The Polyvocality of Resilience: Discovering a Research Agenda through Interdisciplinary Investigation & Community Engagement

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ABSTRACT

This paper presents findings from an interdisciplinary research effort studying community resilience in Boulder, Colorado. Boulder is a progressive region with a history of environmental leadership. The area is currently in the process of recovering from major flooding and has launched several new initiatives related to building long-term resilience to natural disasters and other stressors. In our research, we consider the stakeholders involved in building local resilience as well as the different and often contradictory framings of the concept. This study takes a phenomenological and inductive approach to understanding resilience. In contrast to more reductionist frameworks that are frequently offered, we argue that this allows for greater understanding of the polyvocal and emergent qualities of resilience.

Keywords

Crisis informatics, Infrastructures, Recovery, Resilience

INTRODUCTION

In recent years, the concept of resilience has become increasingly influential in planning, engineering, and disaster management discourses. Within this framing, human settlements are seen as complex social-ecological systems shaped by interactions between political, economic, social, material, and natural phenomena. Though definitions vary, resilient systems are generally depicted as having the capacity to withstand and recover from shocks and stressors. The impacts of climate change, population growth in vulnerable geographies, and the global economic downturn have contributed to the prominence of resilience as an objective that societies should strive towards and organizations such as the Rockefeller Foundation, the World Bank, and the United States National Science Foundation have supported efforts to study resilience or promote it in a range of locales.

Despite this growing emphasis and considerable research conducted in recent years (Comes and Van de Walle, 2014), resilience remains poorly specified. In our fieldwork, which we report on in this paper, we observed that some of the difficulty may be the result of the wide range of things can be said to "be resilient," including

people, places, things, buildings, systems, as well as the relationships between those entities—not to mention a variety of forces they might be resilient to. Its meaning, frames of reference, as well as its practical utility have been brought into question, yet the appeal of resilience as an organizing idea remains.

Much of the published work describing resilience attempts to cope with this complexity by reproducing it in analytical frameworks meant to illustrate the multiple factors, processes, and interactions thought to be at work. We present two examples of this approach in Figure 1a and b. The first, from a non-profit organization that works internationally on resilience issues, sees resilience as process-oriented and as the product of reducing the vulnerabilities present in human and physical systems as well as cultural and legal frameworks. The second, developed by the Rockefeller Foundation as part of its new global resilience initiative, presents community resilience more as a capacity of various types of systems and offers a set of 12 indicators and 51 sub-indicators (ISET, 2014, Rockefeller 2014a).

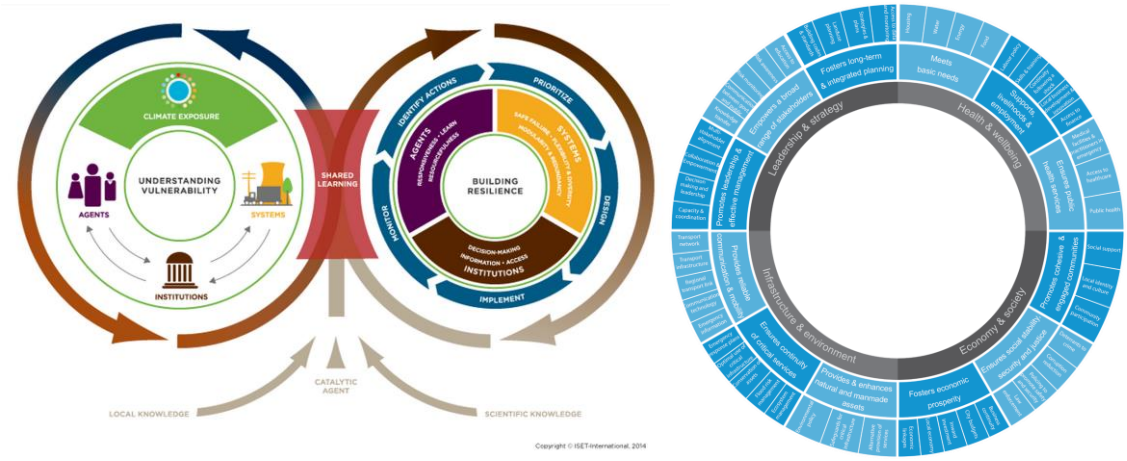

Figure 1a and b. Resilience Frameworks from ISET-International (left) and Rockfeller (right)

We take no position on which of these offerings more accurately describes, defines, or measures resilience. Instead we observe only that there are a number of similar frameworks already in existence and their continued proliferation reflects significant uncertainty about what exactly resilience is, how to study it, and how it might be achieved. As will be discussed below, we see an alternative approach towards achieving a working understanding of this concept.

Resilience as Polyvocal and Emergent

As a way of grounding the argument and approach to the research to be presented in this paper, we offer the idea of *polyvocality* as a way to apprehend the meaning of and solutions that could then be borne of "resilience." Polyvocality literally means "many voices." Although there is a legacy of writings from Anthropology and other disciplines on polyvocality, here we intentionally make use of the term in a simple fashion to show the ways in which the concept of resilience resists the sorts of totalizing analysis attempted by the likes of Figures 1a and 1b. We also take a phenomenological stance with respect to the concept, and look to the ways in which the very idea of "resilience" is one that is *being constructed in situ even as we wrestle with it*. As a result, we propose that one of the most powerful purposes of the concept today might be the ways in which it can mobilize conversation around what it could be. It provides an umbrella for local stakeholders to engage in debate that leads towards increased mutual understanding of stakeholders' visions for their communities' future goals and challenges.

We aim to study not so much "resilience" as a finite capacity or state that can be objectively assessed, but rather all the ways it is being invoked and pursued. We aim to study the "many voices" of resilience—its polyvocality. Who—and even what—is speaking? Who is not speaking? Who is speaking for whom? What are they saying and not saying? What frames are in conflict? We then argue that to be able to "hear" many voices, minimally, the team of people pursuing such a goal must itself be multidisciplinary and embedded in and working with a community wrestling with these very issues.

RESEARCH APPROACH

In an attempt to achieve these ends, our multidisciplinary research team has recently begun a formal and extended study of resilience in the county and extended region surrounding Boulder, Colorado where we live and work. The interest in resilience by Boulder and the surrounding area is an outgrowth of both a decades-long

commitment to environmentalism and responsible land-use that make it one of the most progressive cities in the US (Hinshaw, 2006)—as well as major flooding events that occurred in September 2013, just over one year ago at the time of this writing. The flooding occurred shortly before the Rockefeller Foundation launched its 100 Resilient Cities initiative, which announced Boulder as one of the participating cities in December 2013. The region was well positioned to unify a number of initiatives and long-term goals and strategies under a broader theme of resilience. In the aftermath of the flooding and the ongoing recovery period, a wide range of actors and organizations including government, civil society, and the private sector have participated in activities aimed at goals of flood recovery and building resilience to any number of other short or protracted hazards.

Our team of 10 people launched its research in early Fall 2014 with funding from the US National Science Foundation (NSF); it includes students and faculty with ties to information and computer science, civil and architectural engineering, environmental design and environmental studies, communication and construction engineering, all with a commitment to interdisciplinary collaboration. Members of our team had conducted prior research on the 2013 Colorado Floods events themselves (Dashti et al., 2014; St Denis et al., 2014; White & Palen, 2015) but we saw our union of interests as providing a new way to examine a region that was wrestling with core challenges of recovery and resilience.

In this paper we report on the participant observation of a series of public events timed to commemorate the one-year anniversary of the 2013 Colorado Floods (Table 1). During September of 2014, organizations in the region hosted presentations, social gatherings, tours, and volunteer work days to mark the flood anniversary. These events were held throughout Boulder County and the adjacent St. Vrain County. One or more members of our team attended 14 public events, engaging in an estimated 50 hours of participant observation. To organize the fieldwork, our research team created a master list of events and a shared field guide with sensitizing questions to help align the team's observations. The field guide focused on two general areas of inquiry. First, who goes to these events? What stakeholders are represented? Second, we observed the perspectives on the framings of the events, focusing on how attendees engaged with ideas of recovery, resilience and other frames—as well as if or how they tied together. Members of the team signed up to attend specific events and shared their field notes with the group afterwards. The first author, with assistance from other members of the team, coded the field notes and developed an initial set of thematic memos that provided the foundation for this paper.

Date	Name	Leader Affiliation
8/19/2014	North Boulder Resilience Conversation	BoCo Strong
9/6/2014	Boulder Creek Flood Cleanup & Cookout	Rocky Mountain Anglers/City of Boulder
9/7/2014	BoCo Strong Flood Commemoration Kick-off Event	BoCo Strong
9/7/2014	Resilience: Boulder & the Global Context	ISET-International
9/9/2014	Boulder 2013 Floods: The What & Why of Forecasting a Record Flood Event	National Weather Forecasting Service
9/10/2014	City of Boulder/The Science of Disaster Planning Panel	City of Boulder/Geological Soc. of America
9/10/2014	Boulder Flood Tribute: Community Stories in Action	Boulder Flood Info
9/11/2014	Rockin' Rollout – Lyons	City of Lyons
9/11/2014	One Year After the Flood: Boulder Open Space & Mountain Parks	BoCo Strong
9/12/2014	Forests to Faucets and Floods Bus Tour	City of Boulder/Center for ReSource Conservation
9/13/2014	After the Flood--Saddle Rock Trail Hike	City of Boulder Parks & Recreation
9/15/2014	The 2013 Flood in Historical Context	Colorado Water Conservation Board
9/17/2014	Boulder's Waterworks: Past & Present	BoCo Strong
10/1/2014	Lyon's Field Trip	City of Lyons

Table 1. Flood Anniversary & Resilience Events Observed by Research Team

THE CASE OF BOULDER, COLORADO

Boulder, Colorado and the surrounding area (Figure 2) is a research site that allows investigation of a

community that is undergoing recovery from a major flooding emergency as well as beginning to consider how it might tackle questions of resilience more broadly. Anniversaries of disasters are emotionally charged events that can mobilize action, and this timeframe was used to fold in other charges, including that of resilience.

The 2013 Colorado Floods

Although the 2013 Floods were unique in terms of the amount of rainfall the region experienced, flooding events are not unprecedented in Colorado's history. Past disasters include the 1976 Big Thompson Flood, which killed 144 people, as well as major floods in 1969, 1938, and 1894 and numerous smaller events. Historically, Colorado's Front Range has experienced significant flooding events about every 30-40 years. Encouraged by landscape architect Frederick Law Olmsted and one of the pioneers of floodplain management, geographer Gilbert White (Hinshaw, 2006), both of whom worked in Boulder and contributed to its design, the city has made significant investments in the mitigation of flood impacts over the years. Boulder's open space system and the recreational space around Boulder Creek both function as overflow catchments for river and stream overflow and are believed to have significantly reduced damages caused during the 2013 Floods. Flood management is also stated as a priority in the Boulder Valley Comprehensive Plan (City of Boulder, 2010), a framework developed in partnership between Boulder City and Boulder County to guide planning decisions in the region. The City had just completed a comprehensive flood study prior to the September 2013 flood, which showed that Boulder ranked as the community most at risk of major flooding in all of Colorado (City of Boulder, 2013).

The Boulder area received nearly one year's worth of rainfall between September 9 and 14, 2013. This has become known as a "1,000 year rainfall event," which was caused by the stalling of tropical systems from both the Pacific Ocean and the Gulf of Mexico over the northern part of the Colorado Front Range. The rainfall event affected multiple drainage catchments, leading to widespread flooding that killed eight people, isolated mountain communities, and caused an estimated $430 million in state-owned road damage alone (Boulder County, 2014a). In the City of Boulder (Figure 3), all major waterways overflowed their banks and the city's storm-water system was overwhelmed. The City faced significant damage including over 50 city-owned buildings, water and sanitation infrastructure, and widespread destruction of parks, trails, and recreation areas. Over 6,000 houses in Boulder, around 14% of the city's housing stock, were damaged and 314 houses were destroyed completely. The City of Lyons and mountain communities to the north and west of Boulder, including Jamestown and Ward, were particularly hard hit with many areas cut off from outside assistance during the flood as the result of road or bridge collapse (Boulder County, 2014a).

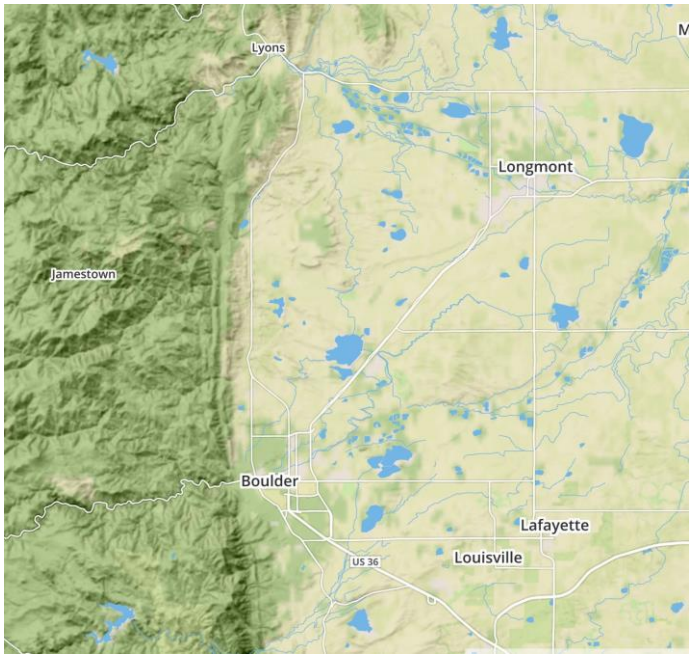

Figure 2.
Boulder and the Surrounding Region ©OpenStreetMap contributors

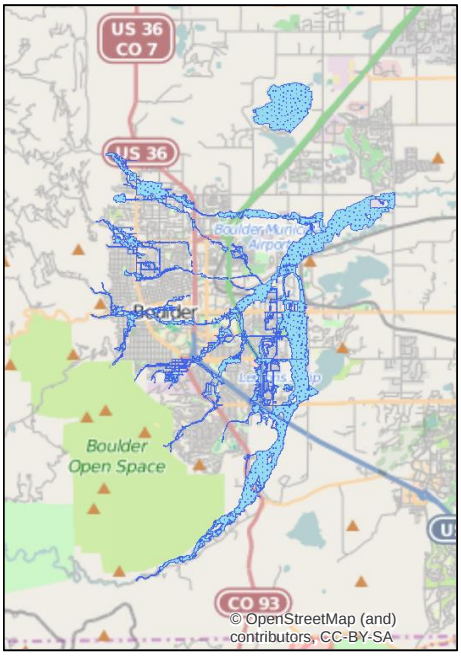

Figure 3.
City of Boulder 2013 Flooding Extents

One year after the flood, Boulder County estimated that it had already spent $44M in recovery costs and projected this to quadruple over a 5-year horizon, the majority of which will go towards rebuilding damaged transportation infrastructure (Boulder County, 2014c). Five of the 10 destroyed county-maintained bridges have

been rebuilt and nearly 75% of the damaged public trails have been restored. In total, 7,850 truckloads of vegetative, sediment, construction and demolition debris were cleared, 60% of which was removed from creeks. Boulder County's Comprehensive Creek Planning Initiative (CCP) has also initiated master planning processes for major watersheds for long-term and well-planned creek recovery. In addition, FEMA provided housing assistance of around $33M for Boulder County flood survivors and provided loans of more than $50M to homeowners and business owners through the Small Business Administration (Boulder County, 2014b). FEMA and the Colorado Division of Homeland Security and Emergency Management also invested more than $320M through Community Development Block Grant program to support the State of Colorado's long-term recovery efforts to address housing, business and infrastructure needs, primarily in Boulder, Weld and Larimer counties (FEMA, 2014).

New Resilience Initiatives for Boulder, Colorado

In the year since the floods, two new initiatives in Boulder have been launched that put resilience on the region's agenda. First, the 100 Resilient Cities (100RC) is an international campaign funded by the Rockefeller Foundation that aims to support local governments to build resilience in urban areas around the world. Boulder is among the first set of 33 cities, chosen for their innovative and engaged leadership, a "recent catalyst for change," an ability to work with diverse stakeholder groups, and a willingness to develop and continue in partnership with the 100RC initiative (Rockefeller, 2014b). The 100RC initiative is overtly three-fold: select cities that are already successful in planning and enacting resilient-thinking approaches, support the hiring of Chief Resilience Officers in each city to locally manage and imagine resilient efforts, and create a network of resources for cities. The resulting knowledge-building local governance is aimed to catalyze local and regional resilient thinking across the world. The City of Boulder has received funding for a two-year appointment of a CRO to further develop a resilience strategy beyond existing frameworks.

The Boulder CRO was appointed in September 2014, and at the time of this research and writing is working to identify needs and opportunities across city departments for collaboration and incorporation of a resilience approach. Areas identified in the initial phase of resilience strategy development include land use, housing affordability, energy futures, and local food systems. In addition, Boulder's strategy aims to incorporate a resilience framework in the 2015 Boulder Valley's Comprehensive Plan, which informs land use, planning, and development in the Boulder region.

The second initiative to prioritize resilience in the region is a group that calls itself *BoCoStrong*. BoCoStrong describes itself as a "grassroots convening" that that has "organically emerged" as a partnership between individuals from different government agencies, non-governmental organizations, faith-based groups, education, and other institutions. The group's mission is:

> "to coordinate a process of individual, business, neighborhood, community and countywide resilience that integrates action across Boulder County in ways which increase the effectiveness of our existing collective capacity of all sectors, respects the unique character of each town and city and leverages additional resources, participation and leadership."

Many of BoCoStrong's members are affiliated with government or local charities that have worked to support community engagement in flood recovery efforts and foster dialogue around resilience. At present, BoCoStrong is an informal organization that is proposing to become a formalized, county-wide resilience network.

During July and August of 2014, BoCoStrong organized 22 community meetings, called "Resilience Conversations," around Boulder County where attendees reflected on their experiences during the flood and discussed priorities for building resilience in the future. During these meetings, BoCoStrong described resilience as "the capability to anticipate risk, limit impact, and bounce back rapidly through surviving, adapting, and learning in the face of disruptive shocks and stresses" and gave its characteristics as "preparedness, flexibility, resourcefulness, back-up systems, and connections." They analyzed these conversations in terms of: what worked well, areas for improvement, and recommended actions. There was substantial overlap between these categories as people reported the importance of connections to people and resources, volunteers, and communications during the disaster while also calling for improving preparedness, communication such as radio networks and emergency notification systems, and strengthening neighborhood connections.

ANALYSIS

Stakeholders, Voice, and Proxy

One goal of our research team was to understand the composition of stakeholders involved in building resilience in Boulder. By participating in these events, we hoped to articulate who was involved in these events—as well as who was not. Presence and absence helps us envision, too, what *could be,* even if full representation is not currently realized. Understanding the potential range of people involved in or affected by efforts towards resilience can help narrow the divide in the ways that risk and resilience are understood between city managers and experts and their publics, promoting community willingness to participate in restoration initiatives that are grounded in shared authority and responsibility. It also helps to shed light on disconnects and divisions between different groups of stakeholders and potentially contradictory understandings of the concept, raising questions of different sources of vulnerability and who stands to benefit or be harmed by particular implementations of resilience.

Attendance at the Boulder Flood Anniversary events varied depending on the format and venue. Attendance ranged from 20 participants in some cases to over 100 in others. In many events, the age skewed toward retirement, and ethnic minorities were under represented. This was also the case for the BoCoStrong Resilience Dialogue meeting we attended. Other frequent attendees to these events included city and county government employees and researchers from the University of Colorado or government-funded laboratories in the area. Many of the individuals were present at multiple events and appeared to know each other.

Though not physically represented to the same extent, a number of other stakeholder groups were invoked during presentations or discussion. There was some discussion of the difficulty that Spanish-speaking households had in obtaining information and support during the flood recovery, though we note that no events were conducted in Spanish (there was an American Sign Language translator, however). In Lyons, one of the communities hard-hit and "islanded" (Sheller, 2012) by road-outages during the floods, residents had to break into a pharmacy to retrieve oxygen and medicine for their aging neighbors. Note that such a tale is possible to tell in this small and tight-knit environment; similar accounts in other disaster events are reported as acts of looting (Fischer, 1998). Due to issues such as medical conditions, physical disability, cognitive impairment, low financial resources and social capital, elderly residents of Boulder County have struggled particularly to deal with displacement or damage to housing. One presenter at the Science Panel discussed how affordable housing has been among the hardest hit and slowest to recover sectors, and those who depend on it often have the fewest resources to cope. As a result, many of these individuals are being forced to leave the region or have not returned after the floods. Other groups with particular sources of vulnerability such as young children, the disabled, or mentally ill were not explicitly discussed.

During one event where participants spent the day cleaning up trash and debris from Boulder Creek, which runs through the center of downtown, volunteers were reported to have removed the belongings of homeless people who camped there. Few examples of conflicting visions of resilience are so clear as this incident but our observations to date raise questions about representation, voice, and agency within Boulder's response to the flood and the dialogue around resilience. Boulder is a predominantly affluent, white, and highly educated city so ensuring equity and diversity in these matters will be a challenge.

Conflicting Frames of Resilience

Despite the relatively homogenous demographic makeup of participants, we observed a range of different and often conflicting framings of resilience. These conflicts challenge rationalized, singular portrayals of resilience. With a few exceptions, we did not so much encounter fully formed articulations of the concept, so much as notions or ideas of what resilience might be. Though we did not witness any direct debates over the precise meaning of resilience, the conflicting ways in which different individuals discussed the concept raises important questions about its stability as an analytic. We focus here on three examples of such diversity of view that illustrate the difficulty of approaching resilience as complete and measurable phenomena.

Resilience of what, to what?

First, there are significant disconnects between people who see resilience as oriented towards major disasters versus those who take a broader view and understand its remit to include everyday stressors. By design and as would be expected, much of the conversation during the Flood Commemoration events was oriented around the memory of the floods, which overshadowed most attempts to broaden the focus to encompass everyday stresses. During the Resilience Conversation facilitated by BoCoStrong, the dialogue began with a reflection on what participants experienced during the flood as well as observations about the ways Boulder did or did not exhibit resilience. Though this approach helped to ground the discussion in lived experience of the participants, it also limited efforts by the facilitators to guide the conversation into other territory. Despite encouragement to think

broadly about resilience, the group did not venture much beyond wildfire and flood hazards. On other occasions, presenters would raise questions of food systems, local economies, and climate adaption, which present significantly different challenges than disaster reduction and response.

The recent experience of the Boulder Floods also created conflicting ideas over whether the floods were an opportunity to promote resilience-building or whether this was an appropriate time to be discussing long-term thinking. It is possible that this contrast was related to the extent to which those involved were still affected by last year's floods. According to the Boulder County Flood Recovery Manager, the idea of resilience did not resonate with many residents of mountain communities still trying to recover from the disaster, and there was a chance that the region might miss this opportunity to "bounce forward." The 15-person staff of the City of Lyons reported feeling "disaster fatigue" a year after the flood and still working to process over 60 grant applications for residents and local businesses seeking assistance for recovery. On the other hand, a Boulder resident pointed out that prior to the flood, it was difficult to get people out to community meetings or prepare for disasters but they have seen a difference: "That's why times like this are so important." In the same conversation, another participant said, "now when you hear about typhoons in other places you have a much different relationship with that."

From these observations, we see important divergences in understandings of the relationship between disasters and resilience. Should disasters be understood as an opportunity or impediment to resilience-building? Should resilience be conceived of in reference to low-probability, high-impact events or include ideas of everyday stressors? These debates partially map to a wider conversation in the literature about "specified resilience," which relates to the resilience of particular components of a system to particular stressors as opposed to "general resilience" which considers "the resilience of the system as a whole to any and all kinds of disturbances" (Walker et al., 2014). The approach advanced in this paper is broadly in line with the view of general resilience, whose proponents have argued that "embedding a resilience approach to planning requires the development of a culture, a mind-set. There is no one 'right' answer; in fact there may often be several 'right' answers, and the process (which is equally important) needs to be adaptive" (Walker et al., 2014).

Self-Reliance and Improvisation

Another site of disconnect we witnessed in discussions of resilience is the role of self-reliance. The City of Boulder was often described to have a sense of privilege or entitlement in relation to their expectations that local government and emergency responders would come to their aid. Indeed, the City was in general well-served by these officials. According to one resident, the response was fast and "we didn't feel abandoned." This is in contrast to some residents of the mountain towns, many of which were isolated and cut off during the flooding. Formal responders did assist these communities, and Lyons as well, which gave rise to the largest animal and second largest human aerial evacuations in US history. These evacuations did not begin until several days into the disaster, and in many cases residents did have to take care of themselves and each other in the interim. Residents of the City of Boulder saw such examples of self-reliance as something to be emulated; one meeting participant said "we need to learn from the mountain people," even as they praised the systems and infrastructures that allowed them to avoid this.

Related to the idea of self-reliance is the sentiment that "disasters can never be fully predicted, resilience is the ability to deal with this uncertainty as it happens,"— a comment made by one of the speakers from Boulder City Government and echoed in many other presentations. The extent of flooding in Boulder during the 2013 event exceeded any preparedness drills conducted by local emergency responders. None of the scenarios included cases where all the canyons flooded simultaneously, as happened early on in the disaster. In the words of the head of the National Weather Service Office in Boulder, "it's tough to forecast something you've never seen before." Indeed, the limits of forecasts and scenario-based planning are well-known within disaster studies. Disaster risk, by definition, carries with it a degree of uncertainty that creates challenges for planners. Though planning approaches to managing uncertainty seek optimal relationships between risk and investment, we might also look to increasing a system's robustness, or its ability to meet its goals across a wide range of potential scenarios. These are different goals and tradeoffs need to be made between these two conceptions of resilience (Hallegate et al., 2012).

The Challenges of Scale

Understanding a community's resilience from a theoretical or practitioner-oriented perspective raises difficult challenges related to drawing boundaries around where and when to focus analysis. The time-scales at which natural systems operate often do not align with election cycles, project periods, or other social phenomena. The

2013 Floods were described as being 1 in 25 or 50 year events caused by 1 in 1,000 year rainfall. According to presentations made during Commemoration events, decisions made about the design of Boulder's water and sanitation infrastructure in the 19th century and land use planning in the early 20th shaped the ways in which the flood impacted Boulder in the 21st century. The town of Lyons, which was heavily impacted by the floods, has launched a five-year stream mitigation plan but during one presentation this was described as being "too short" from a watershed planning perspective. To what time-horizon (or flood return period) should the citizens of Boulder orient their attention now as they take up the challenge of building a more resilient future?

In similar ways, geography can confound attempts to assess the resilience of a place. The 100 Resilient Cities Campaign is focused on the City of Boulder and local government, yet the hardest hit areas by recent floods were in smaller towns or unincorporated regions in the mountains of Boulder County and other parts of the Front Range. The trans-boundary watersheds and floodplains of the region do not adhere to the complex and overlapping jurisdictional boundaries that comprise its man-made system of government. Wildfires, the impacts of climate change, and economic downturn demonstrate a similar lack of alignment with defined boundaries. Boulder's food system is dependent on multi-nodal supply chains that stretch around the globe and face disruption at many points.

The scale at which we assess resilience affects what it looks like, and changes in resilience at one scale can affect resilience at another. Resilience thinking, therefore, requires the ability to keep multiple scales within focus at once. Community engagement and adaptive approaches to understanding resilience can help to facilitate this.

"He heard it in our voice": Interconnected Infrastructures

Throughout the flood events, speakers characterized resilience as an attribute of people, places and things. Physical components of the built environment were sometimes discussed as "being resilient," including a popular hiking trail. There was also discussion about the importance of closely-knit neighborhoods as a component of resilience, and observations about well-supported communities of practice, like hobbyist groups who care about the environment (anglers and birders). A particularly striking observation came when a local meteorologist relayed how a personal relationship between the Boulder fire chief and the forecasting office helped ensure that the information the weather service provided was taken seriously and raised the level of emergency to convince EOCs and responders to take valuable measures to prepare ahead of the flooding. According to the meteorologist, "he heard it in our voice."

This remark captures the essence of how a polyvocal view of resilience is driving what we understand critical infrastructure to be. From our observations, we see abstractions about ideas of "critical infrastructure" that are expanded beyond the usual notions of the built environment alone. Synthesis of the observational work we report on here combined with scholarship elsewhere about resilience (Folke 2006; Goldstein, 2012; Soden, Budhathoki, Palen, 2014; Soden and Palen, 2014), reveal three aspects of an interconnected infrastructure: built infrastructure, social infrastructure, and information infrastructure.

Built infrastructure has long been the focus of disaster risk management studies and there is significant research to demonstrate the value of investing in resilient construction practices. Social infrastructure, or the factors that facilitate the development of human relationships, trust, and shared experience and vision, is important for collective decision-making and action (Lee et al., 2006; Bietz et al., 2012). Information infrastructure is conceived here as the third critical interdependent infrastructure (Star and Ruhleder, 1996); our inclusion of it addresses how individuals, groups, organizations and institutions learn, sense-make, and interact with information they produce, seek and transform—often with new information and communication technology (ICT) (Bowker, 1996; Bowker et al., 2010).

Just as important for understanding the community's resilience are the ways in which these infrastructures engaged with, impacted, and supported one another. It is established that the joint consideration of the built and social infrastructures better accounts for the nonlinearity, uncertainty, and intrinsically dynamic character of complex systems (Folke, 2006). It is also well documented that the information provided by early flood mapping efforts of Gilbert White in Boulder contributed to the hardening of physical infrastructure in the area (Hinshaw, 2006). The interconnections between infrastructures are important for researchers and practitioners to focus on but often obscured by abstracted frameworks meant to describe resilience. The aftermath of Boulder's flooding demonstrated the ways in which the interconnections between the region's built, social, and information infrastructure either failed or succeeded in helping the region withstand the event.

CONCLUSION

This paper reports on the findings of our multi-disciplinary team, which is building a multi-year research program around community resilience in a progressive city recovering from a major natural disaster. The research we report on here has sought to understand the stakeholders involved in community resilience and the variety of framings that these stakeholders brought to the table. From the start, we deliberately chose to avoid overly rigid definitions of resilience and instead take a phenomenological, inductive, and interdisciplinary approach. This allowed us to unearth some dilemmas in the framing of resilience that we might not have otherwise seen. Repeatedly during our observations we encountered situations in which the ideas and issues under consideration did not map neatly to the frameworks being used to describe resilience. These dilemmas, or *aporias*, are perhaps symptomatic of a conceptual overloading of resilience. The multiple framings of resilience at play in this context resist facile classification and confound attempts to fit the ideas at stake into abstracted representations. They represent impasses that such frameworks, regardless of how detailed, may not be able to reconcile. By understanding community resilience as ways of thinking instead of something that can be measured, we are better able to attend to its polyvocal and emergent characteristics. In doing so, we do not attempt to create coherent unified narrative or reconcile conflicting narratives. Instead, we attend to the multiplicity of ideas and ideals expressed and understand them on their own. This in turn gives us a better chance of understanding the complexity of ways in which the concept operates and more hope at operationalizing its promise.

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