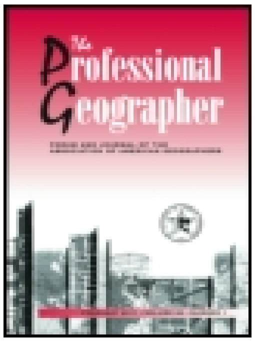

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A Model Controversy: Using Environmental Competency Groups to Inform Coastal Restoration Planning in Louisiana

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This article assesses the use of the environmental competency group (ECG) method as a tactic for bringing residents and scientists in coastal Louisiana into collaboration on designing coastal restoration projects. Based on qualitative research on the competency group during a period of ten months, this article describes the achievements and limitations of the ECG as a technique for democratizing the production of scientific knowledge. Particular attention is paid to distinctions between expert and lay or traditional environmental knowledge in literature on ECGs and how the aspirations of the ECG unfold in the context of coastal restoration planning in Louisiana. Against this backdrop, the article first presents a theoretical overview of the ECG method. Next, it describes the methods and outcomes of an ECG in Louisiana and the efforts of members of the ECG to collaboratively design numeric predictive models and restoration projects. From here, the article analyzes the ideological barriers faced by ECG in their attempts to overcome a one-directional, input-based framework for resident–scientist collaboration. The article ends with a series of critical questions about the possibilities of ECG to achieve the democratization of environmental knowledge in practice. **Key Words: coastal Louisiana, environmental competency groups, environmental restoration, participatory modeling.**

本文评估了环境能力组（ECG）方法如何将美国路易斯安那州沿海地区的居民和科学家联合起来，共同设计海岸恢复项目。基于为期10个月的定性能力组研究，本文描述了ECG做为科学知识民主化技术的成果和局限。尤其关注了文献中专家的和世俗的ECG环境知识的差异，以及在路易斯安那海岸恢复规划中如何实现ECG的愿望。本文首先展示了ECG方法的理论概述，然后描述了在路易斯安那采用的ECG方法及其结果，以及ECG成员们合作设计的数值预报模型和海岸恢复项目。由此，为了克服单向的、基于输入的居民-科学家合作框架的缺陷，本文分析了ECG所面临的思想障碍。文章最后提出了ECG环境知识民主化的一系列关键问题。**关键词：路易斯安那海岸，环境能力组，环境恢复，参与式建模。**

Este artículo evalúa el uso del método de grupo de competencia ambiental (ECG) como táctica para agrupar a residentes y científicos en la Luisiana costera para colaboración en el diseño de proyectos de restauración litoral. A partir de investigación cualitativa sobre el grupo de competencia durante un período de diez meses, este artículo describe los logros y las limitaciones del ECG como técnica para democratizar la producción de conocimiento científico. Se presta atención especial a las distinciones entre experto y profano o al conocimiento ambiental tradicional en la literatura sobre los ECGs y el modo como se desenvuelven las aspiraciones del ECG en el contexto de la planificación de la restauración litoral en Luisiana. Contra este trasfondo, el artículo presenta primero una síntesis teórica del método ECG. Luego, describe los métodos y resultados de un ECG en Luisiana, y los esfuerzos de los miembros del ECG para diseñar de manera colaborativa modelos predictivos numéricos y proyectos de restauración. Desde ahí, el artículo analiza las barreras ideológicas que enfrenta el ECG en sus intentos por sobrepasar un marco unidireccional basado en aportes para la colaboración de residentes–científicos. El artículo termina con una serie de interrogantes críticos acerca de las posibilidades del ECG para lograr en la práctica la democratización del conocimiento ambiental. **Palabras clave: grupos de competencia ambiental, Luisiana costera, modelado participativo, restauración ambiental.**

Louisiana is in the midst of a coastal crisis that represents a significant threat to the state's coastal resources and the communities that depend on them for their livelihood and economic well-being. The U.S. Geological Survey has reported that coastal Louisiana has experienced a net loss of approximately 4,833 km^2 of land and wetlands from 1932 to 2016 (Couvillion et al. 2017). This presents a significant social and ecological threat to coastal communities and environments that rely on wetland buffers to protect them from sea-level rise and the increasing intensity of tropical storms under current conditions of climate change (Laska et al. 2005). In response to this crisis, the Louisiana Coastal Protection and Restoration Authority (CPRA) has developed *Louisiana's Comprehensive Master Plan for a Sustainable Coast*, which relies on systems-based numerical modeling to inform decisions implementing a variety of coastal restoration projects (CPRA 2012, 2017). Although celebrated by environmentalists as the ideal mechanism for defining a coastal restoration agenda in the best interests of all Louisianans (Peyronnin et al. 2013), the extent to which these methodological approaches can reflect

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the diversity of needs of coastal residents outside of biophysical and quantitative metrics is limited.

There is a long history of environmental management practices in coastal Louisiana struggling to better engage with coastal communities in planning practices (Colten 2017; Hemmerling, Barra, and Bond 2020). Despite recent efforts by public officials and scientists to engage with residents and stakeholders on coastal restoration and climate change adaptation projects, many residents feel fatigued, ignored, and frustrated by what they perceive as a top-down and perfunctory public engagement process (Hemmerling, Barra, and Bond 2020; Jesse 2020). This is due in large part to the fact that science-based knowledge—including expert devices such as predictive models, risk indicators, monitoring instrumentation, ecosystem services calculations, and cost–benefit analyses—is granted priority over experience-based knowledge. Such distinctions between layperson and scientific knowledge are reflected in the context of confronting climate change in Louisiana and around the world (Whatmore 2009; Landström, Whatmore, and Lane 2011; Maldonado 2014). Geographers working in the fields of science studies have described conflicting relations between scientific expertise and experiential knowledge held by residents as "knowledge controversies" (Landström, Whatmore, and Lane 2011) that embody the salient tensions that emerge between different ways of knowing environmental issues (Whatmore 2009).

This article examines our attempts to use an environmental competency group (ECG) methodology as a means of addressing the differences and tensions that emerge when different kinds of environmental knowledge—Western, scientific algorithms-based predictive models and nonscientific/traditional, experiential knowledge—come together to collaboratively develop ideas for coastal restoration and protection projects in Louisiana. Following Lane et al. (2011), we locate this research more broadly in the challenges associated with public participation in science-based decision making around ecosystem change and modeling (Folke et al. 2005; Johnson 2008; Voinov and Gaddis 2008; Landström, Whatmore, and Lane 2011; Jordan et al. 2018). Within this article's analysis of the ECG composition, methodologies, and outcomes is a critical analysis of the challenges encountered by the ECG as they worked toward the goal of collaboratively defining restoration projects and modeling scenarios for southeast Louisiana. As such, this research contributes to scholarship on the possibilities of collaborations between scientific and traditional environmental knowledge in context of climate change (Cruikshank 2001; Brosius 2006; Farbotko and Lazrus 2012; Maldonado 2014) and scholarship in geography and science studies interested in novel methodologies for collaboration across traditional and scientific knowledge to address the persistent environmental risks associated with climate change (Whatmore 2009; Lane et al. 2011; Bethel et al. 2015).

A Model Controversy: Sinking Land and Eroding Relations between Coastal Scientists and Publics

Proposals by coastal scientists to create restoration projects to help coastal wetlands keep pace with unprecedented subsidence rates have existed in Louisiana since the mid-twentieth century. Several of these early ideas focused on reconnecting the Mississippi River to adjacent wetlands to reintroduce natural delta land-building processes (Gagliano, Light, and Becker 1973). Reconnecting the river reflects the basic geomorphological nature of deltaic rivers by allowing the river to once again build land by allowing it to bypass flood protection levees and flood local wetlands with freshwater and sediment that will enable sinking wetlands to keep pace with accretion rates (Gagliano, Light, and Becker 1973). In addition to sediment diversions—which are yet to be built in coastal Louisiana—other land restoration projects include the use of sediment dredging and piping to create and help fill in eroding and sinking marshes and barrier island creation to protect wetlands from erosion due to wave action (CPRA 2017).

Although in many ways redirecting the Mississippi River into sinking wetlands makes sense from a geological perspective, doing so in the face of 300 years of human settlement in southeast Louisiana—most prominently for flood control (see Reuss [2004] and Barry [1997] for a historical overview)—complicates what appears to be a simple geophysical solution to Louisiana's land loss problem. Investments in planning large sediment diversions and the predictive models scientists use to conceptualize their environmental impact generate considerable skepticism among the wider coastal public and some scientists (Barra 2019). Deep public opposition revolves around several social and environmental consequences for reintroducing large amounts of the Mississippi River in adjacent wetlands, such as changes to salinity regimes in coastal estuaries and the subsequent displacement of fisheries (de Mutsert, Cowan, and Walters 2012), the potential of nutrient pollution associated with agricultural runoff from the Midwest and the Gulf Dead Zone that will likely cause harmful algal blooms (Bargu et al. 2019), and increased flood risk to homes and communities associated with the influx of water into surrounding wetlands (Peyronnin et al. 2017; Barra 2020).

Many of these concerns from scientists and residents emerge from the ecological impacts of opening the state's first freshwater diversion, the Caernarvon Diversion. Located in Breton Sound

Estuary, the study area of the ECG project, when Caernarvon opened in 1991 the influx of freshwater changed salinity regimes in the outfall areas of the freshwater diversion, resulting in the large-scale mortality of thousands of oyster leases in Breton Sound Estuary and a decade of lawsuits between fishermen and state officials (Caffey and Schexnayder 2002; McGuire 2006; Theriot 2014). Beyond seeking financial compensation for damages to their oyster leases, many fishermen and local residents were frustrated by their lack of involvement with the planning and operation of the freshwater diversion structure. Although predictive hydrologic modeling was not used for the operation of the Caernarvon Diversion, the limited inclusion of local fishermen and their environmental knowledge created the origins of a hostile relationship between residents and coastal scientists.[1] Thus, when CPRA proposed the construction of several large-scale sediment diversions[2] along the lower Mississippi River in 2012, tensions arose again between groups.

Whereas state agencies like the CPRA see disagreements between coastal residents and scientists as a problem of communication, researchers critically examining public–state–science relationships in coastal Louisiana find them to be rooted in the siloed nature of coastal science production and the disregard for nontechno-scientific knowledge as valid for informing coastal restoration science (Bethel et al. 2011; Bethel et al. 2014; Maldonado 2014; Hemmerling, Barra, and Bond 2020). Divisions between scientific and nonscientific (or lay, local, traditional) knowledge exacerbate rifts commonly labeled as "public distrust of science" in coastal Louisiana. In the context of sediment diversions, predictive modeling embodies this rift as CPRA increasingly relies on them to make coastal planning decisions. Planners and scientists invested in predictive models insist that these computer programs provide politically neutral and trustworthy results coastal Louisiana can literally build a future on (Peyronnin et al. 2017). Although there is significant research in the scientific community that affirms the anticipated results of the models will be mirrored in reality (Meselhe, Sadid, and Allison 2016; Allison et al. 2017; Baustian et al. 2018), many local residents whose lives and livelihoods stand to be affected by sediment diversions are quick to point out that models and the predictions they produce are not only "hypothetical" (Barra 2019) but frequently divorced from on-the-ground knowledge and values of coastal residents.

An Environmental Competency Group for Louisiana

By 2017 CPRA affirmed the implementation of two sediment diversion projects in estuaries to the east and west of the Mississippi River below New Orleans: Breton Basin and Barataria Basin. Against the backdrop of past and unfolding controversies over the use of river diversions for coastal restoration, a group of natural and social scientists and engineers from the Water Institute of the Gulf decided to mobilize an ECG methodology for a pilot study of collaborative and participatory modeling of potential nature-based restoration projects[3] in the Breton Sound Estuary of southeast Louisiana (Figure 1). With the goal of developing a methodology that could make a space for collaborations between residents and scientists concerned with coastal restoration projects, we found the ECG to provide a promising model for cultivating a collaborative and more democratic approach to coastal restoration project planning and modeling.[4]

ECGs are a methodological approach to analyzing environmental problems aimed at bringing together a diverse group of participants—from traditional scientists and engineers to everyday residents and environmental managers—all affected by a particular environmental problem with the goal of collaboratively redefining what that particular environmental problem is and what solutions are most appropriate to confront it. Compared to focus groups or input sessions, ECGs aspire to redefine the process of knowledge making itself, confronting the hierarchical, and at times adversarial, relations between scientists and nonscientists, by opening the process of knowledge production to multiple groups. In this regard, developing solutions to environmental problems and the disconnect between scientific and nonscientific knowledge, what Whatmore (2009) characterized as "controversies," is not solely encompassed in more and better science and expertise but by reconfiguring what environmental expertise might be (Whatmore 2009; Landström, Whatmore, and Lane 2011). Compared to incorporating local or traditional environmental knowledges in the worlds of Western scientific practice, ECGs prioritize collaboration among group members as opposed to imagining each participant as a representative stakeholder of a larger constituency of people. By re-envisioning what environmental expertise is, who holds it, and how it is made, ECGs aspire to use environmental controversies as opportunities for the democratization of scientific knowledge or, to invoke the words of Whatmore (2009), to redistribute expertise. In this regard, the ECG method attempts to foster the conditions to make environmental knowledge, with the aspiration to (hopefully) generate innovative solutions—or at least collaborative solutions—to environmental issues (Whatmore 2009; Lane et al. 2011). Theoretically this approach is what Whatmore (2009), in dialogue with scholarship in science and technology studies (cf. Callon 1994, 1999; Latour 2004; Stengers 2005), described as taking advantage of knowledge controversies

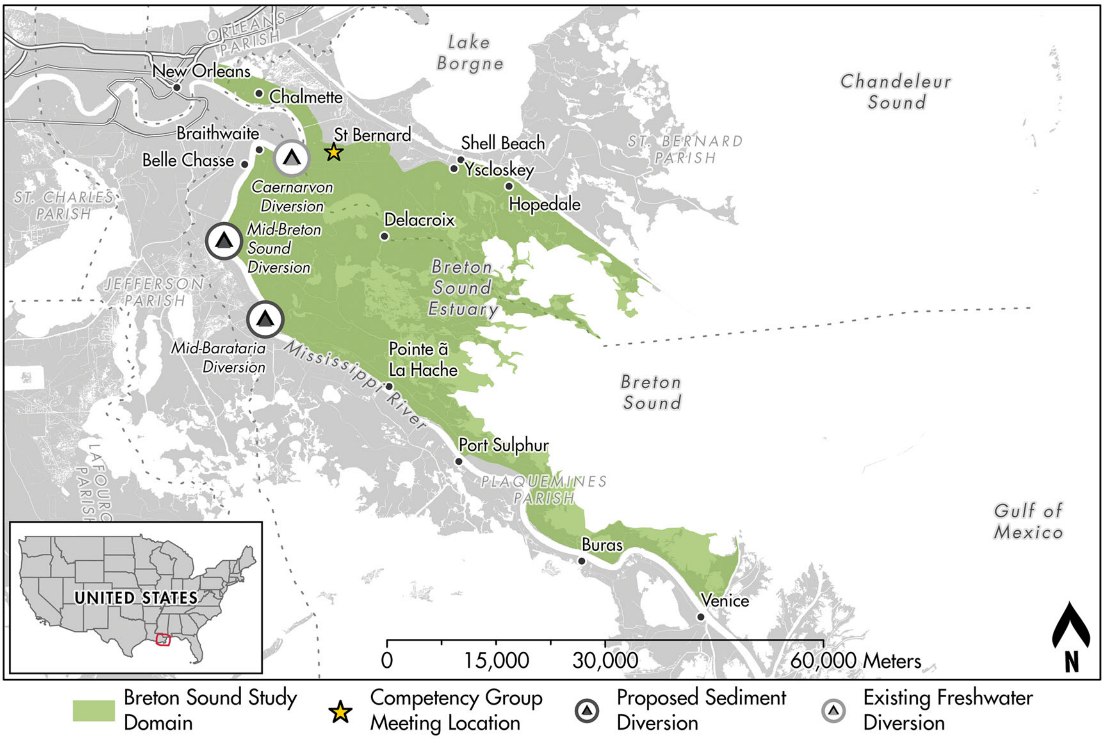

Figure 1 *Map of research area. Source: The Water Institute of the Gulf.*

wrought between scientists and nonscientists to "slow down" and attempt to dismantle the "hardwired" (Whatmore 2009) hierarchies of knowledge that underscore the sense of mistrust cultivated between scientists and wider publics.

Unlike practices of collecting traditional or local environmental knowledge that reinforce nature–culture dualisms that characterize deep epistemological rifts between scientific and nonscientific knowledge (Cruikshank 2001), the ECG methods present a framework for a "multiple knowledge approach" (Maldonado 2014) to environmental planning aimed at reconfiguring institutional practices that reproduce knowledge hierarchies and their correlate social divides in the public sphere. In this regard, our work reflects a recent push by critical social scientists working in Louisiana and in other areas within and outside of the United States (Bethel et al. 2011; Lane et al. 2011; Bethel et al. 2014) attempting to shift the institutional culture of environmental planning to see residents, fishermen, elders, and landowners (to name a few) as collaborators, not merely stakeholders.

Environmental Competency Group Meetings

The ECG was made up of sixteen regular participating members: ten residents from St. Bernard and Plaquemines parishes and six scientists from the Water Institute of the Gulf (the Institute). Following sampling methods from Bethel et al. (2011; Bethel et al. 2014), scientist and resident participants were selected through a peer review recruiting process. This included researchers attending local meetings about coastal issues in Plaquemines and St. Bernard parishes, regularly visiting public gathering places in these parishes, and reaching out to community leaders to generate a list of individuals who fellow residents felt have an extensive history and knowledge of the local coastal environment. Researchers strategically invited individuals who were recommended multiple times as a means of prioritizing invitations to participate in the ECG. It should be noted that individuals were not targeted as stakeholders or representatives of larger groups, because the ECG framework conceptualizes individuals as distinct and not representative of political constituencies or social groups (Landström et al. 2011). Although we did strive to generate diversity in occupations, age, gender, race and ethnicity, class, and so on, we did this with an eye toward having a variety of perspectives on coastal restoration in the ECG not, as is common in community engagement tactics about coastal restoration, to represent a swath of predetermined coastal stakeholders (e.g., commercial fishermen, indigenous community members, people affected by past restoration projects, etc.). We followed a similar tactic for recruiting scientist participants: soliciting recommendations from local universities, research institutes, and environmental organizations and inviting individuals to participate based on multiple recommendations.[5] Due to geographic constraints, however, only scientists working at the Institute were able to participate in all of the ECG meetings. Participants varied in age and occupation and included engineers, local business owners, fishermen, ecologists, and local landowners; they were paid for the time they worked in the group.[6]

The ECG met a total of five times over the course of nine months in 2018. Meetings were designed to achieve two primary goals. The first was to collaboratively develop the appropriate baseline conditions of the Breton Basin model that would be used to test ideas for coastal restoration projects proposed by group members. The second was to develop a series of nature-based (Baustian et al. 2020) environmental restoration projects and modeling scenarios aimed at addressing the challenges of coastal land loss in the region. Meetings were iterative, with a focus on discussing the ideas and questions of all members to ensure that projects and model outputs were not only understood by all participants but reflected considerable discussion and collaboration among participants. Between full competency group meetings, scientist ECG members met to discuss questions and ideas raised by the non-scientist members of the ECG and develop modeling scenarios.

Baseline Environment

Our first ECG meetings discussed project goals and going over the different types of models and their baseline environmental conditions. We covered the nature of the models we wanted to use, the information they contain, and how models would be used to test ideas proposed by the ECG. Although we could not build a model from scratch, our goal was to tweak model baseline conditions to the extent possible to reflect ECG ideas. To begin with, our modelers described two of the programs they would use to test projects ideas: Delft3D, an integrated biophysical model that has small grid cells and a slow computing time, and an integrated compartment model, a planning-level model that has a large grid size and faster computing time (Hemmerling et al. 2020). Some of the details modelers got into with the group were distinctions in grid size and model run time between two models. Modelers also facilitated conversations about what different models can and cannot do in terms of running various model data sets.

After this initial discussion, we used maps of the project area in Breton Basin representing current model data on salinity, bathymetry, inputs of freshwater, vegetation, and other model inputs to jump start group conversation on the topic of inputs to the model (Hemmerling et al. 2020). These maps were presented along with a list of existing model inputs. In two small groups, we discussed which inputs group members felt were necessary, where inputs needed to be changed or tweaked, and what important inputs might be missing. During the course of these discussions, members of the group also discussed which model might be best suited to examine certain biophysical components of the Breton Sound Estuary system, such as changes to near-shore mangroves versus offshore features such as barrier islands. The maps helped group members identify missing data that they felt were crucial to building a useful model, such as an array of freshwater inputs to Breton Sound Estuary not yet captured in the modelers' data sets and new vegetation projects.

Between meetings, ECG scientist members reviewed notes suggested by the entire ECG group and changed aspects of the baseline model to reflect ECG questions and input. To track the relationship between ECG input and the work of the modelers, we generated a list of inputs and correlated them to comments, questions, and concerns raised by ECG members. The goal was to make as explicit as possible the relationship between group input and changes to the models and, furthermore, to track the changes in the model directly back to discussions at the ECG meeting. With explanations of model changes in hand, we spent the next meeting working through questions and changes, arriving as close as we could to a consensus on the baseline conditions of the two modeling programs.

Projects and Conditions

Subsequent meetings focused on developing potential nature-based restoration projects to address land loss in Breton Basin and what environmental scenarios they wanted to test potential projects under in the ECG vetted baseline models. We worked in small groups following a project and condition rubric guide developed with the modelers to articulate the specifics of projects and how to model them within the programs the ECG used. For each project, we asked ECG members to describe the project, its function, location, and ideal outcome. From here, ECG members described how the modelers would test the various projects in the models. This encompassed trying to establish the environmental conditions that ECG members thought would be appropriate for testing their project ideas. Potential scenarios to test included sea-level rise rates, historic storms, subsidence rates, drought, river flood, sediment diversions (with and without operation rules), 2017 Coastal Master Plan projects (with and without), proposed parish-level (county-level) projects (with and without), surge scenarios, and so on (see Baustian et al. [2020] and Meselhe et al. [2020] for more details on ecosystem modeling in the ECG).

Going through these steps together created a situation where members of the group could pose questions, request changes, and gain a sense of how restoration projects are translated from ideas into model scenarios, which ultimately inform which projects are chosen for construction. Careful notation and attention to clarity of ideas was a key part of this aspect of the ECG because everyone wanted to make sure that modelers understood how exactly to work the group's ideas into the model design and project runs. Although seemingly straightforward, there is a significant technical and quotidian linguistic and conceptual barrier across all members of the ECG, which, in practice, forced us to "slow down" (cf. Whatmore 2009) and do our best to understand and be accountable to each other's ideas. This took time, but it was a crucial element of accounting for the ideas of the group in the modeling process and to ensure that everyone felt that their suggestions, as well as critiques, were heard.

After these meetings, the modelers took approximately four months to run modeling scenarios on sixteen projects under nine different environmental scenarios. A total of twenty-two restoration projects were modeled based on the competency group input (Baustian et al. 2020). At this point modelers decided how best to move forward with ideas as they saw preliminary results in the two different modeling programs. Results were presented at our final meeting, a peer review session of results and discussion of the modeling process, specifically how decisions were made to test one project or another. Suggestions were made for editing a final summary of all projects and model runs, including requests for particular maps and more details on the process of how each scenario and its projects were modeled. A series of project recommendations aimed at an audience of coastal planners was the concrete outcome of the ECG (The Water Institute of the Gulf 2018). Finally, we distributed a short, open-ended survey at the end of the last meeting to solicit individual reflections and conducted follow-up interviews with members of the ECG.

Discussion: Opportunities and Challenges of the ECG Method

Although practices of collaboration were amicable in our ECG, it was a challenge to evaluate or measure the extent to which participants felt that their participation in the ECG was distinctly democratic. This is because democratization in the context of the ECG is not an "output" but a process, or aspiration: It is about how we make knowledge, not about what that knowledge "is." It is intended to disrupt normative relations of power between different kinds of environmental knowledge by creating scenarios where individuals can share knowledge and learn from each other. To this end, we feel that a few characteristics of ECG design and facilitation create the conditions through which the possibility of democratizing knowledge can be achieved: (1) incorporating a diversity of knowledge not circumscribed by the framework of stakeholders; (2) long-term, multiple meetings that enable the group to learn and collaborate with each other; and (3) developing mechanisms to account for the work of the ECG in the final products (e.g., group peer review). We feel that by prioritizing these conditions in the formation and facilitation of our ECG, we achieved the broader epistemological goals of our project.

Acknowledging that democracy is a highly circumscribed and evolving ideological concept, we also want to highlight some areas where we feel our ECG fell short of its aspirations of trying to democratize how environmental knowledge is produced. Three particular challenges stand out.

The first is the challenge of lapsing into a community input style of engagement as opposed to a collaborative one. The conceptual thrust of the ECG methodology rejects layperson–scientist binaries (cf. Callon 1999) that reproduce hierarchies of knowledge. Yet in a social and technical context heavily circumscribed by the one-directional input of public engagement into environmental planning, it is a challenge for all participants not to lapse into familiar patterns of residents; for example, telling planners or scientists what to do and scientists trying to integrate their comments as yet another data set. To be sure, there were moments when members of the ECG were able to debate certain aspects of modeling, such as the kinds of subsidence rates used in the model to predict trends in land loss or the best data on local vegetation. In these moments, scientist and nonscientist members of the ECG were able to grapple with differences, ask questions of each other's expertise, and come to consensus on how to address a problem. Yet, it was often difficult for scientist members of the ECG to not interpret ECG conversations as "public input" to models as opposed to creating new approaches to modeling.

The constraints of treating ECG recommendations as the outcome of a group work and not merely capturing data points reflects the epistemological constraints of modeling and how modelers are trained to think about data as something that is put into the model but not necessarily shaped or made by sociocultural processes like modeling. The ECG organizational framework helped move our project in the direction of overcoming this epistemological divide by collaboratively developing modeling scenarios, but such changes require new methods alongside a larger project of actively cultivating different relationships to the production of scientific knowledge: a cultural shift beyond the scope of one project.

The next challenge was constraints of numerical models and existing ideological frameworks for restoration. The fact that we could not build a model from scratch limits the extent to which the ECG could be a departure from other coastal restoration planning practices. Questions such as, "If you cannot change the model, will you produce the same results?" and "How can we produce anything that looks different from CPRA's Coastal Master Plan output if we are using the same model they use?" came up at various points during ECG meetings. This reflects the fact that the scope of coastal restoration efforts and planning in Louisiana is highly circumscribed by CPRA and the framework for coastal restoration they put forward. As indicated earlier, a cultural and technical shift would need to occur to think beyond the constraints and opportunities offered by the Coastal Master Plan and allow time to do so.

In an ideal situation, we could have worked more directly with the group to define the scope of the problem as opposed to beginning with the framework of nature-based restoration projects and existing environmental scenarios in the models based on the state's Coastal Master Plan. A more open and collaborative approach would have been to start the conversation with this: What is the most pressing environmental issue facing Breton Basin and its residents today? From here, we could determine from the group what that problem or set of problems looks like and then work toward identifying collective framing of projects or ideas to address those issues. As it was for our project, however, we had to take an approach to conducting ECGs that could fit within the confines of the project goals and a timeline (particularly for modeling) determined by one of the project funding agencies, CPRA, a point that many ECG members noted.

Transparency of process and building trust was another challenge. Despite the challenges of the project goals and timeline, the ECG was fairly successful at making the process of predictive modeling more transparent to members of the ECG. In taking the time to slow down and explain some of the particulars that go into predictive modeling—such as baseline data, environmental scenarios, and project proxies—members of the group were able to come to a better shared understanding of what exactly modeling is and how it relates to coastal planning. Throughout ECG meetings, members of the group consistently discussed how different models are made, what they are used for, and with what data sets models are populated. Having a forum for these kinds of exchanges and spaces for inquiry led ECG participants to indicate that ECG methods helped to better explain what "goes on" in the modeling process. Although demystifying the process of making predictive models was one significant outcome, the capacity to shape input into the models was another factor that ECG members consistently noted as a welcome outcome of the ECG. Establishing an environment for the mutual exchange of environmental knowledge, to quote one ECG member, "allowed for a larger exchange of ideas" that was more than "just scientists." Along these lines, modeler participants, although challenged by the ECG approach to modeling, were also given the opportunity to rethink how they "do" modeling within a participatory framework. Although this was not an explicit goal of the project, these outcomes are unique compared to community engagement and input frameworks. Because predictive modeling is the cornerstone of coastal restoration planning at the state level, it is significant that ECG members came away with a clearer understanding of the tools that provide the framework for coastal restoration planning and spending in Louisiana.

Many of the scientist members of the ECG hoped that opening up their process to residents would help to foster resident trust of scientists and, moreover, state agencies like CPRA and their coastal master planning work. Understanding models and trusting how scientists and policymakers use them, however, are two separate processes. We cannot say whether or not all members of the ECG felt that they trusted science and scientists more after participating in our project. Rather than trust, we would argue that the ECG developed a mutual respect by inviting nonscientists into modeling practices. Having the resources to slow down planning, taking the time to meet, getting to know each others' perspectives, and debating, reviewing, and revising were valuable aspects of the project. Although this is not an explicit indication of trusting science or CPRA, it is a distinct outcome compared to many other attempts to work with coastal residents on coastal planning.

Conclusion

In light of the possibilities and limitations of our use of the ECG method in coastal Louisiana, we find that our work echoes a growing body of scholarship on ECGs as a method that challenges dominant interpretations of what environmental problems are and the technical and scientific tools we use to address them. Compared to public engagement or collaboration methods that value local knowledge and input as a means of producing buy-in from communities or, at best, developing better ideas and solutions to environmental problems, ECGs work at a more foundational, ideological level to reconfigure how (and by whom) environmental knowledge is crafted in the first place. The ECG method cultivates this by providing the space and time to redefine problems and solutions to environmental issues outside frameworks of state or environmental management planning practices. Even if recommendations for restoration projects were similar to ones crafted by scientists and CPRA, the approach through which the ECG arrived at those projects works in a humble way toward trying to shift a culture of coastal restoration planning away from implicit hierarchies between local and scientific knowledge. Such engagements are not simply a matter of collecting and testing out local or traditional knowledge but of developing a collective and shared understanding of an environmental problem and a knowledge base for confronting it.

Such an approach can be particularly insightful for climate change planning at the regional level, where opportunities for deep and regular engagement among participants is feasible. It necessitates time, though, for giving ECG members the opportunity to achieve adequate results that do not merely mimic older engagement processes or planning approaches. As such, the ECG is not a method suitable for a quick turnaround or research that does not have the resources for sustained, qualitative research. Nevertheless, such a careful and measured approach to understanding environmental problems can yield solutions that reflect the diverse knowledge and values of individuals working and living with environmental change. ■

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Notes

[1] The wider conversation around the mistrust of coastal publics and coastal restoration advocates stemming ultimately from lack of consistent and equitable engagement in coastal planning processes has been well documented in documentary films, scholarly literature, and local and national newspapers and documentaries.

[2] The language shift here is important, especially for coastal scientists and planners. In an effort to distance new proposals for sediment diversions from freshwater diversions like Caernarvon, CPRA has worked hard to explain that sediment diversions are designed and operated to capture the most amount of sediment in the river to build land. This stands in contrast to freshwater diversions, which are designed to manage water salinity levels. Despite the technical and linguistic distinctions, though, the two kinds of diversions are often considered more similar than different in the public realm.

[3] Compared to hard infrastructure projects such as levees and floodwalls, nature-based restoration projects aim to integrate environmental protection for human settlements and (re)generate ecosystems services that can enhance and protect coastal habitats while also providing storm surge and flood protection (see Baustian et al. 2020).

[4] Earlier efforts to integrate local knowledge into coastal restoration planning for the CPRA were conducted by scientists from local universities and Indigenous communities living in coastal areas directly affected by coastal land loss (see Bethel et al. 2015).

[5] For a more detailed discussion of recruitment methods, please see Hemmerling et al. (2020).

[6] For scientists, this was covered in their salaries, because it was considered part of the scope of their everyday work. Nonscientist participants were given stipends for their participation. Although a more extensive conversation on the politics of reciprocity and compensation in community-engaged projects is outside the scope of this article, compensation is standard practice for research that demands labor of participants beyond their everyday jobs.

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