late 1950s with the capture of anchovies for fish meal, a product that has been exported for feed for chicken, livestock, and aquaculture. Yields have generally remained at more than 4 million tons since 1960, although they have fluctuated considerably, rising as high as 12 million tons and occasionally dipping to 2 million tons (Aranda 2009). The maritime fisheries

form one example of the boom-and-bust cycles that have characterized Peruvian exports since the nineteenth century. They have an additional importance for Peru, which pressed actively for the international recognition of exclusive economic zones in territorial waters, extending out to the two-hundred-mile limit; the sovereignty of coastal nations over these zones was protected by the UN Convention on the Law of the Sea, which was concluded in 1982 and came into force in 1994.

The Instituto del Mar del Perú (IMARPE) was established in 1963, when the UN Food and Agricultural Organization (FAO) perceived the danger that overfishing posed to the stability of Peruvian fish stocks and to global fish-meal markets. Until that time, decisions regarding fisheries were made by a number of overlapping offices within the navy, Congress, and the Ministries of Finance, Agriculture, and Labor; the small Instituto de Investigación de los Recursos Marinos (IREMAR) provided little effective oversight. Set up as a semiautonomous state agency, IMARPE replaced IREMAR. It was charged with conducting research on fisheries and providing advice to policy makers and regulators, especially with limiting overall capacity in the fishing fleet and establishing closed seasons. Its board of directors included representatives from the Peruvian navy and universities as well as other government agencies connected with the fisheries sector. It was supported as a line item in the national budget and could also receive funds through grants and contracts—giving it the quality of a mixed public-private entity rather than a branch of the national government. The founding of IMARPE corresponded as well to the political context in Peru. The pro-development social democrat Fernando Belaúnde Terry had come into power in 1963, following the one-year rule of a military junta that had replaced the conservative *laissez-faire* regime of Manuel Prado of the late 1950s and early 1960s. The efforts to manage fisheries within a framework of private enterprise were broadly consonant with other state-supported projects of this government, such as road building, frontier colonization, and expansion of irrigation. The initial purpose of IMARPE, which has continued to the present, is to conduct scientific research for policy makers to support the rational use of Peru's aquatic resources—a task that is consistent with the broader goals of development and modernity. In recent decades, its mission statements have included references to conservation and sustainability.

Adapting to shifts in funding and to changing administrative locations, IMARPE has continued in its research and advisory role. It has been moved on two occasions to a newly created ministry, to the Ministry of Fisheries in 1969 and to the Ministry of the Environment in 2008. It has also weathered major changes in the organization of the maritime fisheries. As catches continued to rise after its founding, IMARPE noted signs of overfishing. In 1965, it recommended placing limits on the total allowable catch and suggested restrictions on the expansion of the fishing fleet. However, no national authority could ratify these suggestions or enforce them. In 1969, the new military government undertook a series of nationalist reforms, including the creation of the Ministry of Fisheries as a national authority to manage fisheries; it placed restrictions on the expansion of fish-meal plants. The anchovy catch fell sharply in 1972–1973 as a result of the effects of a strong El Niño event and other longer climate cycle influences, and

due to overfishing, and it remained low for more than a decade. The military government nationalized many fishing vessels and most of the fish-meal industry in 1973, creating the large state enterprise Pescaperú. This entity was difficult to manage, and the government shifted to a policy of lower levels of intervention in the national economy. It sold off Pescaperú vessels to private owners in 1976. Expansion of the fishing fleet in the 1980s led to another shift in policy in 1992, with the promulgation of new national fisheries legislation that sought to impose limits on the number, size, and configuration of fishing vessels. There are now seven different associations of fishing vessel owners and fish-meal plants; they lobby the Ministry of Production and the Fisheries Working Group in Congress. Since 2002, there have been active debates about the introduction of market-based systems of catch regulation, such as individual transferrable quotas and selling fishing licenses to foreign vessels used in many nations around the world; these led to the promulgation of a law in 2008 that establishes individual vessel quotas for certain commercial species.

In the early 1970s, IMARPE scientists conducted retrospective analyses of recent El Niño events, tracing their evolution and their impacts on fish stocks. In 1976, IMARPE first used analysis of an El Niño event in its early stages to set annual catch limits, seeking both to take advantage of growing scientific understanding of these events and to establish a continued role for their organization in the recently privatized fisheries. Although understanding of El Niño events grew in the international scientific community and in IMARPE through the early and mid-1990s, IMARPE did not draw on forecasts to propose longer closed seasons or smaller levels of total allowable catch at this time. The strong neoliberal policies of the regime of Alberto Fujimori and the relatively large size of the fish stocks worked against such innovations in regulation.

The opportunity for IMARPE to make use of a seasonal forecast in its recommendations came early in 1997, when IMARPE scientists saw information of the preconditions for a strong El Niño event on the Web sites of international climate agencies and heard reports of warming ocean conditions in the far north of the country. Toward the middle of the year, the El Niño event was well established and brought warm sea temperatures that threatened the stock, even though the fishing fleet continued to land large quantities of anchovies by targeting the schools of fish that were concentrated in the remaining pools of cool water close to shore. There was some debate within IMARPE and the Ministry of Fisheries at this time. Some scientists and officials took seriously the threat of the impending El Niño event, whereas others, less disposed to impose tight regulations, thought that it might be a mild and brief event (Broad, Pfaff, and Glantz 2002). Moreover, other Peruvian state agencies also issued forecasts, some of them anticipating a less severe event. A meeting with representatives of other fishing nations on the western coast of South America heightened the tense atmosphere. Afterward, IMARPE pressed firmly to have the closed season begin earlier than usual and, unlike other years, to run for an indefinite period. This relatively strong regulatory effort bears a complex relation to forecasts. Most directly, the projections for further increases in sea-surface temperatures suggested the vulnerability of the fish stocks. In addition, the frequent references to the El Niño event in national

media strengthened the hand of the regulators. At this point, the politicking became unusually intense. The managers of fishing firms placed strong pressure on IMARPE and the Ministry of Fisheries to reopen the fisheries, in part through the Instituto Peruano de Investigaciones Pesqueras (INPESCA), a wholly industry-supported research organization, which offered predictions, based on scanty evidence and implausible readings of data from international agencies, of a much milder El Niño event. Later in the year, the national government, concerned that the event might bring disaster to the fisheries and to other sectors as well, established the Comité Multisectorial Encargado del Estudio Nacional del Fenómeno El Niño (ENFEN) to study the event. This committee included IMARPE, the Servicio Nacional de Meteorología e Hidrología, and other entities, some of which also offered forecasts. The committee chair was IMARPE, which had strong control over its bimonthly press releases and technical reports. This position, strongly favorable to IMARPE, reflected the importance of fisheries, the uneven record of forecasts by other agencies, and some effective mobilizing of political connections on the part of IMARPE. Continuing well into 1998, IMARPE made forecasts for the event. It based the forecasts on data from international agencies, which had been little used in Peru through the 1980s because of limitations in data availability and scientific expertise, but such data had become increasingly accessible through the spread of Internet connections. Of considerable importance in these forecasts were IMARPE's own measurements of oceanographic data. In addition, IMARPE continued its programs of real-time monitoring of stock size and population dynamics. This data source showed that fish stocks had declined sharply. With this advice from IMARPE, the Ministry of Fisheries did not reopen the anchovy harvest until late October 1997, although with a very low level of total allowable catch, 1.5 million tons. Fisheries researchers from FAO traveled to Peru in October to advise the head of the Ministry of Fisheries personally about the dangers of allowing the fishing fleet to operate at that time. Faced with strong evidence that the El Niño event was not abating and that the stocks were threatened, the ministry closed the anchovy fishery again early in 1998 and delayed the reopening longer than usual. The anchovy stocks fell to low levels but recovered after a year, much more quickly than they had after the 1972–1973 El Niño event. This relatively successful use of forecasts provided significant support for IMARPE. It has continued to use forecasts for fisheries management by establishing quotas and closed seasons, and, with its dominant role in ENFEN, it remains more powerful than the competing forecast-providing institutions.

In the past few years, IMARPE has begun to study the possible impacts of climate change on circulation in the Pacific Ocean, on marine ecosystem dynamics, and on stocks of commercially important fish. Scientists affiliated with IMARPE have represented Peru at conferences of nations on the Pacific Coast of South America and have sponsored regional, national, and international workshops on these topics. Moreover, IMARPE coordinates with environmental and social agencies in Peru for planning adaptation strategies to address the impacts of climate change in coastal zones. It also issues press releases to the media; for example, in 2008, it offered the reassuring news that climate change would not create problems for anchovy stocks. Drawing on its long expertise in oceanography

and climate science, its considerable stock of oceanographic data, its national and international connections, and its record of successful use of climate forecasts, IMARPE is well positioned to play an important role in coming years in climate change policy in Peru (IMARPE 2008).

**CASE 3, COMPANHIA DE GESTÃO DE RECURSOS HÍDRICOS:
WATER RESOURCES IN THE BRAZILIAN NORTHEAST**

The third case of the extension of climate information is centered on water resources in the Brazilian northeast, the poorest portion of the country. Settled by Portuguese and by African slaves in the colonial period, Brazil's coastal sections contained sugar plantations that were a center of wealth into the eighteenth century but that declined later; its semiarid interior, an area of cattle ranches and small-scale agriculture, has long been impoverished. The region has served as a sign of continued backwardness and underdevelopment of Brazil for the entire republican period. Periodic droughts have exacerbated the misery of the inhabitants and have led to waves of out-migration to more prosperous regions in the south and to other frontier zones. Since the last quarter of the nineteenth century, the central government has proposed programs to address the problem of drought and has built a number of reservoirs to store water in wet periods for release in dry ones. More recently, cloud seeding, the distribution of improved crop varieties, and some simple forms of agricultural insurance have been used in an attempt to cope with drought. However, water shortage remains a serious problem in the region, given other endemic causes of poverty, including the entrenched elites whose power rests on patronage to the poor. The agency that has moved most directly into providing forecasts to water users, the Companhia de Gestão de Recursos Hídricos (COGERH), was founded in 1993. It is a semistatal private corporation, administered under the *Secretaria de Recursos Hídricos* (SRH) in the state of Ceará.

The organization COGERH emerged at a specific period, in the context of the return to civilian rule in Brazil in the late 1980s, after two decades of military rule. In 1986, the rural oligarchy, long entrenched in power, lost the elections in Ceará to a group of young industrialists, spearheaded by the reformist governor Tasso Jereissati. Development-oriented ideas gained power, and incentives were created to attract investment to the state. In 1987, as part of this change, SRH was created. In 1992, a state law enabled the formation of a system to manage water resources, with an emphasis on the planning of reservoirs for the storage and release of water. As part of the creation of new water planning and management bodies, the law required the licensing of and charges for water use, and permits for infrastructure construction, all of which were radical innovations in a state where the population had always freely used water without official constraints. For the same reason, these novelties quickly became sources of conflict between water users and the state government.

A state law promulgated in 1993 established COGERH as the entity that would implement the law and manage water allocation in large basins with many different users, such as cities, commercial farmers (some of which are multinational

agribusiness companies), small farmers, and inland freshwater fisheries. Its mandate, to establish a system of water management, included a general directive to carry out scientific research on water supply and demand, although it often relied on consultants and other agencies for this purpose. It was also mandated to manage water resources in a manner that would be decentralized, participatory, and integrated (Garjulli et al. 2002). The state government wanted COGERH to be an official agency, but the World Bank, which had considerable influence because it provided funding for water development, insisted that the state set up a private company instead—even though the government essentially owns the company, and the governor appoints its director. The budget COGERH receives comes from fees paid by water users from the sanitation and industrial sectors. In a sense, like IMARPE, it is a mixed public-private entity rather than a branch of the state government.

In 1994, COGERH had the difficult task of allocating the water in an important watershed, the Jaguaribe Valley, during a period of severe water scarcity and of social unrest, as the construction of a canal linking Fortaleza, the state capital, to the Jaguaribe River paralyzed agricultural activity in the valley, leaving much of its population in debt and angry at the state government. Following its mandate for decentralized, participatory management, COGERH staff organized a large informal commission in the valley, hoping that negotiations in the commission would prevent an escalation of conflict. They included representatives of the main economic sectors; members of civil society organizations; and representatives of municipal, state, and federal agencies. As major social unrest was prevented, the participatory approach successfully served as a conflict resolution mechanism that year, and water committee meetings have been held ever since. For all their limitations (the informal dominance of technical staff, the strong influence of powerful landholders), these meetings represent an important opening toward greater democracy and participation in what had long been the strikingly hierarchical, patronage-based society of northeastern Brazil.

Two meetings a year take place, in January before the rainy season starts and in June after it has ended. In these meetings, COGERH staff members present simplified versions of several hydrologic scenarios that they have prepared with other water resource agencies. These scenarios, based on hydrologic models and, in some cases, climate models, simulate the storage in each reservoir for different release rates. The water committee members then discuss the scenarios, sometimes for many hours, until they reach a consensus about which alternative they prefer; the selected scenario is then implemented, although COGERH staff has some leeway in varying the details, depending on the specific circumstances of the season. The pressure to release water is strong at the June meeting, as the commercially important cultivators of irrigated rice concentrate their production in the dry season, and they seek more abundant releases. However, COGERH is mandated to retain enough water for at least thirty months of human consumption (which is usually not a problem, given that volumes required for this use are very low) and for eighteen months of agricultural use. Fearing sanctions that would come if this mandate were not met, COGERH staff members are reluctant to increase the flow.

In these circumstances, the water committee meetings can be tense, as some

local groups, including powerful economic interests in urban areas and large-scale commercial farmers, press for greater releases, whereas COGERH staff members and other groups (like floodplain farmers who cultivate lands inside of the reservoir) seek to maintain lower levels. In this context, the staff began using seasonal forecasts for the preparation of scenarios in the mid-1990s. They received the forecasts from the Fundação Cearense de Meteorologia e Recursos Hídricos (FUNCEME), an organization with a long and checkered history. Founded in 1972 by the government of Ceará to increase precipitation through cloud seeding, FUNCEME shifted to the provision of seasonal climate forecasts in 1987, the same year in which SRH was created. Starting in 1989, it coordinated closely with rural development agencies to provide rainfall forecasts to farmers who did not have access to irrigation. In the early 1990s, however, FUNCEME issued some incorrect forecasts, possibly as a result of political pressures. These mistakes brought it negative attention. It was reorganized in 1995 and reached out to other agencies, including SRH. At the same time, COGERH staff recognized the advantage of using the forecasts in certain circumstances. They saw that reliable forecasts of above-average rain could justify greater releases of water, thus reducing the number and intensity of conflicts. Nevertheless, they were also aware that climate forecasts can add an extra degree of uncertainty to the planning process, because of their probabilistic nature. As a result, the staff decided to use forecasts selectively, applying them only in the management of certain reservoirs, where technical features reduced this uncertainty to levels that they thought would be acceptable. Their long historical experience with reservoir management in Ceará facilitated these judgments, and the relatively closed nature of their preparation of forecasts meant that water users associated with other reservoirs, where forecasts were not incorporated into water management, would not complain.

In the late 1990s and subsequently, the staff began using forecasts in an additional context, at the water committee meetings themselves, particularly at the January meeting. At the June meeting, participants are aware that no rain will fall for a number of months, so they reach an agreement on the amount of water to be released on the basis of the reservoir levels; the forecasts for rainfall in the next rainy season, seven months in the future, are highly uncertain. In January, before the rainy season starts, participants seek to anticipate the amount of rain that will fall in coming months. The water committee invites a meteorologist from FUNCEME to attend the meeting and to present the forecast. Only after the meteorologist finishes does the committee discuss water releases to be made in the coming season and arrive at a consensus about the water flows to be maintained in the rivers; these flows include both releases from reservoirs and runoff of precipitation. The complex presentations of the meteorologists, couched in technical language that many participants do not understand, lends considerable weight to the scenarios that COGERH staff prepare in advance of the meeting. During the same period, the members of the committees transferred to COGERH the authority to alter water releases from reservoirs if the rainfall does not match the forecast. In the past, some members of the water committee have expressed dissatisfaction with this process, fearing that the COGERH staff would not balance the demands of different groups equitably. Although the COGERH staff may not

deliberately have brought the meteorologist to the meetings with the intention of making the shift, the meteorologist's presentations of forecasts to the assembled members of the water committee nonetheless support this transfer of authority from the committee to the staff.

In its statements, COGERH indicates that its contributions to Ceará lie in several realms. It supports development through the rational use of water and the improvement of the local population. It also speaks of democracy and participation. Its current mission statement is to "manage the water resources of the state of Ceará and the nation, in an integrated, decentralized and participatory manner, encouraging their rational, social and sustainable use, contributing to improving the quality of life of the population" (COGERH 2009). It suggests that the competition among multiple users often leads to conflict in water allocation, which makes participation particularly important for management of water: "COGERH seeks to make the community a co-manager of water resources by giving it information and providing it data, so together they can make collective negotiated decisions, and also assess the management policies to be implemented in watersheds. . . . Fishers, dryland farmers, irrigated farmers and industrialists come together in meetings [of watershed committees] to decide on the use and distribution of water, optimizing the use of water resources according to available supplies and the types of use throughout the year. Representatives of civil society, such as unions, associations and municipalities, also attend the meetings, which are the legitimate moderators of the conflicts which are inherent in the process" (COGERH 2009, n.p.).

In the past few years, COGERH has begun to examine the possible impacts of climate change on rainfall and streamflow in Ceará. It has recognized the risk of desertification in Ceará, as a result of alteration in vegetation driven by climate change and by shifting land-use patterns. Such desertification would also affect streamflow and the amount of water available for storage in reservoirs. Moreover, they recognize that water availability in Ceará will be influenced not only by climate change but also by federally supported interbasin transfers from the Rio São Francisco. Their attention continues to focus on the challenges of short-term management, but they are conscious of long-term trends and seek opportunities for their agency in these trends.

DISCUSSION

These three cases of the use of climate information contain two striking similarities. These common elements suggest some patterns of environmental citizenship in Latin America in recent years. The first of these is the spatial and sectoral concentration of the providing of forecasts (agriculture in the Argentine pampas, fisheries on the Peruvian coast, water in the Brazilian Northeast). This concentration is the outcome of several factors. The reliability of the forecasts that climate science can provide is higher in some regions than in others, so that some regions are more favored for this service on narrowly technical grounds. In addition, the applications of forecasts can vary from one sector to another in a given region (a forest manager in a particular region might use them differently than a water

manager or a public health official), so there are incentives for people to continue to develop forecast applications in the sector where they have begun rather than shifting to a new sector. Finally, particular organizations often play a critical role in developing the use of forecasts, and these organizations are concentrated spatially and by sectors. Indeed, the presence of these organizations is the second commonality we wish to stress. In each case, climate information is provided and interpreted by what we term *intermediate organizations* (IOs)—specific institutions that have come to serve as forecast providers to the sectors, serving as intermediaries between forecast producers (scientific institutions) and forecast users (e.g., agricultural producers, fisheries managers, water resource managers). The users rely on the IOs, even though all three countries have well-established national meteorological services that might have been expected to be the main source of such information, either by distributing information directly to citizens or by supplying it to media enterprises that distribute it. These IOs were founded for purposes other than addressing climate, but they took on climate variability and later climate change as activities that they could carry out, driven by a variety of particular factors that are discussed in this article.

These commonalities are all the more striking because of other elements of diversity in the IOs. They address different resources with different patterns of ownership—privately owned agricultural land (AACREA), privately owned shares of publicly owned fish resources (IMARPE), and collectively managed water that is stored in publicly owned facilities (COGERH). Two (AACREA and IMARPE) are concentrated in the richest regions of the nation, whereas the other (COGERH) is in the poorest. One (AACREA) is private, another (IMARPE) is a state agency, and a third (COGERH) is a state-owned corporation. Nonetheless, they play a similar role in transmitting climate forecasts to specific sectors in specific regions.

In some ways, these organizations—AACREA in Argentina, IMARPE in Peru, COGERH in Brazil—are well suited to this task. They have detailed knowledge of particular regions and sectors, and they have established strong networks with other organizations and with local residents. Moreover, they are motivated to engage with climate issues for their own organizational ends; these ends include the expansion of the scope of activities, the support of an image as modern and scientific, and the consolidation of an institutional location within the region and nation. In summary, all three organizations seem to have the required characteristics for acting as successful mediators.

However, concerns might arise about these IOs in the context of environmental citizenship. In particular, the broad public character of citizenship is significantly contradicted in two ways, by the history and by the current operations of these organizations. Turning first to the history, one may note the hasty processes by which IOs were established and the improvisational character of the decisions by which they adopted forecast provision as an activity.

Each of these three organizations was established at a critical political juncture. AACREA arose in the aftermath of Perón's fall, when a group of medium and large farmers sought to overcome the marginalization they had experienced under Perón and to avoid further entanglements with politicized organizations;

in this sense, AACREA marks a decision to withdraw from broad engagement in national politics and to participate in the narrower frame of an occupational group. The other two cases can be seen more clearly as part of a progressive expansion of citizenship, as resource management became somewhat more transparent and oriented toward public goals. Though supported by a UN agency, IMARPE represents national political trends as well. It was a part of a new social democratic president's effort to replace *laissez-faire* conservative rule with state support of development. Similarly, COGERH was the fruit of international and national forces, the World Bank efforts to promote equity and efficiency, on the one hand, and the concerns of a modernizing state in Brazil to use participatory resource management as a means of displacing entrenched regional elites, on the other hand.

In contrast, this varying involvement with a progressive expansion of citizenship is reversed in the phase of forecast dissemination. Though encouraged by American meteorological organizations, AACREA decided to use climate forecasts largely for internal reasons, particularly the long-established and strong ties among membership, staff, and leadership; this element of citizenship is less evident in the other two cases. Although the forecasts may allow IMARPE and COGERH to meet more effectively their responsibilities to manage resources for the collective good, other motives were also salient. The leaders of IMARPE used forecasts during the 1997–1998 El Niño event to push their organization ahead of its rivals, and the presentation of forecasts at contentious water committee meetings run by COGERH supported the authority of the agency staff, with their mastery of technical language, against the challenges from less educated committee members. This narrow attention to organizational self-interest does not appear to be consistent with a broad understanding of environmental citizenship.

The current operations of these IOs may be examined in terms of the three dimensions of citizenship discussed earlier, broadly revealing the same mixed character as in accounts of history. Here, one may note the uneven levels of equity and openness within the IOs and the mixed or hybrid nature of their goals, which contain both public and private concerns.

For the legal dimension, we examine the equity of access forecasts. In terms of spatial equity, only COGERH, through its work in impoverished northeastern Brazil, directly addresses the great regional inequalities that characterize the three countries, like others within Latin America. Both AACREA and IMARPE focus on the most prosperous regions of the countries in which they are located, although it might be argued that these regions constitute examples of low-hanging fruit, or cases in which relatively accurate climate forecasts could be developed and then applied in concrete ways, and from which they could later be extended to other groups. This optimistic view is borne out in the case of AACREA, which has moved to operate in other, poorer sections of the Argentine countryside and in poorer neighboring countries as well. In terms of class equity, the situation is more complex. All three offer somewhat greater support to the wealthy: AACREA serves large and middle landholders and farm operators more than poor landholders, tenants, and workers; IMARPE supports owners of larger vessels more extensively than the owners of smaller artisanal vessels, who represent a signif-

icant portion of the boat owners in Peru; and, in Ceará, the water system that COGERH manages has been historically structured in a way that provides the most extensive benefits to cities and large landholders. However, the three IOs all recognize the poorer individuals and firms in their sectors, and provide them with some services as well. This distribution reflects the fact that climate forecasts, unlike many other goods such as credit, can be shared by many as well as by few; in economic terms, they are nonsubtractable.

For the procedural dimension, we look at the accessibility and openness of the institutions that provide forecasts. Two (AACREA and COGERH) emphasize participation, although they have different relations of technical staff and members. The leadership of AACREA is very open to its members (although the farm labor sector is not well represented in its activities), and its internal operations are visible, both through the participatory engagement of members in research and through the organization's numerous publications. Although COGERH supports the ideology of participation, its meetings are dominated by a small proportion of members, and important decisions take place outside those meetings. The participation of AACREA is participation by the well-off (i.e., landholders, farm operators, and farm managers), and technical staff orchestrate the participation of COGERH from above. In contrast, IMARPE is relatively insulated from the actors whom its forecasts influence, as it exercises informal pressure only indirectly. These intermediate organizations might appear less open to public scrutiny and less accountable to criticism than state agencies that serve the entire nation rather than particular sectors and regions. However, the existence of specific groups that are served means that these intermediate organizations are closely watched. The strong media attention to unusual climate events (e.g., droughts in Argentina and Brazil, El Niño events in Peru) also makes these organizations relatively open.

For the identity dimension, we consider the ways that forecasts are linked to a sense of national identity. Although all three organizations speak of their contributions to specific firms or to private enterprise at large, they all state that they carry out activities to benefit the entire nation by providing information that permits effective resource management, thus promoting development. In addition, AACREA emphasizes its contribution to the personal growth of its members, improving their decision-making skills and making them more cooperative. More oriented toward issues of equity, COGERH describes its goals of increasing participation and promoting collective decision making. Moreover, all three organizations discuss sustainability. The management of fluctuating fish stocks in Peru and scarce water resources in Brazil leads rather directly to this concern; on the Argentine pampas, a history of erosion and problems from invasive pest species create this awareness as well. Even though two organizations (IMARPE and COGERH) support the management of public resources (fish stocks and water), they might well have stressed the profitability of the fishing and agricultural enterprises rather than collective goals.

This review leads to the question presented in the introduction: are climate forecasts, and climate information more broadly, an economic good to be provided to individuals and firms by public or private suppliers, or are they a political, social, or cultural right to which members of the nation are entitled? This

question is central to the nature of environmental citizenship in an era of climate change, and indeed to broader issues of the nature of political subjects. In the trajectories of these regions, sectors, IOs, and nations, we can see implicit answers to these questions, answers that have underlain their actions. Perhaps unsurprisingly, both views of forecasts are found. We note elements of the view of forecasts as an economic good. The focus on the use of forecasts in economic production is tantamount to allowing only property owners to have access to these resources; it is striking that the IOs have not focused on more collective sectors, such as public health or disaster prevention, as has been done in other countries.⁵ The one partial exception is IMARPE's support in ENFEN, which provides civil defense measures to reduce the risk of flood damage during El Niño events. Moreover, within the production and resource management sectors in Latin America where these cases are located, wealthier individuals tend to have better access to the forecasts or tend to benefit more from their applications. Nonetheless, there is evidence as well for the view that forecasts are a political right, particularly the emphasis on goals of national development and sustainability, and the pressures for openness that come from the media and from other groups within the sectors. In the case of Brazil, national political reforms and the policies of the World Bank also promoted this openness. In addition, two of the IOs advance the goals of personal fulfillment that are closer to individual rights than economic goods: AACREA speaks of building a stronger capacity for reflection and decision making and of encouraging a system of social learning in which individuals share knowledge, whereas COGERH promotes dialogue and discussion as means for individuals to reach respect for one another's points of view and to reach peaceful solutions to collective problems. They view these goals as progressing beyond individualism and egotism to a fuller realization of both the individual and society.

This overview suggests that some elements of environmental citizenship are present in these three cases of climate forecasts, and that limitations in the breadth and organization of the cases make these at most partial rather than full instances of such citizenship. In a sense, we have been asking whether the glass of citizenship is half full or half empty, a question that is difficult to answer, granted the challenges of evaluating the very disparate forms of evidence about citizenship, but that is also difficult to avoid, granted the public and scholarly interest in making comparative statements about citizenship in different settings.

We would like to suggest additional questions, ones that are even more difficult to answer: is the glass of citizenship filling or draining, and, if it is filling, is that process occurring quickly or slowly? There is certainly empty space in the glass, in the form of potential environmental citizens who could benefit from climate information but do not happen to be in a sector and region that is currently served by an IO or to be among the well-served groups in the sectors and regions that do receive such service. These include the individuals who suffer harm—economic losses, disasters, illnesses—that are associated with unfavorable climate conditions, and those who are unable to take advantage of the

5. To be fair, such efforts generally stem from initiatives by international agencies, as in the promotion of forecasts in malaria preparedness in southern Africa (DaSilva et al. 2004).

opportunities presented by favorable climate conditions. To phrase the question more directly, will the IOs provide a model that will lead others to make claims to receive such information, or will they monopolize such information and exclude others? There is at least some evidence for the former. For example, AACREA has spread spatially to reach new regions within Argentina and to develop parallel organizations in neighboring countries. It makes its information available in print and online forms; it also collaborates with other agricultural organizations in Argentina, and it may lead them to adopt forecast delivery as well. Similarly, IMARPE spreads forecast use to other organizations by participating with them in shaping national policy in fisheries and, through ENFEN, in national disaster preparedness as well. In Brazil, COGERH has collaborated with other agencies in northeastern Brazil and neighboring regions to encourage them to use forecasts and to conduct participatory meetings in water management. Through strong media presence, all three IOs contribute to growing public awareness of climate issues, and hence to pressure for fuller environmental citizenship as well.

Climate change will be an issue of growing importance in coming decades in Latin America. It is already evident in the form of melting glaciers, increased frequency of intense storms, decline of coral reefs, and coastal impacts such as saltwater intrusion associated with sea-level rise. Larger impacts, such as water scarcity, spread of disease, and massive forest loss, are projected. Will the IOs play a significant role in this next phase? They will not be the only actors. National agencies will be important, as the international organizations associated with climate change seek more uniform partners and prefer partners at the national scale rather than at the regional scale like the IOs. The UN Framework Convention on Climate Change often works directly with ministries, and the World Meteorological Organization has ties to the national meteorological services that are its member units. The particular strengths of the intermediate organizations—their flexibility, their long connections to particular populations, their knowledge of concrete situations—might serve well, not in formulation of national climate change policies but in building adaptation programs. The three IOs have all taken some steps in addressing climate change, and one (IMARPE) has had some success in representing the nation on the international stage of climate change politics. Moreover, COGERH is assessing future opportunities for engaging in climate change activities, although its attention is focused on the more immediate possibility of interbasin water transfers that could increase the amount of water at their disposal. With its broad ties to agriculture and its interest in technical issues, AACREA follows climate change issues and is well positioned to promote adaptation programs to its members. Whatever their specific roles, the futures of these IOs, like their pasts, are likely to contain rapid, unanticipated turns. It is also likely that citizenship claims in era of climate change are likely to bear traces of these IOs. We may hope that the awareness that they have built of climate issues, their efforts to link these issues to public participation and to collective goals, will support the efforts to treat adaptation to climate change as a right of citizens rather than a good available to those fortunate, or privileged, enough to afford it.

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