Unpacking Intermittency

Living with Infrastructures in Southeast Louisiana

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ABSTRACT

Intermittent infrastructures are often described as infrastructures that are not always on or accessible. In the face of climate change, infrastructures are facing increased challenges regarding intermittency. As the LIMITS community shifts to investigating and designing transitional systems—computing systems centered around sustainability and climate justice—understanding intermittency and its relations to infrastructure is necessary. In this paper, I use the lens of intermittency to examine infrastructures across southeast Louisiana, where stronger and more frequent hurricanes, increased flooding and coastal land loss can cause disruptions in infrastructures. Drawing on this case study and existing work in networking research, infrastructure studies, and the LIMITS community, I propose key dimensions to examine intermittency for future research within the LIMITS community.

KEYWORDS

Intermittency, infrastructures, climate change, networks

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1 INTRODUCTION

On August 29, 2021 at 11:55 pm, Hurricane Ida made landfall in Port Fourchon, Louisiana as a category 4 storm with winds recorded at 150 miles per hour. As the storm made its way through southeastern Louisiana, the lights began to go out. Hurricane Ida left residents not only in the dark, but in the sweltering late-summer heat without relief. In the wake of the storm, tens of thousands of utility poles had been damaged or broken, bringing down many of the lines that transfer power and data across the southeastern portion of the state. While cell signal was available for a few days, the backup generators at cell towers soon ran out of fuel. Without the roads cleared, the service crews were unable to refuel these generators. Hurricane Ida coincided with the ongoing COVID-19 pandemic, during which time many people had come to rely on the Internet for distanced education and employment. As a result, the power outage caused class cancellations and work closures across the state.

The infrastructures that support everyday life in southeast Louisiana are becoming increasingly intermittent. In the case of Hurricane Ida, residents were out of power for weeks or, in some cases, months. This infrastructural intermittency reveals the precarity of living against the backdrop of climate change, which is bringing more severe storms, frequent floods, and rising sea levels to an already vulnerable coastal landscape.

As the LIMITS community shifts to investigating and designing transitional systems—computing systems centered around sustainability and climate justice—understanding intermittency and its relations to infrastructures is a necessary task. In computing, intermittency is often thought of in relation to networks that yield unstable, delayed, and asynchronous communications [6]. Within LIMITS, the concept of intermittent infrastructures was first raised in Patterson's assessment of Haiti, which presented a characterization of how people were living with "failing, intermittent infrastructures that are too expensive to keep operating at continuous levels of availability" after the 2010 earthquake [25]. In recognizing the constraints of keeping infrastructures constantly "on" [26], LIMITS researchers also have begun to investigate alternative paradigms that acknowledge and embrace intermittency in the design of systems [1,5,24,30,32].

In this paper, I begin to ask the linked questions of: "What does intermittency tell us about infrastructures?" and "What do infrastructures tell us about intermittency?" I draw from existing work in networking research, infrastructure studies, and the LIMITS community to understand how intermittency is a core aspect of infrastructure. I then contribute three ethnographic vignettes of living with intermittent infrastructures in southeast Louisiana against the backdrop of climate change. With these vignettes, I examine the broader patterns of intermittency. I then raise several key dimensions to examine intermittency for future research. My overall aim in this paper is to ground and expand the understanding of intermittent infrastructures in the LIMITS community and beyond.

2 BACKGROUND AND RELATED WORK

In this paper, I use intermittency as a lens to examine how climate change affects how we envision and understand infrastructures. I draw my understanding of intermittency from networking research, infrastructures studies in Science and Technology Studies (STS) and related fields, and prior work in LIMITS.

We are only starting to see the initial impacts of climate change through unprecedentedly severe weather-related events such as storms, floods, and wildfires. These scenarios are, perhaps unsurprisingly, detrimental for existing infrastructures. For example, sea level rise can impair critical points in network infrastructure along coastal areas [11]. In the United States, this issue is exacerbated by the staggering number of aging infrastructures in dire need of updates, maintenance, and repairs. In February 2021, Winter Storm Uri brought ice and freezing temperatures to the state of Texas. In previous studies, researchers have shown that the warming of the planet at the Arctic contributes to extreme winter weather in the United States [9]. This storm revealed the inadequate weatherization of the electrical grid, leading to 4.5 million households and businesses losing power [8]. While the grid has been largely restored, it is expected that we will see similar events unfold in the near future.

Within computing networking, intermittency describes the connectivity of networks. Intermittency is often viewed as a challenge to overcome within a network. Instead of providing continuous, stable, and real-time communications, intermittent infrastructures yield unstable, delayed, and asynchronous communications. These intermittent infrastructures can result in a loss of data, high latency, increased amount of jitter, and overall decrease in network performance.

In networking, intermittency can be due to several factors, such as a lack of general networking infrastructure [10,28], an overwhelming of infrastructure due to a high level of data traffic [15,29], and failures of dependent infrastructures like electricity [6]. Across these potential causes, intermittency is often seen as a shortcoming of the system, which often entails building or bolstering additional network infrastructures. For example, to address high levels of data traffic, solutions can entail monitoring network activity to prioritize communications, or creating temporary infrastructure to relieve issues [15,28]. In the absence of connectivity, such as in remote or extraterrestrial terrains, approaches like delay-tolerant networking (DTN) takes advantage of opportune moments to send postponed or batched messages [14,23].

The ways that networking research has examined and addressed intermittency reveals the negotiations and collaborations that are required for us to design an infrastructure that works within a specific environment. Rather than a one-size fits all approach, networks are built within constraints that includes standards, policies, local practices, communities, and places [4,10,12,16,21]. While some forms of intermittencies can be anticipated, they are often remedied through processes of diagnosing and troubleshooting [12]. Likewise, while intermittency is often viewed as an undesirable aspect of these infrastructures, it is also understood as a situation that can occur because these networks are components of dynamic worlds. Rather than viewing intermittency as something that can be completely prevented, networking research shows ways of working with intermittency.

This insight aligns with work across in STS that uses the concept of "seams" to examine the different ways that infrastructures may be stitched or patched together by the people who use them [34]. In the case of networks, seams are seen as gaps between heterogenous devices, protocols, and connections that need to be resolved by network researchers and engineers to create a network. Seamless visions of constant connectivity belies the social, material, and environmental circumstances to produce these networks [27]. Intermittency can be said to be resolved when these gaps are successfully bridged. However, the persistence of intermittency within networks also suggests that these seams can shift and expand, compromising what was a seemingly robust infrastructure.

Researchers have often noted how infrastructures can simultaneously "promise circulation and distribution" while "these precarious assemblies also threaten to breakdown and fail" [2]. In other words, infrastructures are not as stable as we might imagine. Rather, they are vulnerable to breakdown, decay, and abandonment without the necessary repair, maintenance, and care [17,20]. In this paper, I build on this work to examine how intermittency is a part of these cycles of maintenance, breakdown, and repair of infrastructures.

In this paper, I also examine intermittency not as an issue to be overcome, but rather as a core aspect of infrastructure. This framing draws from recent work in LIMITS that evoke intermittency as a provocation to contest the dominance of centralized systems [1,5,30]. In this work, a shared thread is how a transition to renewable energy is key to addressing unsustainable emissions from using fossil fuel sources. While intermittency is often seen as a challenge to networking, other approaches have embraced it as a central feature of their infrastructure. Projects like [1,5,32] incorporate intermittency into the design and development of their servers, hardware and websites, while design fictions [24] and speculative works "re-articulate our relationship to energy futures and practices of consumption [30]." Using intermittency in this context suggests that we must attune to the broader patterns of whether an infrastructure is "on" or not. In these following sections, I provide three vignettes that illustrate living with intermittent infrastructures against the backdrop of increasing impacts of climate change.

3 METHODOLOGY

This paper draws from ethnographic fieldwork research in southeast Louisiana that started in February 2022 and is ongoing as of March 2023. For this paper, vignettes take place across parts of Terrebonne and Lafourche parishes (see figure 1). The primary goal of the broader research project is to examine the impacts of climate change on network infrastructures in a vulnerable coastal region. My approach to conducting this study draws from Star's description that infrastructures are "both relational and ecological," where 'relational' points to how different groups understand and interact with infrastructures, while 'ecological' refers to how infrastructures are inseparable from 'actions, tools, and the built environment.'" [31] However, I extend Star's meaning of 'ecological' by looking beyond the built environment, considering instead how infrastructures are inseparable from the effects of climate change.

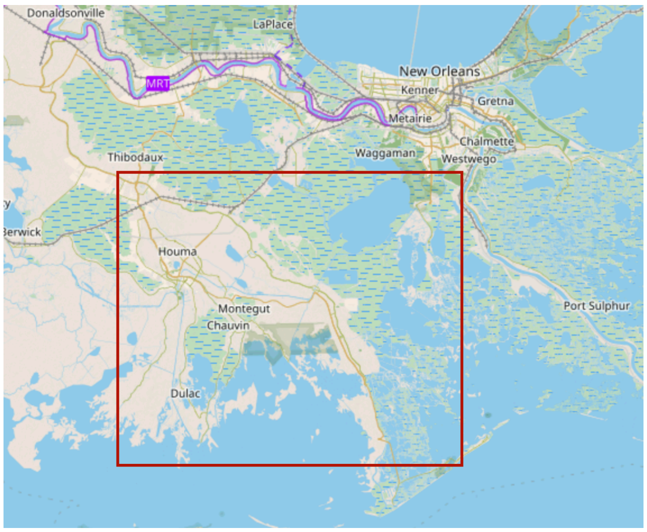

Figure 1 Map of southeast Louisiana with a red box around the areas featured in this paper (screenshot from Open Street Maps)

This work includes interviews with policymakers, utility workers and managers, non-profit workers, government employees, and local residents on the subjects of using, maintaining, and repairing networks, particularly after severe weather-related events like hurricanes. Relevant participant-observation activities have includes attending monthly statewide regulatory and policy meetings pertaining to utilities and several ride-alongs with utility workers during which maintenance and repair work is observed. Data was collected through audio recordings, videos, and images. While the focus on the study is on networks, the intertwined bundling of infrastructures [18] often led me to examine the relations of other infrastructures like the roads and electricity infrastructure. These vignettes were selected based on their relation to infrastructural intermittency.

4 VIGNETTES

4.1 Preparing for blackouts: The inevitability of intermittency

On a hot July weekend, a group gathered at a community center to build solar generators. Over the course of two days, attendees worked in teams to assemble generators that would be distributed to designated hurricane recovery hubs across the region. The workshop was run by a nonprofit with a mission to make disaster recovery more sustainable. Many attendees were members of local mutual aid groups and community organizations. Frustration from the lack of adequate state and federal responses to hurricanes and other issues motivated people to build local networks of support. During the workshop, participants received worksheets to calculate how much load the generator could take on. One community organizer noted how they needed to keep a mini fridge on to keep medications cool for neighbors, while another person said they wanted to create a charging station for people's phones. All these discussions were informed by their experiences waiting for the electricity to come back on not just after Ida, but also the many other storms they had endured over the previous years. These generators provided one tangible form of relief in a time of increasing blackouts. The solar-powered nature of the generators means that community members do not need to worry about stocking up on additional fuel, an often scarce resource post-storm.

The people of southeast Louisiana are no strangers to hurricanes and the blackouts they bring. For residents, this is expected—it's a question not of if but of when the lights will go out. The designated Atlantic hurricane season extends from June through November, with most storms occurring between August and October. In the weeks leading up to hurricane season, people find ways to prepare for potential storms. This can include stockpiling nonperishable food items, gathering flashlights and other tools, adjusting storm windows, buying extra fuel for generators, checking in on neighbors, and planning possible evacuation routes. Municipalities, churches, nonprofits, and mutual aid groups also host local events to distribute resources and supplies. Increasingly, there are workshops like the solar generator making one described above to address other post-storm strategies. Then comes an anxious waiting. While forecasts can provide a general glimpse of the weather for the week ahead, where a hurricane will hit can only be ascertained a few days in advance of landfall.

In the case of Hurricane Ida, the projected path and intensity of the storm was determined on August 26 when the tropical depression organized into a tropical storm near the Cayman Islands in the Caribbean Sea. That same day, Governor John Bel Edwards of Louisiana issued a state of emergency, followed soon after by a federal emergency declaration by President Joe Biden. The next day, several parish governments across southeast Louisiana began to call for evacuation. Terrebonne, Lafourche, and Plaquemines parishes, southeastern parishes that border the Gulf of Mexico, all issued mandatory evacuations, while a voluntary evacuation was in place in New Orleans and the surrounding metropolitan area. For those who were evacuating, the interstate roads leading out of the area were heavy with traffic as people headed east, west, and north. For those staying, people gathered last minute supplies before bunkering down as the first rain showers started coming down. Finally close to midnight on Sunday, Hurricane Ida made landfall.

This brings us to the scenario at the beginning of the paper where residents are without power. In recent years, hurricanes have increased in both frequency and intensity due to climate change. Greenhouse gases cause warming ocean waters, which in turn create conditions for storms with higher wind speeds and increased precipitation. In 2020, the most active Atlantic hurricane season on record saw several Category 3 and 4 storms across the region. The National Oceanic and Atmosphere Association (NOAA) predicts that the proportion of hurricanes that reach Category 4 or 5 levels will increase over the course of the next century [33]. Much of the grid in southeast Louisiana was built to previous standards to brace winds at 110 miles per hour, equivalent to a Category 2 storm [13]. With stronger storms comes increased damage, in which entire networks are incapacitated and people are left in the dark for weeks. 17 of the 28 reported deaths in Louisiana related to Hurricane Ida were caused by generator and power-outage related issues [19]. Louisiana consistently ranks as having one of the least reliable electricity grids in the country, with residents spending an average of 80 hours a year without power [36].

In this case, intermittency of infrastructures is expected. However, there are still elements that are unknown or unpredictable, such as scale and duration. While intermittent outages are a seasonal expectation for south Louisianans, the combination of aging infrastructures and increased storms is creating unprecedented situations. People expect the infrastructures to be irregular during and following a storm—the power will go out, the roads will be flooded for some time—but it is becoming harder, and more dangerous, to deal with the increasingly extended outages and longer and longer recovery times.

4.2 Extending hurricane season: The labor of intermittency

"We're still in hurricane mode."

This statement came from the general manager of an electric cooperative in one of the areas where Hurricane Ida had caused severe damage. He sat in a trailer that had become his workspace and living quarters after Hurricane Ida damaged both his office and home in August 2021. It was now mid-June 2022, two weeks into the next hurricane season, and he was still waiting on repairs for both. Through the window, a newly poured concrete pad could be seen where the old office once stood, surrounded by other trailers out of which the employees worked. The manager explained that they were waiting on some modular office units to be delivered in a few days.

Some of the staff had been in the office on the day that Hurricane Ida hit. As employees at a utility, they provide essential services and are therefore exempted from mandatory evacuations. Nonetheless, given the severity of the forecast, many of their family members and coworkers with young children had departed to evade the hurricane's path. When the lights went out mid-morning, the backup generator had kicked on. However, by the late afternoon, the strong winds had begun to peel the aluminum roof off the top of the building, letting water spill in. One of the employees immediately went through the building and piled the computer hard drives on a table as water began to seep under the doorways. They recorded a video showing them moving from room to room, wearing flip flops in ankle-deep water, aiming a flashlight in the darkened offices to salvage possessions their colleagues might want to save.

After the storm passed, the utility workers immediately began their plan to restore electricity. In the months leading up to the hurricane, the utility had updated their storm preparedness procedures. Several recent storms had just barely missed their service territory and the manager wanted to be ready. Part of their preparation included getting permission from an unused shipyard to house the hundreds of temporary workers that would come in to assist with recovery. Even before the hurricane had hit Port Fourchon, subcontractors and crews from across the state and country were on standby at the request of the utility company. As soon as the roads cleared, the shipyard was transformed into a "tent city" to house the hundreds of workers. Over the course of a month, over 400 workers worked to clear debris, re-install poles, and string new connections.

However, the aftermath of the storm lingers on. In September 2022, while working on installing a new line to an existing network, a line worker noted the incorrect placement of a crossbar on a distribution pole. They referred to it as "storm work," work that was probably done by out-of-state contractors, who are sometimes less experienced and may have less investment in ensuring proper installation. Since this error did not prevent the overall network from working, it was also not prioritized as a repair; other more urgent work such as electrifying new developments and hardening the system for future storms took precedence. Moreover, as the line worker speculated, regardless of whether this crossbar is corrected or not, the pole will probably come down in the next big storm.

While much of the region's infrastructure is back up and running, it is not necessarily all in use. For some residents in Terrebonne Parish, their homes are still in disrepair from Hurricane Ida. In early December 2022, a resident was still waiting on their home insurance to come through for their house that was made unlivable by the storm. While they waited, they were living with their grown children almost an hour away. On the weekends, they would come down to do some work around their property but had not reconnected service yet since they were still waiting on insurance payouts. As one telecommunications worker said about people not returning to their homes after a storm, “What’s a network without any users?”

This above case shows the labor needed to get infrastructures back on with storms that can prolong periods of intermittency. It shows that within intermittency, there is not always a clear binary between on and off states. While for many, the lights are back on, there is still work yet to be addressed in other parts of the infrastructure that can threaten the overall integrity of the system.

4.3 Repairing Island Road: The uneven consequences of intermittency

On a clear, calm day, driving across Island Road is to be surrounded by blue (see figure 2). The sky and the water stretches out from the two-lane paved road that connects Highway 665 in Pointe-Aux-Chênes to Isle de Jean Charles, a small island on the eastern edge of Terrebonne Parish. This island is home to the state-recognized Band of Biloxi-Chitimacha-Choctaw Indians. On the westbound side of the road are utility poles that brings electricity and communication services to the island. These poles are wedged up among a wall of piled rocks that act as a barrier against wind and water. Despite this fortification, this road is becoming increasingly impassable. Many days, it is hard to cross the road due to flooding from tides, storm surges, and sea level rise.

Isle de Jean Charles was not always so isolated. The land became inhabited in the 1830’s by Indigenous people which included the Choctaw, Chitimacha, Biloxi, and Houma. They were evading the policies of the Indian Removal Act that forced people off their homelands. Instead of moving westward onto designated reservations, many chose to move south into lands that were, at the time, considered uninhabitable by the American government. At the time, Isle de Jean Charles was a raised ridge surrounded by coastal prairie and wetlands, where one could get to the mainland via boats or along trails through the marsh.

In 1953, Island Road was constructed by the parish government. During the mid 20^{th} century, Louisiana was also seeing a boom in the oil and gas industry. Although oil was first struck in the state in 1901, it wasn’t until post WWII when the industry took off. Increased exploration and extraction resulted in the construction of gas and oil infrastructure in the areas near Isle de Jean Charles. Canals cut into the marsh to move equipment and supplies can quicken the pace of erosion and invite in saltwater, while wells and pipelines built to extract and transport oil can leach toxins into the fragile ecosystem. In 1955, the island was estimated to be 22,400 acres, while today only 320 acres remain.

Figure 2 Image of Island Road taken in December 2022 (photo by author)

Furthermore, the construction of levees meant to protect the mainland from storm surges halts the spread of sediment deposited from flooding from the Mississippi River. This seasonal process is crucial to the formation and continual renewal of the land that makes up most of south Louisiana.

The construction of the levee infrastructures also demarcates what is deemed valuable for protection. The Morganza to the Gulf of Mexico Project is a planned hurricane protection system consisting of a series of levees and floodwall gates designed to protect Terrebonne and Lafourche parishes from Category 3 storms. The project, sponsored by the U.S. Army Corps of Engineers, Louisiana Department of Transportation and Development, and the Terrebonne Levee and Conservation District, leaves out Isle de Jean Charles in its plans. This plan, originally made in 1998, did not include the island since it was determined it would be too expensive to include Isle de Jean Charles [22].

This decision to omit the island from protection against future storms and floods was one reason the tribe has begun to examine resettlement for their members. People had long been moving off the island to towns nearby and resettlement to a location designated for tribal members could mean a place where their community would be reunited. Starting in 2002, the tribal chief, Albert Naquin, began looking for assistance from state and federal authorities. In the meantime, the area faced several disasters. Hurricane Katrina hit in 2005, while Hurricanes Gustav and Ike in 2008 both damaged Island Road. At one point the sides of the road had eroded so badly that it was necessary to drive in the middle of the road, lest the car risk falling into the water. In 2011, the parish spent $6.24 million dollars to repair the road [7]. This work included re-paving the road, but not raising it. Parish officials also announced to residents that the road would not be fixed again.

In 2016, the state received a $48 million grant from the United States Department of Housing and Urban Development

(HUD) to resettle residents of Isle de Jean Charles, including tribal members. However, by 2018, Chief Naquin had begun to express skepticism in the state's direction with the resettlement plan [35]. Without consultation from tribal leadership or members, the state office in charge of the resettlement effort had hired their own architects and planners, in addition to changing eligibility requirements [22]. In 2018, the state also received close to $3 million as part of the 2010 BP Oil Disaster settlement funds to fortify Island Road and install six fishing piers to "mitigate for lost recreational opportunities due to the spill [7]."

As of November 2022, construction is still underway on Island Road. The rock wall blocks strong winds, while pipes placed strategically in the wall can drain the road when it floods. Twelve members of the Biloxi-Chitimacha-Choctaw Band still remain on the island [3].

On the surface, this case might seem unlike the others. For one, it involves roadwork rather than connectivity. More substantively, the case seems to involve disrepair more so than intermittency, particularly when we arrive at the present. Nonetheless, this case helps us to explore how intermittency manifests across social differences. The present status of Island Road lies at the intersection of a long history of Indigenous struggles for recognition and the increasing impacts of climate change. This case raises the question of who might be ones that have to bear the negative burdens of intermittency.

5 DISCUSSION

The vignettes presented above examines the intermittency of infrastructures in southeast Louisiana. As illustrated across the vignettes, infrastructures are embedded within landscapes. In southeast Louisiana, network infrastructures are built on subsiding land shaped by legacies of extractive economies, which face increasing vulnerabilities from a changing climate. These relations to the environment shape how we should understand the intermittency of infrastructures.

In the following section, I propose three dimensions—historical, political, and spatial—to begin articulating the relations among intermittency, infrastructures, and the landscapes in which they are embedded. These dimensions frame intermittency in concrete and material ways. I describe these dimensions in relation to the vignettes presented and existing work. In addition, I raise questions that provide orientation for how we can think about intermittent infrastructures in terms of these dimensions. This preliminary list of dimensions also serves as a guide for further research on intermittency.

5.1 Political Dimension

How is intermittency addressed by communities, institutions, organizations, and other actors? When treating an infrastructure as embedded, we can ask how it is addressed by communities, institutions, organizations, and other actors. Examining this political dimension of intermittencies reveals how power is acquired and contested in the context in which an infrastructure is embedded. In the vignettes, we see a lack of oversight by the state and federal government. For example, in cases 4.1 and 4.2, while Hurricane Ida caused physical damage to the grid, this grid was already weakened by lax standards and unenforced regulations from the state. As such, repairing these infrastructures can extend months and even years after the initial disaster. A similar situation can be seen in [25], which describes situations like mistrust of aid workers, lack of transparency from NGOs, and government corruption over fuel prices. These all contributed to the delay in post-earthquake recovery and the continual intermittency of infrastructures Patterson observed five years later. How can institutions and organizations be held accountable for failures to respond to intermittency?

However, as the speculative vignettes from [30] show, within scenarios of energy limits, communities and individuals take on the role of addressing intermittencies through building alternative energy storage and generation. In case 4.1 and [25], people already employ a suite of tactics to prepare for impending intermittencies. When intermittencies are predictable and expected, they can be easier to foresee, such as in the case of residents in 4.1 preparing for storm season. How can lessons of living with intermittencies be shared across different communities?

5.2 Historical Dimension

How do past events shape intermittency? When treating an infrastructure as embedded, we can also ask how past events shape its intermittency. Examining this historical dimension of intermittencies reveals the longer trajectory of infrastructures. In case 4.3, the longer history of intermittency of Island Road shows how the state has continually marginalized the Indigenous residents of Isle de Jean Charles through delaying and neglecting to repair one of the only pathways to and from their home. While the community on the island had requested funding to support their livelihood on a shrinking island, the state has refused and, instead, only authorized reinforcing the road to serve recreational use targeted for non-residents. How has the repair and maintenance of infrastructures shaped where people live?

Transitional systems are often anticipatory. They take on the hard and necessary task of imagining and designing within unfamiliar constraints. For example, as [24] show, there are still many questions of living with renewable energy sources, which include planned and unplanned outages. Furthermore, we will continue to see intermittent infrastructures as we see the effects of climate change unfold. In the vignettes, the landscape is changing within the timespan of a few decades as land loss outpaces the ability for the region to regenerate, which in turn impacts where utility poles are located and networks will be maintained. To account for intermittent infrastructures means accounting for the broader histories of the place these infrastructures are situated within. What can histories of intermittent infrastructures teach us about living in transitional systems?

5.3 Spatial Dimension

Where does intermittency happen? Finally, when treating an infrastructure as embedded, we can ask where intermittent infrastructures occur. Examining this spatial dimensions of intermittencies reveals and highlights the question of the location of intermittencies. Previous studies that have examined intermittent infrastructures are usually situated in development contexts [6]. These locations are often juxtaposed to places like the United States, where infrastructures are purportedly "well-maintained [25]." The vignettes I describe in this paper, all based in southeast Louisiana, show that this juxtaposition need not hold. In the United States, we find aging infrastructures that can become more vulnerable to the impacts of hurricanes, floods, and other climate-change related scenarios. How can we re-orient spatial understandings of intermittency?

While networking can connect people at a planetary scale, the last-mile connections are shaped by local conditions. In 4.2, the telecom worker raises the question of the network being impacted by displacement after a storm. This scenario raises further questions regarding how repairs may be ordered and prioritized. Furthermore, the spatial distribution of rural and remote regions can present challenges in building and maintaining infrastructures, whether for roads, electricity, or computer networking, In the case of 4.3 and [10], marginalized communities that have been displaced by the state are based in locations where infrastructure is more difficult to build and maintain. How can transitional systems account for different geographies?

7 CONCLUSION

Within the LIMITS community, intermittency is already being embraced as part of the infrastructure for transitional systems. This is essential work as we shift our energy sources away from fossil fuels. In this paper, I build on this work by examining the relations between intermittency, infrastructures, and the places in which they are embedded. I draw upon examples from ongoing field research, in which I examine the impact of climate change on Internet infrastructures in southeast Louisiana. Understanding intermittency goes beyond whether an infrastructure is "on" or "off." In the discussion, I introduce a means of examining intermittency through political, historical, and spatial dimensions. These dimensions offer ways to understand intermittency beyond technical framings. Rather than treating intermittency as a challenge that we must overcome with infrastructures, perhaps we need to consider living artfully with intermittencies.

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