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Building Participatory Knowledge Infrastructure Against the GMO Agribusiness Regime: The Case of *Los Campamentos Sanitarios*

SPECIAL COLLECTION: DISASTER, INFRASTRUCTURE, AND PARTICIPATORY KNOWLEDGE

RESEARCH PAPER

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ABSTRACT

From 2010 to 2019, Argentinian medical students and faculty at the Universidad Nacional de Rosario worked with allies from grassroots movements to routinize new epidemiological data collection practices designed to call medical students' attention to the public health consequences of industrial agriculture's indiscriminate use of pesticides. This paper charts the rise and fall of their collective efforts to institutionalize participatory knowledge and pedagogy that directly challenged the political legitimacy of industrial agriculture. We anchor our study in a trio of concepts—sociotechnical regime, niche, and network—using these tools to describe the dynamic interplay among dominant and subordinate knowledge systems. Our analysis reveals that radical participatory projects cannot be understood without reference to the historical and institutional contexts that structure opportunities and constraints within which participatory knowledge research is developed, implemented, and sustained.

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INTRODUCTION

Research analyzing opportunities for citizen science to improve responses to natural disasters and public health crises is flourishing. Community-based, participatory knowledge (PK) production improves the relevance of research questions (Brown et al. 2016; Lichtveld et al. 2016), enhances research efficiency through crowdsourcing (Haworth and Bruce 2015), contributes to the creation of monitoring infrastructure that empowers disadvantaged communities (Hendricks et al. 2018) and increases public visibility of social inequalities and injustices (Newman et al. 2020).

While there is little doubt that citizen science can induce positive changes in disaster-related public policy, such change is more likely when PK aligns with the goals and interests of political actors who control the policymaking process. In other words, citizen science seems to be most politically impactful when it promotes incremental reforms that do not fundamentally threaten the status quo and supporting power structures. As studies of just and sustainable transitions in the context of fossil fuel and alternative energy infrastructure are beginning to show (e.g., Wylie 2018), policy transformations grounded in citizen science that directly challenges the status quo are often more difficult to achieve. The institutional politics of citizen science and the material conditions affecting transformative change remains under studied.

This paper examines a radical PK and pedagogy project designed to create epidemiological data to counter industrial agriculture's indiscriminate use of pesticides in genetically modified (GM) soy-producing regions of Argentina, a centerpiece of the country's economic development policy (Leguizamón 2020). Situated at the Universidad Nacional de Rosario (UNR), Los Campamentos Sanitarios[1] (hereafter, LCS) engaged medical students in a series of weeklong collaborative community health surveys in towns and villages impacted by pesticide spraying. For a decade beginning in 2010, LCS collected, analyzed, and presented survey results in forty impacted communities representing more than 100,000 people, all of whom lacked prior access to epidemiological and environmental health data. For a time, concrete successes multiplied. LCS organizers were able to institutionalize the project in medical degree (MD) curricula and programming. Local governments, environmental neighborhood assemblies, and health and legal experts also used the data to endorse municipal ordinances restricting the use of pesticides, to pursue lawsuits to protect public health, and to promote changes in local public health and agrarian policies. Despite the positive impacts and growing recognition from national and international media and social movements, the project sparked increasing resistance from agribusiness interests, and in 2019, university authorities summarily, and without warning, closed down the project.

Amidst an impressive record of incremental "wins," we want to understand why LCS ultimately lost. Following a literature review that situates our study in the sociotechnical regime-niche framework developed by Rip and Kemp (1998), we next set our case study in historical context and briefly describe our research methods before presenting a case study of the development of the LCS. A concluding discussion highlights how historical and institutional context is essential for understanding the politics on which the failure or success of oppositional PK projects turn.

PARTICIPATORY KNOWLEDGE

Originating in different disciplines, the concepts and definitions used to describe participatory approaches to knowledge production sometimes overlap. "Participatory action research" (Fals Borda 2000), "popular epidemiology" (Brown 1987), "citizen science" (Irwin 1995), "street science" (Corburn 2005), "community-based research" (Israel et al. 1998), and "transdisciplinary research" (Maasen and Lieven 2006), among others, constitue a family of like concepts and approaches. Despite their attention to different political goals, different audiences, and different ways of opening the production of knowledge (Eitzel et al. 2017), these perspectives share an intention of promoting a closer integration of research and practice between science and society. Following Eitzel et al.'s (2017) suggestion to work with definitions that are as broad as possible, for the purpose of this paper, we use PK as an umbrella term encompassing the various models of PK production.

Proponents of PK point to several demonstrated benefits. Sauermann et al. (2020) summarize PK's advantages as improving the identification of societal problems, increasing resource mobilization, and facilitating sustainability by providing robust contextual knowledge of sociopolitical conditions. Others have delineated PK's benefits in relation to environmental justice (Brown 2007), public health advocacy (Minkler et al. 2008), and early monitoring of and recovery from natural disasters (Newman et al. 2020).

In spite of their clear promise, PK approaches remain marginal in public policy design and implementation (Nascimento et al. 2018). Indeed, a growing body of literature has identified four major challenges that constrain PK's broader legitimacy and uptake in science and policy domains (Bergold and Thomas 2012; Hendricks et al. 2018; Marchezini et al. 2017):

1. *There are issues related to developing research partnerships with non-professional participants*: community members' reluctance to participate; time-consuming work processes; tensions among academic and extra-academic partners; and misrepresentation of "the community."
2. *There are methodological issues mostly related to data quality and data management*: questioning the scientific quality of the research; developing data security systems; and integrating data from multiple sources.
3. *There are difficulties in influencing public policy*: obstacles to democratizing decision-making processes within governmental institutions; few mechanisms for PK to impact top-down policy-making structures; and mistrust of PK data quality for policy purposes.
4. *There are broader social, political, economic, and cultural issues that can impede the social changes commonly associated with PK projects*: competing institutional demands and power imbalances; systemic inequality; lack of funding for participatory research and training; risks for the researchers' careers; and limited social trust regarding data quality and data misuse.

The LCS case we examine below illustrates the third and fourth sets of larger structural constraints. We use it to motivate a political sociological analysis of power in knowledge production processes (Frickel and Moore 2006), anchoring our study in the concept of sociotechnical regimes, as developed by Rip and Kemp (1998). Sociotechnical regimes are heterogeneous systems consisting of cognitive, social, economic, institutional, scientific, and technological elements and processes. They are akin to Bowker and Star's (1999) concept of "infrastructure," insofar as regimes are also "a negotiated order" in which technological and organizational resources, routinized work practices, and "a wide variety of users" are "made to work together" (p. 34). These infrastructural elements articulate with and mutually reinforce one another, setting the conditions for certain types of knowledge to be produced and circulated while blocking other types of knowledge that are subsequently left undone, unfunded, or incomplete, and may become objects of suppression when they threaten powerful economic and political interests (Hess 2007; Martin 2007). Conceptual similarities between sociotechnical regimes and infrastructures notwithstanding, the former explicitly theorizes a dynamic tension between dominant and subordinate knowledge systems that we find particularly useful in making sense of our empirical case.

Suppression of alternative knowledge practices, including PK, is most likely when counter-regime actors, practices, and knowledge occupy "sociotechnical niches," which Belmin et al. (2018) describe as "protected spaces where alternative networks design and develop breakthrough innovations" and that function as "banks of options for further regime transition" (p. 44) (see also Smith 2006; Smith and Raven 2012). When sufficiently protected institutionally, niche actors can subsequently build alliance networks as a strategy against mounting selection pressures from the dominant regime (Kemp, Schot, and Hoogma 1998). These three concepts—sociotechnical regime, sociotechnical niche, and network—provide a set of analytical tools for investigating how counter-regime PK actors increase their capacity to attain meaningful and lasting social change under conditions of limited epistemological and political power.

As we describe below, LCS directly challenged and in turn was openly attacked by incumbent interests embedded in the very sociotechnical regime – Argentinian GMO agribusiness – whose local health consequence LCS struggled to illuminate. Researchers have analyzed regime responses to PK in public policy formulation and implementation (Puente-Rodríguez et al. 2016). Others have studied the institutional vulnerabilities affecting the effectiveness of PK projects in developing societies (Marchezini et al. 2017). Yet, in all cases, the PK projects were requested by regime actors as inputs for policy making and thus already on the regime's political agenda. In contrast, LCS involved a PK project that addressed a problem – the epidemiological impacts of GMO pesticide spraying on rural and peri-urban communities – which incumbent regime actors did not initially recognize as a problem and whose niche development through alliance networks subsequently fueled exceptional levels of regime resistance and suppression. The next section sets the context for our analysis.

HISTORICAL CONTEXT

THE GMO AGRIBUSINESS REGIME

Since the mid-1990s, Argentina has supported an agricultural economic development model based on a suite of patented biotechnologies that combine GM seeds and broad-spectrum systemic pesticides (glyphosate) within industrial-scale monocrop systems (Leguizamón 2020). Initially, in the absence of national restrictions on pesticide use, pesticide applications to soybean fields rose exponentially, greatly increasing crop yields (Naturaleza de Derechos 2019). By 1998, Argentina had emerged as the world's second-largest producer of GM crops (James 1999). Higher exports in turn softened traditional balance-of-payment constraints (Teubal 2008), encouraging broad political support for the GMO agribusiness regime from right- and left-wing governments alike. Various other actors, including seed firms, biotech research organizations, farmers, and village leaders, co-evolved with the regime (Rip and Kemp 1998), supporting GM crops against less-chemical-intensive alternatives (Arza and van Zwanenberg

2014). Within a decade, a new sociotechnical regime had taken hold.

Systematically ignored by government officials, communities from Argentina's agricultural regions began protesting the use of pesticides in 2001, soon identifying themselves as *Pueblos Fumigados* (*Sprayed Villages*) (Arancibia and Motta 2019). Movement activists demanded restrictions on pesticide use, and often encouraged a transition to an agroecological agrarian model, on the basis of communities' claims that pesticide spraying was linked to the growing prevalence of developmental abnormalities, cancers, and other pathologies (Rossi 2021; Verzeñassi and Vallini 2019). To date, few government officials at the national or provincial levels have formally recognized or addressed the public health crisis or promoted epidemiological and environmental studies to analyze the specific impacts of exposure to pesticides in the country. Doing so would threaten the legitimacy of the GMO agribusiness regime.

Facing conditions of "undone science" (Arancibia and Motta 2019), activists from the *Sprayed Villages* movement have allied with scientists and health experts to conduct laboratory and field studies of pesticide effects to support their claims (Motta and Arancibia 2016, Frickel and Arancibia 2021). LCS was the first (and to date only) project to systematically produce epidemiological data in the affected rural areas. Importantly, for a time, LCS made some of the invisible infrastructure of the GMO agriculture regime broadly visible by creating a new tool—community health surveys—and publicizing the results with formal support from municipal and village governments and a public university.

THE PUBLIC UNIVERSITY SYSTEM

Argentina has a strong tradition of free and unrestricted public higher education. Public universities are self-governed by a democratic system, which seeks to guarantee political autonomy and implies a high level of politicization of academic life. Universities are organized into different schools (e.g., medical sciences, political sciences, agricultural sciences), with each school governed by a Directive Council and a Dean. The Council, composed of democratically elected counselors representing faculty, college students, graduate students, and administrative staff, makes budgetary and curricular decisions and elects a new Dean every four years (Nosiglia and Mulle 2015). As relatively autonomous organizations, universities differ from one another in terms of research focus and politics.

Enshrined in the educational reform laws of 1918, Argentina's national universities also embrace a social mission of public outreach focused on identifying and solving local and regional social problems. However, this mission has never enjoyed status or resources within the university system, and since the 1990s, administrators have instead stressed universities' role in national economic development (Di Bello et al. 2020). This reframing linked the university system politically to the then-nascent GMO agribusiness regime, and some universities have embraced this connection through research investments in transgenic crops and related biotechnologies. Even so, critics—including those at UNR—raised concerns regarding the need to recover the social outreach mission of universities (Arocena and Sutz 2015; Romero et al. 2015). As we will show, the UNR Medical School, for a time at least, supported a social mission approach to environmental health that challenged the biomedical model of health, and directly challenged the regime supporting GMO agriculture. In this way, the medical school functioned as a sociotechnical niche that provided protection and legitimacy to activists and their academic allies employing PK practices designed to draw attention to the hidden pesticide crisis.

RESEARCH METHODS

While the camps were designed around PK approaches, the data presented here are based on more traditional qualitative methods involving interviews, document collection, archival research, ethnography, and participant observation (within a PK context, see the section Competing Interests). We carried out data collection in two phases.

In 2015 and 2016, VA and FA conducted qualitative research to learn about the potential for LCS to challenge the GM agribusiness regime with PK. Data collection involved thirteen in-depth interviews with LCS organizers, teaching assistants, and students, as well as non-participatory observations, at a Congress organized by LCS faculty and students and during a five-day LCS field study trip. VA and FA also co-organized with LCS a two-day workshop on designing tools for socio-environmental health. In addition to conducting ethnographic analysis and developing field notes to record their personal experiences at these events, VA and FA also taped and transcribed audio recordings of interviews, speeches, presentations, and formal panel discussions. Data collection during this phase was mainly prospective rather than retrospective. It helped us to understand the extent to which the LCS defied the status quo within the medical school and to identify political controversies in niche-regime relations.

The second phase of data collection occurred during 2020 and early 2021. FA initiated a series of in-depth conversations with DV, to collaboratively reflect on DV's leadership role in the LCS as the project evolved (at different times as faculty participant, Director of the Final Practice, Outreach Undersecretary and Secretary, and Academic Undersecretary at the UNR Medical School), especially

in relation to opposition to the GM agribusiness regime. These conversations focused on the main challenges faced by LCS organizers, researchers, and community participants, and the PK strategies developed to overcome those challenges. The reflection was carried out over a period of days, involving three interviews and several follow-up email exchanges and telephone conversations. We summarized the reflection in a series of written briefs that we draw from throughout the case study narrative that follows.

Finally, throughout the entire process, we collected and analyzed data from secondary sources that included newspaper articles, organization web pages, and documents from the *Sprayed Villages* movement.

LOS CAMPAMENTOS SANITARIOS

Established in 2010 in the UNR Medical School, LCSs were five-day field study trips for final-year medical students who collected morbidity and mortality data through a public health survey, and conducted community health workshops in the rural communities they visited. Guided by PK principles, LCS organizers designed the first survey in collaboration with *Sprayed Villages* activists, and convened field camps only where local officials explicitly requested them. Participating community members were encouraged to add new questions to the health surveys to ensure that the instrument addressed specific local needs. Students shared results with the community through oral presentations and written reports certified with the imprimatur of the UNR Medical School. LCS posed a radical challenge by raising awareness and promoting policy changes to restrict pesticide use and to improve community health and ecological well being.

LCS was radical in another, institutional sense, insofar as the camps promoted a holistic or biocentric medical model (Payán and Monsalvo 2009) as an alternative to the hegemonic model of western medicine that is positivist, ahistoric, and individualistic, oriented more toward repair rather than prevention (Menéndez 1985). By building their analyses from community experiences rather than imposing students' own medical knowledge onto the community, LCS participants embraced an integral, holistic, and collective perspective of human health as inseparable from ecosystem health. More importantly, LCS challenged traditional classroom and hospital-based education focused on biomedical dimensions of health and medical care, instead promoting interdependent and reciprocally beneficial partnerships between medical schools and the communities they serve (Strasser et al. 2015). Not least, LCS enmeshed the UNR Medical School within the increasingly contentious politics of pesticides and the *Sprayed Villages* movement—a linkage that positioned LCS in direct opposition to the GMO agribusiness regime anchoring Argentina's economic development and that would prove instrumental in LCS's dissolution in 2019.

We have organized the analysis longitudinally to emphasize successes and challenges of an oppositional sociotechnical niche advocating for participatory environmental health knowledge. Figure 1 locates key events in temporal order and corresponds with our narrative organization of LCS's creation, consolidation, and eventual dismantling.

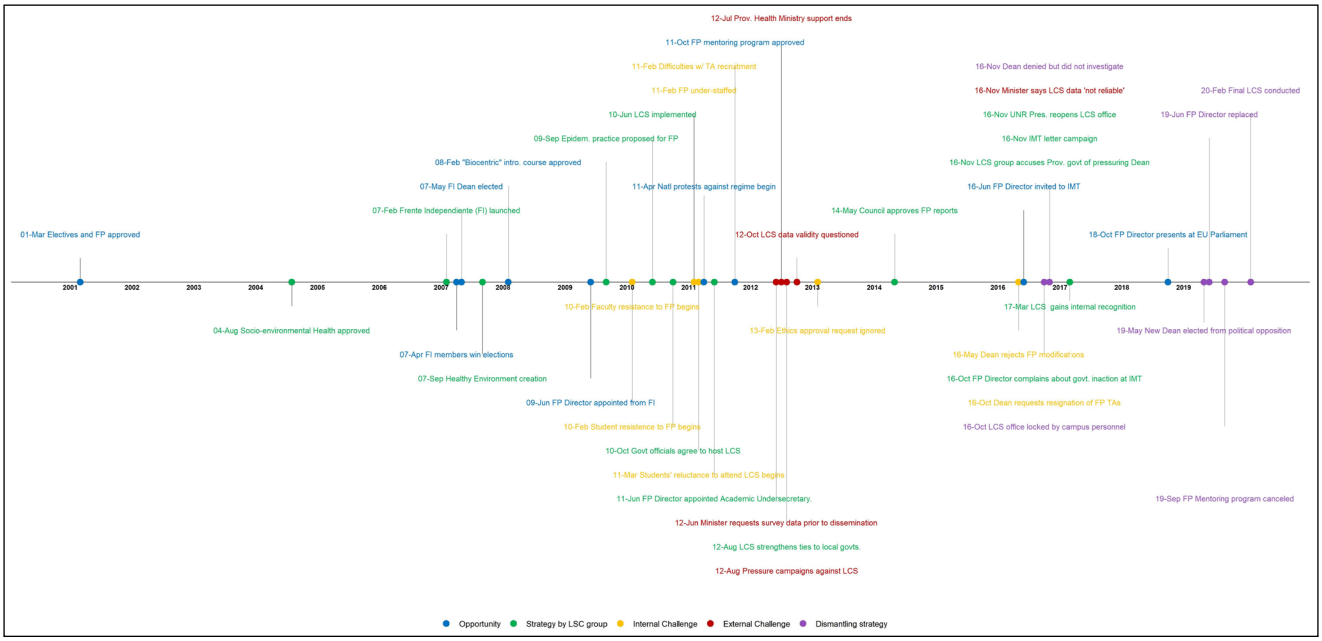

Figure 1 Timeline of events associated with LCS.

CREATION (2001–2010)

In its origins, the health camps reflected the growing societal influence of the *Sprayed Villages* social movement, but they were also a product of institutional opportunities emerging within the UNR. In 2001, the medical school Council approved the creation of a new curriculum requiring additional elective courses and a hands-on practicum experience, the Práctica Final (Final Practice) (FP), as the final requirement for the MD. The actual content of the FP, however, was left for future determination. Seeing an opportunity for creating new courses, in 2004, a group of medical students (hereafter "the group") developed and received Council approval for an elective course called Socio Environmental Health—the first medical school course to address environmental topics. In 2007, the group proposed a university extension program called Healthy Environment that would provide public hands-on educational activities including organic gardening practices and topical workshops.

Once approved, Healthy Environment became an important outreach and networking mechanism, incubating new connections between the group and state institutions such as the Provincial Ministry of Health and various municipal governments, as well as social movement organizations, many of which were part of *Sprayed Villages*. Inside the medical school, the course Socio Environmental Health functioned as niche space, providing an organizational setting in which students began promoting a biocentric medical perspective and democratizing the curricula through a new student-run political organization, *Frente Independiente*. In 2007, students and faculty associated with *Frente* were elected to Council; another *Frente* member was elected Dean. Now, the niche had some institutional power as well as an organizational existence.

With this power shift, the school became more inclusive in promoting an alternative medical curriculum. In 2008, the Council scrapped the entrance exam, replacing it with a course based on biocentric, community-based medicine. The following year, the Dean and Council appointed a faculty member and Outreach Undersecretary (DV) associated with *Frente* to direct the FP, who in turn designed a new syllabus for the FP that, among other things, required students to participate in LCS as the final integrative evaluation of the FP. It was with this move that the project first encountered resistance: from students, who did not want their MD to be dependent on spending five days in a rural village, and from professors and lecturers who preferred a more traditional clinical medicine exam. The conflict at this stage mainly took the form of a professional ideological dispute. At issue were two competing models of medical education and, more broadly, disagreement among faculty and students about the university's proper role in society. Importantly, the conflict was contained within UNR.

The *Frente's* general popularity among the students, in addition to some strategic lobbying and the group's prior outreach work with *Sprayed Villages*, revealed the concrete societal demand for community health data in the context of intensive pesticide use by the GMO agribusiness regime. These efforts were sufficient to overcome internal opposition to including the LCS in the FP syllabus, which the Council finally approved in June 2010. Beginning that spring and for each year after, four cohorts of 80 to 90 medical students participated in LCS, conducting the surveys and reporting the results to local communities as the final step in their degree program. With the approval came new legitimacy as well as new resources for buses, travel insurance, computers, and other material expenses, also helped by the new position of the FP Director (Outreach Secretary). Government administrations in the affected communities provided other critical resources, including food and lodging, and the Provincial Ministry of Health (Santa Fe Province) connected LCS organizers with local health centers.

In its origins, LCS grew from efforts inside UNR, led by a small group of progressive students and faculty who pursued a bi-directional organizing strategy. They worked simultaneously to build alliances to powerful interests within the university administration while also developing new connections among social movement and civil society actors outside the university. The two sets of alliances reciprocally reinforced the sociotechnical niche that was emerging within the medical school's left wing, securing material and political resources sufficient to overcome internal ideological resistance and secure basic institutional support for an innovative curricular model of medical education anchored in a PK approach to environmental health.

CONSOLIDATION (2011–2015)

As LCS consolidated over the next several years, opposition grew steadily. Professional opposition within the university continued as before, although the internal challenges during this period were more organizational than ideological. They manifested in students' reluctance to participate in the camps and difficulties in recruiting and developing a stable group of TAs and lecturers to run the FP. New forms of resistance arose from *outside* the university, primarily related to LCS's emerging confrontation with the incumbent GMO agribusiness regime. We describe each conflict in turn.

Internally, not only lecturers and professors resisted the FP promoted by the *Frente*, but many students as well. Once LCS became a compulsory part of the FP, students'

resistance surged, aided by a negative campaign from oppositional student groups. The oppositional faction insisted that forcing LCS participants to record residents' health information from doorsteps rather than diagnosing patients in a typical medical clinic setting was inappropriate for medical students. In response, the group stepped up lobbying efforts within the Council to promote additional curricular changes and to extend the niche's institutional power into the MD.

In 2011, the group designed and received Council approval for a 9-month mentoring program within the FP to support and train students participating in LCS. The mentoring program was an important step in consolidating PK approaches and expanded the sociotechnical niche LCS occupied within the medical school by creating a new space for critical reflection on traditional medical practices. The mentoring program also created a new set of organizational challenges. At this stage, the FP had no paid teaching positions and was carried out by ten ad-honorem TAs. With the new mentoring program, the need for a stable group of paid lecturers and TAs became more pressing. A related problem was that LCS organizers had limited practical experience with community health surveys, since it was a novel project, and no experience training and motivating students. A third problem was that while no advanced students could teach in the FP (as it was the final requirement for the MD), finding recent graduates to run the program was difficult because most preferred to initiate their careers in better-paid clinical positions outside the university. In 2011, the FP Director was appointed Academic Undersecretary of the medical school, a political position that afforded him new power and responsibilities for curricular and staffing decisions. In that role, he created thirty part-time TA positions to support the FP. Now, LCS's institutionalization was more or less complete, with cumulative capabilities that helped deal with the other issues: LCS activities were managed more effectively and participating students were more motivated.

Beyond the university, other challenges confronted the project. Specifically, the program's consolidation phase coincided with a rise in the number of protests against the GMO agribusiness regime's overuse of pesticides. Protests had grown nationally, and included critical voices of several higher-visibility scientists and physicians (Arancibia 2013). A year later, with a few LCS camps completed, their political impact on the larger pesticide conflict became clear. The field studies reactivated long-simmering local conflicts and empowered community activists by providing epidemiological data to press municipal and provincial governments to make and enforce new rulings curbing pesticide use. In the context of escalating social conflict, the Provincial Ministry of Health demanded access to survey results before the group released them to the communities. As LCS denied the request, the relationship between the group and the Ministry deteriorated, and in 2012 the Ministry terminated the supportive agreement (Página 12 Rosario 2012). Subsequently, Ministry representatives mounted pressure campaigns discouraging municipal mayors from hosting camp sessions in their villages and towns (Página 12 Rosario 2012). With the Ministry alliance in tatters, the group worked locally to strengthen relationships with municipal governments in the pesticide-affected regions.

LCS faced another significant challenge to their growing social authority during this phase. Designed mainly as an outreach and pedagogical tool responding to community needs, the organizers had not prioritized research or prepared articles for peer-reviewed publication. Regime interests framed the absence of published research as a weakness that called into question the scientific validity of the community health survey data. Similarly, in lawsuits filed by community activists against unregulated spraying, the lawyers defending the communities insisted that only published data would be accepted in the courts (Cabaleiro 2020).

Because the group had not received prior approval from the school's Ethics Committee,[2] the data already collected would not be acceptable for academic publications, and any new data produced would need prior approval. Yet university administration ignored the group's subsequent request for approval to collect new data. Instead, the still-supportive Council agreed to approve and thus officially certify the final FP reports. According to Argentine law, such official reports constitute valid forensic evidence and therefore are admissible in court. This pivot from scientific to legal authority has since met with considerable success in different successful lawsuits (Cabaleiro 2020), as well as in the media. It shows how a sociotechnical niche strategically manipulates different, intertwining infrastructures—in this case, scientific and legal tools and norms for their use—to further one's political goals.

With institutional consolidation, LCS gained new organizational resources inside and outside the university. It also attracted new forms of external opposition. Even so, LCS's new institutional capacity, now including networked connections to social movement actors and to sympathetic lawyers and scientists, provided opportunities for political maneuvering—from Provincial administration to local governance and from scientific authority to legal authority—that allowed the program to continue to grow and extend its reach into society despite new external threats.

DISMANTLING (2016–2020)

In the third stage, regime opposition fused with heightened internal conflicts to create new institutional obstacles

that niche actors promoting LCS ultimately would not overcome. As we show here, the failure occurred in the context of growing international attention to the politics of pesticide use and a changing political opportunity structure inside the medical school.

The two medical school Deans in office during 2007 to 2015 represented *Frente* and had supported LCS. A new candidate put forward by *Frente* won the deanery election in 2015, but once in office withdrew his support for LCS. This was an unexpected turning point. The new Dean's growing opposition began in May 2016 in the context of a proposal to modify the FP syllabus. To reduce delays in the elaboration of the LCS reports and improve the work with sprayed communities, a revised syllabus required students to work with the communities for a longer period (making three trips instead of one) and take a larger role in processing and analyzing the collected survey data. The Dean rejected this modification, arguing that he did not want to incur student opposition (Nidd 2016).

Later in the same year, at the invitation of the International Monsanto Tribunal (IMT) convened in The Hague, the FP Director presented epidemiological data collected during twenty-seven LCS field studies. Five judges heard from thirty witnesses from five continents and passed judgement on Monsanto, which stood accused of ecocide (International Monsanto Tribunal 2018 and 2018). In his testimony, the Director presented empirical evidence suggesting that cancer, disorders of the endocrine system, thyroid conditions, allergic respiratory conditions, chronic neurological conditions, miscarriages, and congenital abnormalities in babies occurred disproportionately in the *Sprayed Villages* (International Monsanto Tribunal 2018). He also complained about the inaction of the national and provincial governments in addressing these health inequities (International Monsanto Tribunal 2016).

The presentation produced an important echo in national and international media. An article in the provincial newspaper *La Capital* reported that the cancer rate in the south of Santa Fe Province was twice the national rate (La Capital 2016b), and this sparked intense public conversation. Notably, the spike in media attention coincided with a series of unprecedented administrative actions against the group in charge of the FP (Página 12 2016a).

While the FP Director was still at The Hague, the Dean requested the resignation of two other LCS organizers from their political positions as Extension Secretary and Student Wellbeing Secretary (Nidd 2016). A few days later, campus administrative staff locked the offices where LCS health surveys were stored (Página 12 2016a). Unable to access the surveys, the group published a statement denouncing the confiscation of their research and claiming that the Dean had received strong pressure from the provincial government and agribusiness interests (Integrantes del equipo 2016; Página 12 2016b). In part, the statement claimed that the LCS's PK approach to "building epidemiological data from and with the communities … [and] disseminating results that belong to the people and no one else, has put many business and political interests in crisis." Noting that external pressures against LCS had recently intensified from regime actors inside and outside the university, the statement continued:

> We have witnessed provincial authorities who are uncomfortable with our work and suggest that we silence/conceal the results of the LCS. The same has been done by representatives of agribusiness. And internal actors of the university have played as their allies, actors who call themselves "revolutionaries" and act with the agribusiness employers' organizations. (Integrantes del equipo 2016)

The Dean published a response denying actions against the project (Nidd 2016), but also did not initiate an investigation into who instructed the office closure. At about the same time, the Provincial Minister of Health released a public statement to the most important provincial newspapers arguing that the LCS results were not serious (i.e., scientifically valid) because they were based on health surveys, rather than clinical diagnoses, and that it was reckless to publicize the results (La Capital 2016a; Página 12 2016c). Social movements organizations saw the Minister's statement as defending agribusiness interests (Redacción Rosario 2016).

By now, the conflict had escaped the university. News of the lockout made headlines in a well-known newspaper (Página 12 2016a). In response, the organizing team of the IMT initiated a letter-writing campaign to request the UNR President reopen the office and guarantee the continuity of LCS. Across Latin America, social movement activists launched a signature campaign to encourage international support (Observatorio Petrolero Sur 2016). Under pressure, the UNR President reopened the office and stopped further initiatives against the group. This allowed LCS to continue during 2017–18 while the group's international recognition continued to grow. In October 2018, the FP Director was invited by the UN Committee on Economic, Social and Cultural Rights and by the European Parliament to present the LCS data and to discuss the hidden public health crisis in Argentina that the epidemiological data made visible (Giancaglini 2019).

The following May, without warning, a newly elected Dean quickly dismantled LCS. In rapid succession, he replaced the FP Director and canceled the FP mentorship

program, leaving the twenty-two lecturers and TAs with no assigned tasks. By February of 2020, a different group of lecturers and TAs led the FP field camp, now reduced to a two-day visit in which students would measure blood sugar levels from neighbors gathered in a public square, but no longer conduct door-to-door environmental health surveys.

Coinciding with the moment of highest national and international recognition, external opposition from actors supporting the regime escalated and penetrated the sheltered niche space of the university, breaking down some of the political networks that had previously supported LCS's PK approach to environmental health. According to the former FP Director, powerful opponents pushed the allied Dean to withdraw his support from LCS. This implied a strong deterioration of the group's governance capacity within the medical school. In fact, the loss of internal political power facilitated the formation of a set of institutional obstacles, precipitating the project's ultimate termination.

CONCLUSION

This special issue's engagement with disaster and infrastructure signals the material conditions of PK production as a topic for critical analysis and broader reflection. While conflicts over GMO agriculture and pesticide poisoning are not specific to Argentina, we caution against generalizing from this case to others. Even so, we can draw many insights from the case that are relevant to the larger theoretical issues invoked by this issue's thematic focus. Owing to space limitations, we describe only three:

First, the rise and fall of the LCS illustrates why it is important to study PK projects and the infrastructure implementing and sustaining them, within the historical contexts of political contention and conflict. This is especially the case when disaster-impacted communities and academic allies marshal PK approaches in direct challenge to dominant or status quo political, economic, and institutional structures. Thus, understanding why many smaller wins by the LCS group paradoxically conditioned the project's ultimate failure requires reckoning with the sharp structural inequalities and power imbalances that shaped political and epistemic conflict at the center of the case study. The short-term, highly localized focus of much PK research often misses the longer-term ebbs and flows that mark PK as a fundamentally political process.

Second and relatedly, the concepts we rely on to tell the LCS story—regime, niche, and network—provide a compact but powerful toolkit for investigating cases of PK politics, individually and comparatively, across any number of national, historical, or cultural contexts. The sociotechnical regime-niche model is useful for tracing the political etiology of obstacles to PK practices and mapping contention and accommodation among dominant and subordinate actors. Network draws attention to cross- and intra-field coalitions and alliances that can inform new strategies and alter balances of power as regime-niche conflicts heat up or cool down over time (Hess and Frickel 2014). This triad of concepts offers clear analytical advantages. For example, in her analysis of infrastructure in community-initiated responses to air quality disasters, Gwen Ottinger (this volume) astutely observes that data from PK projects becomes infrastructure only when government agencies routinize PK in institutional practice—something that, according to Ottinger, happens rarely. The regime-niche-network framework can shed light on why such efforts so regularly fail to cohere into routinized practice, and can help researchers and activists identify the collective strategies that condition longer-term success under odds that may seem impossibly long.

Finally, the LCS case highlights the value of theorizing "in time" with the actors we follow along the temporal cadences of PK projects/politics. Challenges and opportunities are difficult to anticipate. The group itself may have underestimated challenges and its own transformative potential (e.g., if they had known, they may have asked earlier for ethical approval). Strategies to confront and overcome internal and external challenges come in fits and starts (see Figure 1). Like the air quality disasters Ottinger studies, the pesticide conflict in Argentina is a crescive disaster, accumulating its damages and victims slowly, over two decades (and counting). Public recognition of the regime's quiet violence also took years to produce, thanks to the patient resistance of niche actors (among them, LCS organizers and their networks). These temporal dynamics, we submit, are fundamentally different from the sudden chaos of acute disasters and require long-term perspectives to coax into view. Doing so is hard work, but imperative in our view, insofar as PK projects articulate alternative infrastructures for disaster science and build toward a collective political response to environmental and social injustice.

NOTES

1 The term translates to English as "health camps."

2 Although institutional ethics approval is required in the health sciences in Argentina, organizers initially conceived of LCS as a training and outreach activity rather than as a research activity. In interviews, LCS organizers understand this to have been a mistake, one that weakened their position relative to the GMO agribusiness regime and university administration.

SUPPLEMENTARY FILE

The supplementary file for this article can be found as follows:

- **Translations.** Spanish language translation: La construcción de infraestructura de conocimiento participativo contra el régimen agroindustrial: El caso de los Campamentos Sanitarios. DOI: https://doi.org/10.5334/cstp.400.s1

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COMPETING INTERESTS

FA, VA, and SF have no competing interests to declare. DV directed the FP from 2009 to 2019 and is therefore personally involved in the events underlying our analysis.

AUTHORS CONTRIBUTIONS

FA and VA contributed throughout with conceptualization, data collection, analysis, and writing. DV contributed to data collection and analysis. He led most of the activities involved in organizing the 40 LCS field studies carried out through December 2019; SF joined the project at the revision stage (having worked previously with FA on a closely related study) with conceptualization, re-writing, and editing.

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