

**Learning Processes, Public and Stakeholder Engagement:  
Analyzing Responses to Colorado's Extreme Flood Events of 2013**

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In early fall of 2013 in the Front Range of Colorado, several communities experienced intense rainfall over a three-day period, exceeding annual average precipitation rates. Extensive damage occurred to roads, infrastructure, parks, river corridors, homes and business throughout the region. Across the U.S. and in other nations, as population increases in flood-prone areas, flood risks and vulnerability are increasing as well. Successful response to extreme events may be due to policy learning—changes of beliefs, attitudes, behaviors, and goals – in response to new information and experiences. This learning can at times lead to adaptation of local policies to increase the resilience of communities faced with risk from extreme events. Through the reflection on and modification of former policies, and the adoption of new policies, communities may adapt and become more resilient. The extent of policy learning may depend on how communities engage with stakeholders and the public in post-disaster recovery. Using a comparative in-depth case study approach of seven Colorado communities, this study examines how communities actively engage stakeholders and the public in decision processes after an extreme event.

## **Introduction**

As summer of 2013 turned to fall in the Front Range of Colorado, over 16 inches of rain fell in a three-day period in some areas, totaling more than annual average precipitation rates (Henson, 2013). Towns such as Boulder, Lyons, Longmont, among others that sit at the mouths of mountain canyons, experienced flash flooding. When the rain and water moved east towards the plains, other towns such as Evans and Milliken were devastated. Infrastructure throughout the region was damaged, if not destroyed. Immediate road repairs cost over \$450 million and costs are expected to rise as repairs are completed (Whaley, 2013). Many residents' homes became inhabitable, and many residents were under no flush restrictions (eight days in Evans). In Lyons over 20% of the housing was destroyed or severely damaged and over 1,000 residents in Evans lost their homes. Beyond infrastructure and homes, business, community parks, and open space were also affected.

As population density increases in flood-prone areas, community vulnerability to flood risk is increasing. Along with this trend, in the U.S. the responsibility to design strategies and policies to mitigate flood risk is shifting from the federal government to states and localities (Brody et al., 2009). In the wake of a flood, communities must make decisions about whether, where, and how to rebuild, as well as whether to adopt changes in zoning and floodplain uses. Communities may need to repair or rebuild key public infrastructure, roads, storm sewers, and wastewater management systems. Floods may allow communities an opportunity to learn from their experiences and adjust their policies going forward. Flood management decisions may lead to increased community resiliency or continuing vulnerability to future flood events. By reflecting on past policies, modifying former policies, or adopting new policies, communities may become less vulnerable to future flood risk. How communities engage with stakeholders and the public during these recovery processes may impact local-level flood management practices. By examining the policy and decision responses to the September 2013 floods in seven Colorado communities, this study examines how communities actively engage stakeholders and the public in decision processes. While it is too early in the process of recovery to present conclusions about learning outcomes in flood response, it is critical to understand the decision processes that occur that may either encourage or limit learning from the experience of the floods.

## **Learning in Response to Extreme Events**

Learning in response to an extreme event may take many forms. Communities may identify policy failures or draw new conclusions about relationships, networks, and organizational structure (organizational learning). Policy learning, changes of beliefs, attitudes, goals, or behaviors in response to new information may occur in response to extreme events (Albright, 2011). These overlapping concepts of learning may encourage adaptation of local policies to increase the resilience of communities faced with risk from extreme events. There are several potential driving factors that may explain variation in learning in response to extreme events: extent of flood damage, resource availability (e.g., financial, technical, human capacity), structure and openness of decision-making processes, and type of stakeholder participation in recovery (Brody, 2003; Johnson et al., 2005; Brody et al., 2009; Albright, 2011; Vulturius, 2013).

## *Policy Change and Learning*

The policy change and crisis literatures posit several potential causal mechanisms that may explain the occurrence of policy change and learning in the aftermath of an extreme event or crisis (Nohrstedt and Weible, 2010; Sabatier and Weible, 2007). One such framework, the Advocacy Coalition Framework (ACF) is based on the concept of advocacy coalitions and defines policy-oriented learning as changes in beliefs held by these coalitions (Sabatier and Jenkins-Smith, 1999). Several additional concepts inform the theoretical landscape of learning in response to an extreme event (Table 1). While the reflection of past experiences and the collection of new information are central to a variety of learning concepts, the content of what is learned varies (Birkland, 2004; Busenberg, 2001; Sabatier and Jenkins-Smith, 1993; May, 1992; Bennett and Howlett, 1992).

In the wake of extreme flooding, communities will be faced with decisions about how to respond and what future plans to make regarding emergency management, rebuilding, and similar issues. The outcome of these decisions may depend on the extent and type of learning that has occurred within a community, what is learned, and by whom (Table 1). How a community conducts participatory and decision making processes in response to floods may help explain what type of and to what extent policy learning occurs. This study, therefore, examines the links between a shock (i.e., the floods in Colorado), damage incurred, shifts in resources, and subsequent local-level participatory processes to inform flood recovery.

**Table 1. Operationalization of Policy Learning Concepts**

<b>Type of Policy Learning</b>	<b>Relevant Policy Learning Framework</b>
Reflection on past experiences	Policy-oriented learning, Social learning
Goal redefinition	Social learning (May, 1992; Sabatier and Jenkins-Smith, 1999; Birkland, 2004)
Belief change	Policy-oriented learning (Sabatier and Jenkins-Smith, 1999); Social learning
Changes in policy instruments (Birkland, 2004; May, 1992)	Instrumental learning; Lesson drawing (Rose, 1991; May, 1992; Birkland, 2004)
Learning from others' experiences	Lesson drawing (Rose, 1991)
Learning about governmental organizations (Bennett and Howlett, 1992)	Government learning (Etheredge, 1981; Bennett and Howlett, 1992)
Learning about strategies and tactics	Political learning (May, 1992; Birkland, 2004)

### *Democracy and Transparency in Policy Learning*

Since Schattschneider (1960) first discussed venue expansion, the process of expanding and contracting venues of debate, political discourse, and actors involved in policy decisions has been considered a key variable in understanding policy change. The openness of governance, however, has not been viewed as a central element of disaster response and policy adaptation to extreme events.

Participatory processes vary along multiple dimensions, including type of participants (e.g., government, civil society organizations, experts, citizens); scale of process (e.g., local, regional, national) (Gregg et al., 1991; Margerum, 2008); the level of governance (e.g., government-led, citizen-led, hybrid) (Moore and Koontz, 2003; Steelman and Carmin, 2002); and method or intensity of participation (e.g., public hearings, public advisory committee, consensus meetings) (Beierle, 2002; Rowe and Frewer, 2000; Hansen and Maenpaa, 2008). These processes range from bottom-up approaches of locally-initiated collaborations to top-down government-led programs. Sabatier et al. (2005) argue that all organizations or individuals who are, or could be, affected by a management decision should be able to participate, either directly or indirectly through representation, in a stakeholder process. Further, to have a successful stakeholder process, representative stakeholders should be involved throughout the entire decision making process (Korfmacher, 1998, 2001).

If experts dominate a decision process, citizens are typically less likely to become involved and the processes themselves are less open to participation (Crow, 2010; Schneider and Teske, 1992). These experts can have easier access to decision processes and elite decision makers due to their political or professional expertise. Schneider and Ingram (1997) also argue that expert language can be used to marginalize citizen engagement and prevent participation by non-expert actors, which suggests that when experts are granted higher levels of access to decision makers, citizens might be less central to decision processes. If processes are less open to non-expert stakeholders, new actors and/or new ideas may not be likely to enter decision processes.

Groups and individuals who are not considered political elites or experts may be able to influence political discourse in more open, collaborative systems—which may in turn lead to policy learning (Albright, 2011). Communities with more open and democratic participatory processes may display a greater depth and extent of policy learning.

### **Research Questions and Hypotheses**

Based on the literature outlined above, the following research question and associated hypotheses will be examined in this paper.

**RQ1: How do learning processes, and more specifically the degree of openness of stakeholder and participatory processes, differ across communities?**

*H1: Participatory processes will vary across communities based on extent and type of flood damage and resource availability.*

*H2: We expect to see communities with (1) greater post-flood resource availability (e.g., financial, technical, relationship/network, public support) and (2) more extensive shifts in resources to demonstrate greater levels of openness and stakeholder participatory process.*

## Multi-Method Comparative Case Study Research Design

Using a comparative in-depth case study approach (Yin, 2003) of seven Colorado communities, the research question and hypotheses posited above are examined in this paper. These communities are situated within the three Colorado counties (Boulder, Weld, and Larimer) most affected by the 2013 floods (Federal Emergency Management Agency, 2013). The seven communities vary across size, demographics, extent, and type of flood damage (Table 1). Data collected for this paper are detailed below.

### Data Collection and Analysis

#### *Data Collection: Interview and Document Data Collection*

In-depth semi-structured interviews (Rubin and Rubin, 2005) were conducted within each community. Initial interviews were conducted in November and December 2013 as each community transitioned from ‘response’ to ‘recovery’ phases (for example, Lyons did not move into recovery until December 18, 2013). These interviews (n=24) provided background information on flood damages and general flood recovery. For this paper, we also systematically analyzed five of those interviews that were conducted with an individual in each community who managed, lead, or had the most knowledge of participatory flood recovery processes in their community. The interviews were conducted in person and digitally recorded. The transcripts were coded for three major themes: resources, recovery processes, and actions taken by local governments in the wake of the floods (i.e. increasing wastewater fees to pay for infrastructure repairs, or convening stakeholder processes).

**Table 2: Demographics of Case Study Communities**

<b>County (population)</b>	<b>Community</b>	<b>Approx. Size (2010 Census)</b>	<b>Median Household Income (2008-2010 Census)</b>	<b>% College Graduate (2008-2010 Census)</b>
Boulder (295,169)	Boulder	101,800	\$56,206	71.3
	Longmont	88,600	\$57,142	37.3
	Lyons	2,000	\$73,918 <sup>1</sup>	58.2
Larimer (299,630)	Loveland	67,039	\$55,838	32.4
	Estes Park	6,000	\$57,789	48.3
Weld (254,241)	Greeley	95,300	\$44,226	25.9
	Evans	19,500	\$46,180	14.9

<sup>1</sup>Median household income and education attainment data for Lyons, CO was obtained from City-Data.com

All documents related to flood management planning, participatory processes, evaluation of policies, and community responses to the floods were gathered and analyzed. This includes all web content and public or media outreach, city council minutes and memos, minutes from

commissions and boards, planning session documents, and other documents as appropriate to each community.

### *Document and Interview Coding and Analysis*

For this paper, coding of all of the documents (n=773) and five interview transcripts was conducted to identify major concepts and patterns across cases<sup>1</sup>. The codebooks for the documents and transcripts are shown in Appendix I and II respectively. Using NVivo software, we analyzed the data to examine variations and similarities among interview subjects, variables, and cases (Miles and Huberman, 2013). The documents and transcripts were coded for process variables (e.g., meeting frequency, topic, and type, and public participation mechanisms) and resource availability.

## **Research Findings**

The process of recovery, including public outreach, participatory processes, and stakeholder involvement is important to understand in order to determine if these variables matter to policy learning over the long-term recovery period. To address RQ1 and the first hypothesis (H1), flood damage and resource availability will be discussed first, followed by a discussion stakeholder and participatory processes.

### **RQ1: How do learning processes, and more specifically the degree of openness of stakeholder and participatory processes, differ across communities?**

*H1: Participatory processes will vary across communities based on extent and type of flood damage and resource availability.*

### **Extent of Flood Damage and Resource Needs across Communities**

The extent of damage experienced by each of the communities is outlined in Table 2. As noted, Greeley suffered the least amount of damage, while Lyons experienced a loss of approximately 20% of its housing stock as well as significant infrastructure damage. The costs of recovery, especially in terms of its relative size compared to a community's annual budget, vary significantly across communities, with Lyons and Evans experiencing the greatest cost to budget ratios. Estes Park was not only affected directly by the flood, but also indirectly with a loss of tourists traveling to Rocky Mountain National Park (Estes Park is the 'gateway' to the National Park), and was also impacted by the federal government shutdown of the National Park and other federal lands in October 2013. Lyons, a small town that relies on a river-based tourist economy, has lost tourism dollars as a result of the damages to the river corridor. See Table 3 for a breakdown of the flood-related costs for the case study communities.

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<sup>1</sup> Interview quotations used in this paper are cited using an alpha-numeric code to identify the community (BO = Boulder, LG = Longmont, LY = Lyons, EP = Estes Park, EV = Evans, GR = Greeley, and LV = Loveland)

## Resources and Resource Availability

Prior to, and in the wake of extreme events such as floods, each community has a unique composition of available resources. These resources may include fiscal, human, community support, networks, and technical assets or capacities. The basket of resources after a flood, including resource shifts that occur in response to an extreme event may dictate, in part, how a community approaches the recovery process. As shown in Table 2, the population size and average median income vary across case study communities in this analysis. These measures may serve as proxies for resource availability prior to the floods (e.g., size of government staff budget are related to the local population/tax base). Evans and Lyons, both small communities, differ in relative wealth, with Evans having a comparatively lower median household income. Boulder, the home of the University of Colorado's flagship campus, has a relatively high median household income, and a highly educated and relatively large population. Greeley and Evans, both located in Weld County, have lower median household incomes compared to other communities. The economic profiles of the communities vary as well—with the communities in Weld County having larger agricultural, industrial, and petroleum/natural gas extraction industries. Estes Park, with its largely tourism-based economy sits at the gateway the Rocky Mountain National Park.

Beyond town resources prior to the floods, the availability of resources and shifts in resources in response to the floods may also influence a town's ability to initiate and manage stakeholder and participatory processes (Table 4). All communities are constrained, to varying extents, by budgets, staff (human capacity), and technical capacity. All communities will seek reimbursement of varying amounts from FEMA for flood recovery costs. As a general practice, the standard FEMA cost-share is 75% of the amount of damage that is not covered by insurance. The State of Colorado will cover 12.5% of the remaining costs, with the expectation that each town will fund the remaining 12.5% of damage costs<sup>2</sup>. FEMA reimbursement and these cost shares frequently do not cover river corridor restoration unless these costs can be directly tied to flood hazard mitigation. Corridor restoration can be significantly costly, especially for communities where the riverbed shifted significantly.

In addition to fiscal resources, community managers and staff frequently mentioned the importance of an array of resources that have aided or will assist in immediate flood response and long-term recovery. Of these resources, relationships with non-governmental organizations, faith-based organizations, state and federal agencies, counties, other communities, and community members were seen as most important. Several interviewees also mentioned the importance of technical capacity, such as the ability to GPS map the high water line during the flood (Loveland) and public outreach using digital media during both response and recovery (e.g., Twitter, Facebook, Google groups, websites, etc.).

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<sup>2</sup> All of these figures apply after insurance has been paid on covered properties or assets.

**Table 3 Extent of flood-related damage across sectors in each community.**

Community	Public Works/ Infrastructure	Residential	River corridor	Parks, Trails and Open Space
<b>Boulder</b>	<ul style="list-style-type: none"> <li>• 50 municipal /facilities significantly damaged.</li> <li>• Sewer and stormwater infrastructure and treatment facilities damaged.</li> <li>• 60 miles of road covered in debris</li> </ul>	<ul style="list-style-type: none"> <li>• 50 housing units uninhabitable</li> </ul>	<ul style="list-style-type: none"> <li>• Applying for \$500,000 to \$1 million from FEMA for debris/sediment removal</li> </ul>	<ul style="list-style-type: none"> <li>• 25 damaged areas of trail system.</li> <li>• Hundreds of Open Space and Mountain Parks areas damaged</li> </ul>
<b>Longmont</b>	<ul style="list-style-type: none"> <li>• Storm drainage \$74 million</li> <li>• Street repair \$17 million</li> <li>• Sewer \$4.6 million</li> </ul>	<ul style="list-style-type: none"> <li>• Mobile home park area experienced most damage</li> </ul>	<ul style="list-style-type: none"> <li>• \$48 million, river corridor must be repaired</li> </ul>	<ul style="list-style-type: none"> <li>• Parks \$21 million damage</li> <li>• Two park closures.</li> </ul>
<b>Lyons</b>	<ul style="list-style-type: none"> <li>• Significant damage to roads</li> </ul>	<ul style="list-style-type: none"> <li>• &gt; 20% of residences destroyed or severely damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Significant damage to river corridor, shifting of river</li> </ul>	
<b>Loveland</b>	<ul style="list-style-type: none"> <li>• \$20-\$30 million in infrastructure damage</li> </ul>	<ul style="list-style-type: none"> <li>• Minor, minimal development in the floodplain</li> </ul>		<ul style="list-style-type: none"> <li>• Extensive damage to two city parks</li> </ul>
<b>Estes Park</b>	<ul style="list-style-type: none"> <li>• \$30-40 million in damage, mostly to roads, bridges, and sewers</li> </ul>	<ul style="list-style-type: none"> <li>• Minor, along two specific river corridors</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate to significant debris deposits</li> <li>• River moved up to 50 feet in some locations</li> </ul>	
<b>Evans</b>	<ul style="list-style-type: none"> <li>• Significant damage to infrastructure</li> <li>• Sewer system down 8 days</li> </ul>	<ul style="list-style-type: none"> <li>• Significant damage in specific neighborhoods, particularly mobile home parks</li> </ul>		<ul style="list-style-type: none"> <li>• Significant damage</li> <li>• Park closure</li> </ul>
<b>Greeley</b>	<ul style="list-style-type: none"> <li>• Minor</li> </ul>	<ul style="list-style-type: none"> <li>• Minor</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate debris removal costs</li> </ul>	<ul style="list-style-type: none"> <li>• Minor</li> </ul>

<sup>1</sup> Minor damage denotes minor debris clean-up, street flooding in scattered areas throughout the community, but not significant damages.

**Table 4. Resource availability across communities in the aftermath of the floods.**

<b>Community</b>	<b>Resource Availability</b>	<b>Relevant Quotations</b>
<b>Boulder</b>	<ul style="list-style-type: none"> <li>Along with the FEMA and CO shares, this is manageable within the city budget and planning process</li> <li>City staff and departments were able to handle initial minor repairs and they are contracting for larger work</li> </ul>	<p>“In comparison to the rest of the county, especially our northern neighbors, we are very lucky. We had no loss of life. I think there were 13 homes that were placarded as not habitable. The rest of the damage has mostly been underground.” (BO-01)</p>
<b>Longmont</b>	<ul style="list-style-type: none"> <li>Longmont immediately increased city Water &amp; Sewer fees and the Park Fee for all residents to help pay for recovery</li> <li>City staff and departments were able to handle initial minor repairs</li> <li>They have prioritized the moderate and major projects and will contract for those, some of which will require grants from outside agencies and organizations</li> </ul>	<p>“Our three big priorities are reestablish the city’s water supply, deal with ‘the river’, and then housing.” (LG-01)</p> <p>“We’re starting to dredge Longmont Reservoir, and as of this morning we’re actually flowing water through the north pipeline all the way down to the treatment plant...so that’s a major thing... there’s lots left to do.” (LG-02)</p>
<b>Lyons</b>	<ul style="list-style-type: none"> <li>With an operating budget of \$1 million annually, this far exceeds the town’s capacity</li> <li>Lyons is depending on outside agencies and volunteers to do assessments and repairs, and the State of Colorado to help defray more than the standard 12.5%</li> <li>They have logged 35,000 volunteer hours between September and December</li> <li>The state will hire and pay for a recovery manager starting in January 2014</li> </ul>	<p>“When the water came through it ripped out all of the underground utilities with it. So we lost all connections to our wastewater plant, gas lines, electric lines, sewer lines, communication lines. We lost all access in and out of Lyons. In some cases the roads and bridges were totally washed out... no one in and no one out.” (LY-01)</p> <p>“We had to evacuate all 2000 people and the National Guard did that.” (LY-01)</p>
<b>Estes Park</b>	<ul style="list-style-type: none"> <li>Cost is within the town’s capacity, depending on whether Larimer County and federal highway funds contribute sufficient resources</li> <li>Estes Park has met its FEMA match primarily through in-kind costs such as labor</li> <li>Grant awarded by the Colorado Water Conservation Board</li> </ul>	<p>“We actually fared fairly well for everything that happened. We have several streams go through town...downtown was a river.” (EP-01)</p> <p>“The road was pretty much completely destroyed, took out the sewer system and all utilities [in Fish Creek corridor].” (EP-01)</p>
<b>Loveland</b>	<ul style="list-style-type: none"> <li>With the FEMA and state contributions, and insurance coverage, the costs should be within city’s capacity</li> <li>Loveland had updated floodplain maps twice in ten years in response to the 1997 Spring Creek flood in Larimer County.</li> </ul>	<p>“Within our urbanized area, our damage is primarily public infrastructure and only a distant second private property. The reason for that is the physical layout and the past regulatory environment which has prevented a lot of private development in the floodplain, has avoided that.” (LV-01)</p>
<b>Evans</b>	<ul style="list-style-type: none"> <li>Damage costs far exceed fiscal capacity of community</li> <li>Evans has very limited resources to deal with the response and recovery</li> </ul>	<p>“And, you know, for a city of almost 20,000 that’s a relatively small number of people. And our staff, especially our professional staff, the engineers and those kinds of folks, have been on flood duty almost full time sense September 13<sup>th</sup>. And that’s been really stressful on our organization. We are just now going to hire a bunch of more temporary staff to work on these things because—as you know, these recovery things can go on for years.” (EV-02)</p>
<b>Greeley</b>	<ul style="list-style-type: none"> <li>Cost within town’s capacity</li> <li>Greeley increased contingency funds through budgeting process</li> <li>Greeley had resources to aid Evans in emergency response</li> </ul>	<p>“We didn’t have anything that went down and became completely unoperational. Just some damage that needs to be dealt with, so that it can continue to function as it’s designed.” (GR-01)</p>

**Table 5. Counts of meetings in various local-level venues September 2013 thru July 2014 across the case study communities.<sup>1</sup>**

<b>Community</b>	<b>City/Town Council</b>	<b>Elected or Appointed Advisory Commission/Board</b>	<b>Flood Task Force</b>	<b>Public Meeting</b>	<b>Total</b>
Boulder	4	29	0	10	<b>43</b>
Longmont	29	19	0	11	<b>59</b>
Lyons	0	0	35	4	<b>39</b>
Loveland	16	25	0	3	<b>44</b>
Estes Park	19	18	1	3	<b>41</b>
Evans	10	6	4	0	<b>20</b>
Greeley	3	5	0	2	<b>10</b>
<b>Total Flood Meetings</b>	<b>81</b>	<b>102</b>	<b>40</b>	<b>33</b>	<b>256</b>

<sup>1</sup>Only documented meetings were included in these counts.

## Variation in Participatory Processes

As described in the introduction, this study examines the relationships between flood damage, resource availability and flood-recovery participatory processes, as put forth in our second hypothesis:

*H2: We expect to see communities with (1) greater post-flood resource availability (e.g., financial, technical, relationship/network, public support) and (2) more extensive shifts in resources to demonstrate greater levels of openness and stakeholder participatory process.*

In response to the floods, city councils, commissions, stakeholders, and the public of each affected community began to assess and discuss the damages left in the wake of the extreme floods. These conversations occurred in a variety of venues in each of the communities. Table 5 displays the number of community-level meetings in which the floods of September 2013 were discussed. The number of total flood-related meetings<sup>3</sup> varies across communities, with Longmont holding the greatest number of meetings and Greeley the least. The topical focus of the meetings also varies across communities, with a greater focus on open space, trails, and parks in Boulder and Longmont and more frequent discussion of infrastructure in Longmont, Loveland, and Estes Park (Table 6).

Community-level participatory approaches for flood recovery also differ across communities (Table 7). Lyons is holding extensive and deliberative meetings on every aspect of recovery and asking citizens to volunteer for a committee on which they will serve (housing, parks and recreation, arts and culture, roads and bridges, infrastructure, public facilities, stream recovery, individual assistance, and businesses). Prior to the development of specific projects, each recovery group developed a set of goals, objectives, and priorities to help guide future decisions. In addition to the small recovery groups, Lyons involved the public via public meetings (with as many as 500 in attendance (Table 8)) as well as participation through electronic means, including near-daily email updates on the status of flood recovery (Table 7).

Longmont has discussed floods in a large number of meetings and has engaged the public in the largest number of meetings, which focus primarily on park redevelopment and river corridor recovery (Table 5). Boulder has held a large number of public meetings, some focused on specific neighborhoods, to address the issue of floodplain management (Table 5). Boulder has also experienced a relatively high level of community involvement in open space and trail redevelopment, both through public meetings and public comment at city council meetings (Tables 5 and 6). Estes Park has engaged in a stakeholder process surrounding the Fish Creek corridor, in which multiple stakeholders are involved. Approximately 140 individuals attended a public meeting associated with this process that has been funded by \$78,000 by the Colorado Water Conservation Board.

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<sup>3</sup> We define flood-related meetings as meetings in which meeting participants discussed at least one-flood related topic as documented in a meeting agenda, minutes or notes.

**Table 6. Counts of flood-related meetings assorted by major topics September 2013 thru July 2014.**

<b>Community</b>	<b>Broad Recovery<sup>1</sup></b>	<b>Public Works<sup>2</sup></b>	<b>Residential</b>	<b>Business/ Economic development</b>	<b>Landuse/ Floodplain</b>	<b>Stream Restoration</b>	<b>Parks, Trails and Open Space</b>
Boulder	11	1	0	0	8	2	18
Longmont	18	13	8	3	0	4	9
Lyons	9	5	11	5	0	5	5
Loveland	13	11	0	1	0	0	13
Estes Park	7	14	0	6	6	2	0
Evans	5	2	0	3	5	0	0
Greeley	8	2	0	0	0	0	0
<b>Total Flood Meetings</b>	<b>71</b>	<b>48</b>	<b>19</b>	<b>18</b>	<b>19</b>	<b>13</b>	<b>45</b>

<sup>1</sup>Broad recovery encompasses those meetings that discussed overall damage assessment, FEMA reimbursement, and planning processes and did not discuss specific topics such as residential, business, etc.

<sup>2</sup>Public works encompasses discussions of city infrastructure including roads, utilities such as power, gas, sewer, drinking water, and stormwater.

**Table 7. Mechanisms and fora through which citizens have participated in and shared views on flood recovery.**

	<b>Public meeting participation</b>	<b>City council/ commission participation</b>	<b>On-line information collection</b>	<b>Task Force/ stakeholder process</b>	<b>Survey of residents</b>
Boulder	Yes	Yes	Yes	No	Yes
Longmont	Yes	Yes	No	Yes	Yes
Lyons	Yes	No	Yes	Yes	Yes
Loveland	No	No	Yes	No	No
Estes Park	Yes	Yes	No	Yes	No
Evans	No	No	No	Yes	No
Greeley	Yes	No	No	No	No

**Table 8. Relevant quotations about participatory processes and public involvement in flood recovery across the case communities.**

Boulder	<ul style="list-style-type: none"> <li>• “So the neighborhood meetings have been critical in that right now we’re just—we’re asking the—it’s almost like a debrief. We’re asking the residents to come tell us what their experience was and also what they think, and it’s been fascinating to watch them come to the flood maps and say, “No, that’s not how it happened; this is how it happened.” So it’s really just—it’s kind of letting the community vent, but also debrief, because that will help us gather data.” BO-01</li> </ul>
Longmont	<ul style="list-style-type: none"> <li>• “So to some extent, it really is a massive information campaign around, “You need to know. You need to know. You can track yourself. Here’s where we are. This is what’s happening.” You know, regular updates, regular conversations, you know, interactive maps and videos and everything to try to get the information out. Once we get to a point where some of those critical infrastructure pieces are met, then we probably will involve them more.” LG-02</li> </ul>
Lyons	<ul style="list-style-type: none"> <li>• “We had our kickoff meeting. And we invited the entire public. We did door-to-door flyers, hand delivered to every person saying we want your input. And last night we had about 500 there.” LY-01</li> </ul>
Loveland	<ul style="list-style-type: none"> <li>• “I think we’re probably going to have community work-shopping and community participation on Viestenz-Smith Mountain Park, pretty sure that we will have that on the south half of Fairgrounds Park as well... they would be driven really not as a special overall flood recovery process but individual projects.” LV-01</li> </ul>
Estes Park	<ul style="list-style-type: none"> <li>• “Residents. And then they are able to ask—answer questions, and we describe kind of how we were trying to help facilitate some of these recovery efforts. Then, from there, we split up and we had a Fish Creek meeting, just specific to Fish Creek. And we created a Fish Creek email list where we can—people can subscribe and we can then communicate directly with the Fish Creek property owners, and the same with Fall River. So we can talk about their specific goals. We just started with also making sure people introduce themselves so that neighbors start to meet neighbors.” EP-02</li> </ul>
Evans	<ul style="list-style-type: none"> <li>• “In fact, we had a—we were having almost every day a public meeting at 10:00 to just update folks on where it was going. This was an interesting event. If you were north of 23<sup>rd</sup> street, you probably never knew anything happened except we got a lot of rain because once you got beyond—well, actually once you got beyond 35<sup>th</sup>, you weren’t in the no-flush zone; you’re in another basin, and so that goes to a different plant. And so we have a community that about almost 2/3rds of the community was initially affected by the no-flush, but once that was done, the event was over for them. And then, of course, we have the folks on the east side, who some of whom lost everything.” EV-01</li> </ul>
Greeley	<ul style="list-style-type: none"> <li>• “You know, the press conferences and stuff that Evans had, to be able to inform people what’s going on, but we didn’t have to do anything of that in Greeley. Would have. It’s in our plan, if necessary, but we didn’t have to activate—fully activate and do those types of things in Greeley.” GR-01</li> </ul>

Evans has more recently formed a flood recovery task force that meets twice per month and covers a wide swath of topics, potentially culminating in a proposed plan with recommendations for changes in land use plans, building codes, and other flood-related policy instruments (Table 5). The task force meetings are open to the public, but no documents were found that indicate broad public outreach in the recovery process. The meeting notes, nor the agendas, were posted on the town of Evans' website. Greeley, also located in Weld County, with its very limited flood damage did not speak of community-level involvement in flood recovery, nor do the documents suggest that extensive meetings were held in response to the floods (Table 5). Loveland is facing the recovery processes akin to traditional capital projects with design workshops but limited policy deliberation among stakeholders (Table 8). An approximately equal number of meetings have involved discussion of public works and parks and open space (Table 6), the latter which the community will engage the public in park redevelopment.

### **Discussion**

In the introduction, we posited two hypotheses: (1) participatory processes will vary based on extent and type of flood damage; and (2) communities will adopt more open stakeholder participatory processes depending on post-flood resource availability and shifts in resources. Prior to the floods, each community had a unique set of resources and relationships that they bring to the recovery process. Layered on top these 'baskets' of resources (e.g., fiscal or budgetary, staff, technical expertise, community support), exists significant variation in the extent and type of flood damage incurred on each community – the amount of damage to public infrastructure, including parks and open space, private residences, and businesses, or a mix of all three sectors. The damage costs incurred as a percentage of annual budgets vary widely across the seven communities, as well as the ability to cover these expenses. Table 9 synthesizes flood damage, resource availability and participatory processes across all communities.

In response to the floods of 2013, the communities have experienced shifts in resources, whether due to an influx of money from FEMA, state agencies or insurance payments, additional staffing and volunteer participation, or outside technical expertise from contractors and consultants. Stemming in part from all of these factors, as well as past practices, community culture, and federal and state processes (e.g., FEMA reimbursement procedures, National Incident Management System), each community has adopted its own process for incorporating the broader community into decisions surrounding recovery and future planning.

The findings based on analysis of documents and interview transcripts suggest that the extent of flood damage, resource availability, and resource needs all may interact to help determine the extent to which the public is involved in recovery processes. Lyons may, in part, be driven to develop extensive participatory processes due to the limited capacity of its Town Government. This, however, is not likely the complete picture. Evans, also with limited fiscal and staff capacity, has not adopted a similar participatory approach to Lyons. Potential reasons may include the capacity of the community to participate in such a process. The two towns differ in size, socioeconomics (Lyons is wealthier with higher levels of educational attainment), and the spatial patterning of the flood damage. Downtown Lyons, central to its economy, was heavily impacted while in Evans, lower socioeconomic status neighborhoods, including mobile home parks were most severely impacted (Table 6). And in Boulder, where resources are available and

**Table 9 Synthesis of flood damage, resource availability and participatory processes across case communities**

	<b>Flood damage</b>	<b>Resource availability</b>	<b>Public engagement and participatory processes</b>
Boulder	<ul style="list-style-type: none"> <li>• Extensive open space damage</li> <li>• Moderate infrastructure damage</li> </ul>	<ul style="list-style-type: none"> <li>• Cost within city capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Open process to public</li> <li>• Extensive outreach, especially concerning open space</li> <li>• Active collection of information from public on internet</li> <li>• Neighborhood-based meetings on floodplain management</li> </ul>
Longmont	<ul style="list-style-type: none"> <li>• Extensive damage to parks and river corridor</li> <li>• Moderate infrastructure damage</li> </ul>	<ul style="list-style-type: none"> <li>• Cost within city capacity with increase in water sewer fee and FEMA and State assistance</li> </ul>	<ul style="list-style-type: none"> <li>• Open process to public</li> <li>• Extensive outreach, especially concerning open space</li> <li>• Deliberative, long-term processes re park redevelopment</li> </ul>
Lyons	<ul style="list-style-type: none"> <li>• Extensive damage to residential and town core</li> </ul>	<ul style="list-style-type: none"> <li>• Cost far exceeds town capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Open process to public, high level of public participation</li> <li>• Comprehensive, deliberative, long-term processes re park redevelopment, across sectors of town life</li> <li>• Active collection of information from public on internet</li> </ul>
Loveland	<ul style="list-style-type: none"> <li>• Infrastructure damage</li> <li>• Damage to parks</li> </ul>	<ul style="list-style-type: none"> <li>• With FEMA, State and Insurance contributions, costs within capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy reliance on already established government institutions-- councils and com</li> <li>• Infrastructure/project-based approach to recovery</li> <li>• Public input for park redevelopment</li> </ul>
Estes Park	<ul style="list-style-type: none"> <li>• Extensive infrastructure damage in two corridors</li> </ul>	<ul style="list-style-type: none"> <li>• Cost within town capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Stakeholder and public process to restoration of river corridors</li> <li>• High level of participation from public in one meeting, future meetings unclear</li> </ul>
Evans	<ul style="list-style-type: none"> <li>• Extensive damage to specific regions</li> </ul>	<ul style="list-style-type: none"> <li>• Cost far exceeds town capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Limited public participation in recovery process</li> <li>• New Flood recovery task force formed, open to public, but information about task actions not readily available</li> <li>• Rely heavy on already established government institutions: city council</li> </ul>
Greeley	<ul style="list-style-type: none"> <li>• Minimal damage</li> </ul>	<ul style="list-style-type: none"> <li>• Minimal costs</li> </ul>	<ul style="list-style-type: none"> <li>• Limited to no flood recovery public participation</li> </ul>

resource needs are manageable, the City of Boulder has conducted neighborhood meetings to understand local knowledge about the flood event and solicit resident input, has produced a series of technical studies of floodplain maps and open space areas, and has actively engaged the public through a number of means. Boulder's participatory process contrasts most significantly with Loveland, a community of roughly the same size and financial capacity. Whereas Boulder has actively engaged its citizenry in many aspects of flood recovery, Loveland has relied most heavily on elected government institutions and government staff to direct and manage flood recovery projects.

### **Conclusion**

The literature on stakeholder processes suggest that an array of participatory processes have been used in local-level environmental and water resource decision making and management, varying on participant type, length and scale of process, and method and intensity of public participation. The literature is less clear on the form and structure of participatory processes that form in the wake of extreme or disastrous events. In the context of the aftermath of the floods of Colorado in September 2013, we also found a diversity of stakeholder processes across our case communities. And, similarly to the literature, the processes we studied have varies on how open, deliberative, and participatory they are. Our results suggest that extent and type of flood damage, resource availability (pre- and post-flood), and past practices influence the type of participatory processes a town adopts.

Research suggests that when a new venue opens encouraging an increase in diversity of voices and opinions, changes in policies might ensue. This may indicate that those communities with more open and deliberative processes, like those forming in Lyons, may motivate greater change and learning. Some cities have a more engrained culture in openness of city planning processes (e.g., Boulder), while other communities do not have a long history of these practices. The adoption of new modes and methods of community involvement in decision-making processes, such as seen in Lyons, for example, may lead to policy change and learning, both within government and in the town as a whole. As our research continues, we hope to assess the policy learning outcomes as laid out in Table 1 and then examine the links between flood damage, participatory processes and policy learning outcomes.

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## APPENDIX I: CODEBOOK FOR INTERVIEW TRANSCRIPTS

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### Coding Instructions:

- Coders should read through the full transcript prior to beginning coding
- Coders should review codebook before coding
- When coding, coders should:
  - Code entire sentences, including any necessary contextual information around that sentence (when appropriate or necessary)
  - If coding for a single word using a ‘find’ search, read the entire question response by the subject in order to capture any context surrounding the word in question
  - Code for a single category of code at a time (i.e. code an entire document for all codes under super-code ‘INFOSOUR’ and then return to the beginning of the transcript to code for all codes under super-code ‘ORGSIND’)
  - Code segments of text into multiple codes, if appropriate (i.e. codes are not mutually exclusive)
  - Treat the super-code (e.g. INFOSOUR) as a bin to put text that should be under the broad category but may not fit within one of the sub-codes
    - After coding, return to this super-code to determine if additional sub-codes should be created (i.e. emergent categories of data per Corbin and Strauss)

### CODEBOOK:

- **RESOURCE – Mentions of resources that were helpful, or would have been helpful**
  - FINANC – Mentions of financial resources (e.g. FEMA aid, etc.)
  - TECH – Mentions of technical resources (e.g. GIS mapping, etc.)
  - NGO – Mentions of NGOs or faith-based organizations
  - VOLUN – Mentions of individual volunteers
  - PARTNER – Mentions of partnerships with other governments or NGOs
  - GOVT – Mentions of their own internal government resources
- **PROCESS – Mentions of the recovery process**
  - MEET – Mentions of meetings held with public or other groups
  - WEBINFO – Mentions of using the internet or social media to inform the public
  - COLLAB – Mentions of collaborations between groups or citizens
  - STKHLD – Mentions of stakeholders’ opinions or actions
  - COALIT – Mentions of the formation of coalitions

- **ACTIONS – Mentions of specific actions taken by the community to recover**
  - FEES – Mentions of passing fees to pay for recovery
  - SHORT – Mentions of short-term projects (small repairs, etc.)
  - LONG – Mentions of long-term projects
  - POLITIC – Mentions of political actions

## APPENDIX I: CODEBOOK FOR DOCUMENTS

### Coding Instructions:

- Coders should read through the full transcript prior to beginning coding
- Coders should review codebook before coding
- Fill in the appropriate response into the correct column on the excel spreadsheet.

Q1. Community name

Boulder  
Longmont  
Lyons  
Estes Park  
Loveland  
Evans  
Greeley

Q2. Document # (1, 2, 3....)

Q3. Name/title of document.

Q4. Date of document

Q5. Who wrote the document? (Drop-down menu)

Mayor  
City/Town Council  
City manager  
Government staff (general)  
Government staff--transportation  
Government staff---utilities (water, sewer, electricity)  
Government staff---planning, land use  
Government staff---economic development/business  
Government staff---historic preservation/art/culture  
Government staff---emergency response, fire  
Government staff---parks, open space  
Flood recovery working group/task force (ie made up of citizens,  
businesses, staff, etc., formed for purpose of flood recovery)  
FEMA  
Federal agency (general)  
State agency (general)

External consultant  
University/Academic  
NGO  
Public/citizens  
Other

Q6. Type of document (Drop-down menu)

Minutes from meeting  
Agenda from meeting  
Recovery goals/objectives/plans/guidelines/strategies  
Public input/comment summary  
Specific project report (e.g., creek restoration)  
Alternative analysis  
Scientific/technical report  
Budget  
Land use plan/map  
Floodplain map  
Other

Q6a. Type in OTHER type of document (Q6)

Q7. Primary topic of document (Drop-down menu)

Budget  
Damage assessment  
Debris removal  
Waste water management (sewers, wwtp)  
Drinking water  
Electricity/Gas/Power utilities  
Transportation  
Creek restoration  
Housing/residential  
Historical preservation/art/culture  
Businesses/economic development  
Emergency response  
Land use planning/zoning  
Other

Q8. Secondary Topic (same list above)

Q9. Tertiary Topic (same list above)

Q10. Does the document summarize or mention a specific meeting? (Yes/no)

If no, stop coding document.

Type in Community name and document # in columns 1 and 2.

Q11. What is the name of the meeting?

Q11a. What type of meeting is discussed in the document? (Drop-down menu)

Internal community staff meeting (general)

City council/elected official meeting

Meeting with other communities staff/officials

Meeting with FEMA or other federal officials

Meeting with state officials

Water/Sewer board meeting

Economic development board meeting

Public meeting (primary purpose to engage broad public/public at large)

Recovery working group/task force meeting

Other

Q11b. Other (Q11)

Q11c. What were the dates of the meeting(s)?

Q11d. Was this meeting already coded in a previous document? If yes, type in document number and stop coding.

Q11e. What was the primary topic of the meeting?

Budget

Damage assessment  
Debris removal  
Waste water management (sewers, wwtp)  
Drinking water  
Electricity/Gas/Power utilities  
Transportation  
Creek restoration  
Housing/residential  
Historical preservation/art/culture  
Businesses/economic development  
Emergency response  
Land use planning/zoning  
Other

Q11f. Who led/facilitated meeting?

Government staff  
Elected government official  
State agency staff  
Federal agency staff  
Resident  
NGO  
Other

Q11g. Fill in Other led meeting (Q11f).

Q11h. Who attended the meeting? (list all that apply)

1. Government staff
2. Elected government official
3. State agency staff
4. Federal agency staff
5. Residents
6. NGO
7. Other

Q11i. Fill in for Other from Q11h.

Q12. Did public participation or input occur as part of meetings? (Yes/no)

If no, go to Q13.

Q12a. How many community members (non-staff) were in attendance at the meeting?

Q12b. Describe mode of public participation

Input collected via Internet form/town website

Input collected via survey (email, phone, or mail)

Unsolicited input from residents via emails, phone calls, letters

Input from residents via social media, fb, twitter

Resident input at meeting (eg., speaking at city council meeting)

Input collected at public meeting

(purpose of meeting to collect info from residents)

Deliberative/collaborative process of stakeholders, residents

Other

*[if more than one is true, drop down a line in the spreadsheet and use drop down for additional participation types]*

Q12c. Fill in other from Q12b.

Q13. Information dissemination: did the town disseminate information to the public as a part of the meeting? (Yes/no)

Q13a. What topic of information was disseminated?

Utilities update (sewer, water, power)

Transportation update (e.g., road closures)

Temporary sheltering

Housing information

School information

FEMA reimbursement

Volunteers/volunteer opportunities

Budget

Specific project update (e.g. Creek restoration project)

Land use plans

Floodplain maps

Flood risks  
Other

