What factors influence the quality of hazard mitigation plans in Washington State?

Daniel Feinberg

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Reading Committee:

Clare Ryan, Chair

Nives Dolsak

Craig Thomas

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Abstract

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Daniel Feinberg

Chair of the Supervisory Committee:

Clare Ryan

School of Environmental and Forest Sciences

Hazard mitigation plans (HMPs) can help communities to reduce their losses of lives and property in the face of natural hazards, such as earthquakes and floods, and to qualify for federal funding if a disaster occurs. These plans are particularly important as climate change increases the risk of some types of hazards, including floods. Counties in Washington State (WA) have prepared HMPs, although literature is scarce regarding the quality of these plans and how they were developed. This study investigated the quality of county-level HMPs in WA, along with factors that may lead to higher- or lower-quality plans. Content analysis of 34 plans yielded plan quality scores, which were examined through principal component analysis and a multilevel model of statistical relationships with hypothesized predictor variables, such as indicators of collaborative dynamics (principled engagement and capacity for joint action) and vertical and horizontal diffusion; these indicators were measured through an online survey of 168 hazard planning professionals who had created the plans. Semi-structured interviews qualitatively explored these collaborative dynamics and potential diffusion processes, through a purposive sample of 20 emergency managers and planners. Significant predictors of plan quality included

indicators of vertical (state-to-county) and horizontal (county-to-county) diffusion, as well as economic capacity. The study found evidence of indicators of collaborative dynamics, although they did not significantly predict plan quality. Some survey respondents and interviewees expressed that important stakeholders were missing from their planning processes, raising concerns about HMPs' ability to reflect their respective communities' needs. This study has implications for contributing to the literature on collaborative governance and policy diffusion and for increasing decision makers' understanding of the processes that lead to higher-quality plans, which are more likely to be implemented.

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Acknowledgments

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Chapter 1:
Evaluating the quality of county-level hazard mitigation plans in Washington State

Abstract: Local-level hazard mitigation plans have the potential to reduce communities' losses due to natural hazards, some of which are projected to intensify with climate change, although literature is scarce regarding the quality of these plans. This study used an established protocol to assign plan quality scores to county-level hazard mitigation plans in Washington State. The plans received higher scores in some components of quality (e.g., vision statement) than in others (e.g., specific policies), and overall quality varied with geography and plan authorship. This paper concludes with recommendations for future planning and research that may support community resilience to natural hazards.

Keywords

hazard mitigation, plan evaluation, sustainability

Introduction

Environmental planning aims to involve a variety of stakeholders in navigating the relationship between humans and the natural world; it can guide development in ways that protect nature from humans (e.g., habitat conservation) and that protect humans from nature (e.g., natural hazard mitigation) [Randolph 2004]. However, the discipline of planning (including with regard to environmental issues) has historically overlooked the need for standardizing criteria that would define a high-quality ("good") plan, i.e., one that is likely to achieve its objectives (Baer 1997; Berke and Godschalk 2009). Such criteria should be applied to plan documents to pinpoint their strengths and weaknesses and to identify opportunities for improving future planning efforts (Berke and Godschalk 2009).

Within this broad context, my study focuses specifically on the quality of *hazard mitigation planning*, which is a proactive approach intended to reduce communities' losses of life and property (Godschalk 2003; Pearce 2003), often in the face of *natural* hazards, such as

earthquakes and floods. These hazards may manifest themselves as *disasters* by occurring in densely populated regions (Godschalk et al. 1999). Therefore, hazard mitigation planning is especially critical in urban areas (Godschalk et al. 1999; Godschalk 2003).

Washington State (WA), in the Pacific Northwest region of North America, is vulnerable to several types of natural hazards due to its combination of seismic activity and exposed shores (WA Sea Grant n.d.), and some of these hazards (e.g., floods) are projected to intensify with climate change (Huppert et al. 2009; Miller et al. 2013). This problem severity positions WA as an important location for studying communities' existing hazard mitigation planning and for providing recommendations to guide future plans. In the subsections that follow, I will review relevant literature (on hazard mitigation planning in general and in WA, as well as plan quality evaluation), before presenting this chapter's objectives and research questions.

Hazard mitigation planning

In the United States, communities' hazard mitigation planning initiatives are formalized through their respective hazard mitigation plans (HMPs), which can make the communities legally eligible for federal assistance under the Disaster Mitigation Act of 2000 (Public Law 106-390; MRSC 2015). In addition to this monetary incentive, other reasons why communities may wish to develop HMPs include increasing education and awareness, building partnerships (e.g., between government and businesses), and identifying implementation strategies that reduce risk (FEMA 2018). HMPs, including those in WA, occur at various levels of government (e.g., state; tribal; local) [FEMA 2018; WA Emergency Management Division 2018]. In order to maintain funding eligibility, local level (sub-state) HMPs must be updated every five years (FEMA 2013). While HMPs are voluntary and incentive-based, hazard mitigation can also be addressed in mandatory plans (e.g., comprehensive plans), further spurring local governments to protect vulnerable communities (Burby 2006).

In theory, local-level HMPs have the potential to play important roles in reducing communities' losses; in contrast to state and federal governments, local residents may possess deeper knowledge of their communities' hazard issues and the ability to respond more quickly to disasters (Jackman and Beruvides 2013). However, in practice, the quality of these plans is often poor, with insufficient coordination across organizations (e.g., Lyles et al. 2014) and boilerplate text that does not fit the local context of each community (e.g., Horney et al. 2016). Some communities fail to invest adequate resources into their local hazard mitigation planning processes due to "the complex and infrequent nature of disasters" and "ambiguity caused by shared governance" (Jackman and Beruvides 2013, 69).

Hazard mitigation planning in WA

In WA, the state-level HMP is prepared by the WA Emergency Management Division, which works with other state agencies (e.g., Department of Natural Resources; Department of Transportation) to administer federal grants to local jurisdictions (WA Emergency Management Division 2018). WA was the first state in the U.S. to have a FEMA-approved *enhanced* HMP, based on comprehensive mitigation strategies, emphasizing coordination across agencies (FEMA 2006; WA Emergency Management Division 2018). In addition to preparing the state-level HMP and administering funds, roles of the state include community outreach, implementation of mitigation strategies (e.g., on state-owned roads), and reviewing local-level HMPs, along with reviewing other types of plans that contain hazard mitigation elements (e.g., comprehensive; shoreline management) [WA Emergency Management Division 2018].

Evaluating plan quality

Plan quality evaluation involves systematically analyzing plan documents through content analysis, i.e., the qualitative study of themes in text (Patton 2002), by searching the documents for predetermined indicators of high-quality plans and assigning numerical scores

(Baer 1997; Berke and Godschalk 2009). The purpose of this research approach is to distinguish between higher- and lower-quality plans (as well as strengths and weaknesses within a given plan) through "searching out their comparative advantages and disadvantages and the act of setting down the findings of such analyses in a logical framework" (Lichfield et al. 1975, p. 4). Broadly, indicators of plan quality can fall under categories such as the plan's *goals*; *fact base*; and *policies* (Berke and Godschalk 2009), and these categories yield component scores within overall plan quality scores. By assigning these scores, evaluation can provide insights to guide future planning efforts and aid planning groups in accomplishing their objectives.

Although there is not yet a universally accepted set of HMP quality criteria, some studies (e.g., Berke et al. 2012; Horney et al. 2016; Lyles et al. 2014) have evaluated HMPs using the following principles: *goals* (clear descriptions of the intended future conditions); *fact base* (a rational, well-informed foundation); *policies* (guides for accomplishing the goals); *participation* (actors in the planning process, such as government agencies, businesses, nonprofit organizations, and citizens); *coordination* (between governments, such as those of a state and county); *implementation* (how the plans are to be carried out, including responsible agencies and timelines); and *monitoring* (assessing the plan's performance). Lyles et al. (2014) and Horney et al. (2016) provide good examples of HMP evaluation methods; in addition to their detailed, item-level criteria, they calculate component scores, which assess the extent to which each HMP reflects the above principles of high-quality plans.

These studies' findings include generally low quality of rural HMPs in the southeastern United States (Horney et al. 2016) and low to moderate quality of HMPs in a subset of jurisdictions in six coastal states, including WA (Lyles et al. 2014). In addition to reporting overall plan quality scores, both of these studies (Horney et al. 2016; Lyles et al. 2014) found variability in scores across the key *components* comprising plan quality, including relatively high

component scores for *goals* and relatively low scores for *policies* and *coordination* (suggesting that the work of distinct agencies might not be adequately integrated to achieve the county's mitigation goals in practice). One study (Frazier et al. 2013) evaluated county-level HMPs in eight counties within western WA and found higher quality in urban counties than rural counties, but prior to my study, literature has not reported statewide HMP quality for all of the counties.

Objectives and research questions

The objectives of this study were to evaluate the contents of county-level HMPs in WA and to characterize the types of counties that have higher- or lower-quality plans. Thus, I pursued the following, exploratory research questions:

> Research Question 1 (RQ1): *What is the quality of county-level HMPs in WA?* (1a: To what extent do the HMPs contain individual indicators of plan quality?; 1b: To what extent do the HMPs demonstrate broader components of plan quality?; 1c: What are the HMPs' overall plan quality scores?)
>
> Research Question 2 (RQ2): *What types of plans have overall higher or lower quality?* (2a: Does overall plan quality differ geographically, between counties in eastern and western WA?; 2b: Does overall plan quality differ demographically, between urban and rural counties?; 2c: Does overall plan quality differ between plans that were prepared internally [by county staff] and those that were prepared externally [by consultants]?)

Methods

Study sites

This study focuses on county-level HMPs in 36 of WA's 39 counties (Figure 1.1). The exceptions are Adams, Ferry, and Klickitat counties, which lacked HMPs at the time of this study, due to insufficient resources (Amy Rooker, personal communication, December 2, 2016; WA Emergency Management Division 2018). More recently, Klickitat County received a FEMA

grant that allowed it to begin creating an HMP (Gorge Country Media 2019). The three omitted counties (those that lack HMPs) might be less prepared for disasters than the study's 36 counties, and I acknowledge that their omission may bias the study's results. However, as all three of these counties are rural and located in eastern WA, I would expect that they might share similar characteristics with rural, eastern counties that were part of the study. One HMP combines three counties (Asotin, Columbia, and Garfield); hence, $n = 34$ plans. Through online searches and contacting county employees, digital copies were obtained of 33 target plans and a paper copy of the remaining plan (from Wahkiakum County), which was scanned to produce a searchable, digital file. The most recent available version of each plan was used.

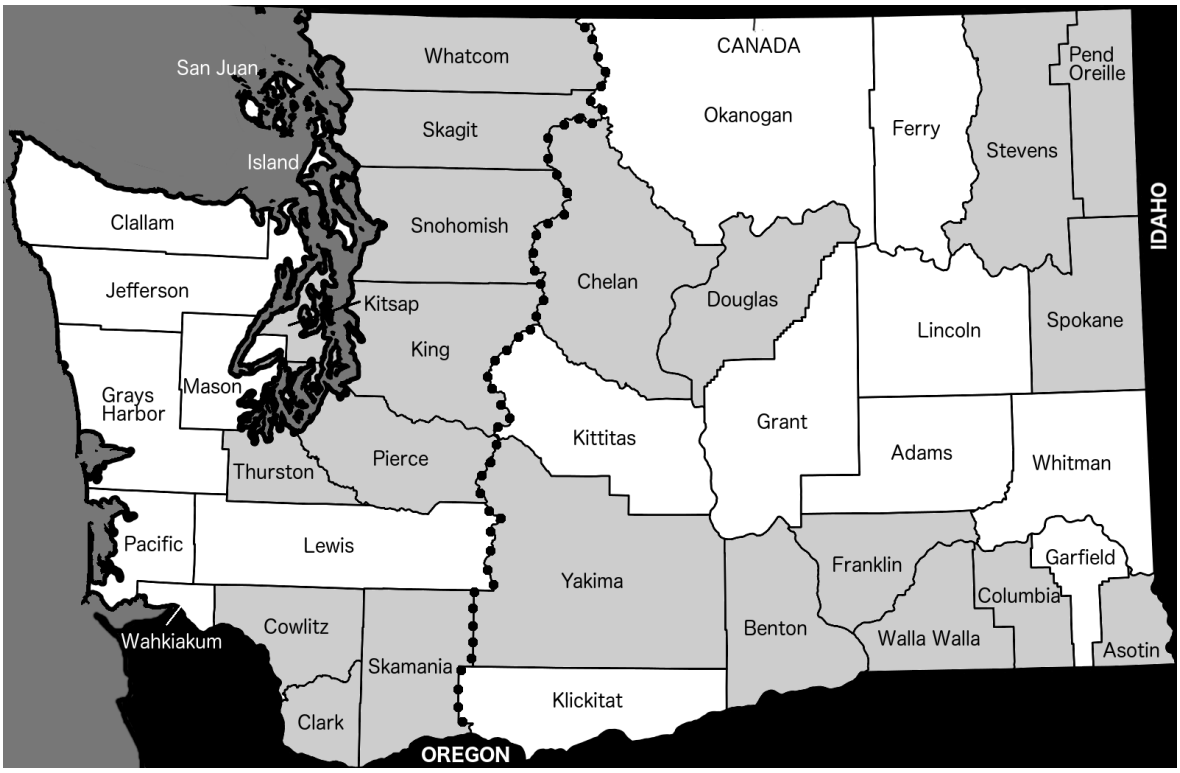

Figure 1.1. Counties in WA, with dotted line demarcating western and eastern counties. Gray represents urban counties, and white represents rural counties.

The study counties are diverse in terms of demography, geography, and plan authorship. They include 20 *urban* and 14 *rural* counties (as defined by whether or not the counties are in

metropolitan areas, based on population and worker commuting data; USDA 2013; 2018). The combined plan for Asotin, Columbia, and Garfield counties was analyzed as urban because two of these three counties (Asotin and Columbia) fit this designation. Geographically, 19 of the counties are located in *western* WA and 15 in *eastern* WA; hence, they are physically vulnerable to different types of natural hazards, with higher overall vulnerability (on average) in western counties than in eastern counties (WA Emergency Management Division 2018). The HMPs vary in authorship (Table 1.1), with 18 plans written by county groups (e.g., Thurston County Regional Planning Council) and 16 by consultants (e.g., Tetra Tech); these can be described as *internal* and *external* plans, respectively (Frazier et al. 2013). Given these examples of diversity across counties, I expected to find heterogeneity with regard to plan quality scores, e.g., between urban and rural counties, as previously observed by Frazier et al. (2013).

Scoring approach

I assigned plan quality scores by coding the plans through content analysis (Patton 2002), using an established protocol (Hazard Reduction and Recovery Center 2008; Appendix A). This protocol was appropriate for my study because it incorporates all of the key principles of local-level plan quality from the HMP literature (e.g., Berke et al. 2012; Horney et al. 2016; Lyles et al. 2014): *vision statement*, *fact basis*, *planning process* (e.g., participation), *mitigation goals and objectives*, *inter-organization coordination and capabilities* (e.g., identification of different levels of government), *specific mitigation policies and actions*, and *implementation*. Within each category, the protocol includes several items (for a total of 126 items); detailed protocols such as this can enhance a study's internal validity (Grover 2010), as scores are more likely to reflect the actual quality of the plans than if the scoring approach were more coarse-grained. I tailored the protocol to WA by removing items that were not locally relevant (while maintaining the overarching categories), since it was originally designed for evaluating plans in the state of

Texas. I also ensured that *coordination* items did not overlap with indicators of collaborative dynamics (Chapter 2).

In order to answer RQ1, I assessed plan quality at three scales: item, component, and total. First, I assigned an ordinal score (0 = not mentioned; 1 = briefly mentioned; 2 = described in detail) for each of the 126 items. I recorded the item scores in a matrix, and then I applied the PC_j and *TPQ* equations (Brody 2003; Tang and Brody 2009), to calculate scores for component quality of the *j*th component (Plan Component *j*, or PC_j) and overall (Total Plan Quality, or *TPQ*). These equations (given below) consist of calculating index scores for each of the components through a three-step process: (1) summing the indicator scores I_i within the component, (2) dividing by the maximum possible component score $2m_j$ (i.e., the sum if each of the items in the component had received a score of 2), and (3) multiplying by 10 to give a component score from 0 (lowest quality) to 10 (highest quality). After this process, I summed the component scores to generate the total plan quality score, with a maximum possible score of 70. I tailored the *TPQ* equation to match the seven components of plan quality that I used in this study's evaluation protocol. The same person (I, the author) coded all of the plans.

$$PC_j = \frac{10}{2m_j}\sum_{i=1}^{m_j} I_i \qquad\qquad TPQ = \sum_{j=1}^{7} PC_j$$

Statistical analyses

After I coded the plans, I analyzed their scores at the levels of (1) individual item (i.e., scores of 0, 1, or 2); (2) component (i.e., principle of plan quality); and (3) overall plan. For item scores, I conducted exploratory principal component analysis (PCA; Wold 1987) across all of the study plans, and I plotted the first two principal components, in order to visualize groupings in the data. Specifically, I used *polychoric* correlations (Kolenikov et al. 2009) because the discrete, ordinal data would otherwise violate the traditional assumption of normality in PCA. For

component scores, I calculated descriptive statistics to explore the range, central tendency, and spread of the data. For overall plan quality scores, I conducted two-sample *t*-tests ($\alpha = 0.05$) to investigate potential differences between *urban* and *rural* counties; between *eastern* and *western* counties; and between *internally* and *externally* authored plans. Prior to these tests, I assessed assumptions of normality and equal variance via quantile-quantile plots and *F*-tests, respectively.

Measurement limitations

Plan quality evaluation should be grounded in sound methods of content analysis, such that results are reliable and reproducible (Berke and Godschalk 2009; Lyles and Stevens 2014). However, there is not yet a standardized approach to plan quality evaluation, and previous literature has included a mix of studies that involved one coder, more than one coder, or unspecified coding approaches (Lyles and Stevens 2014). One potential threat to reliability in the study at hand is that the evaluation protocol (Appendix A) does not provide specific guidance on distinguishing between scores of 1 and 2 for some items, leaving these decisions to the judgment of the coding author (for these items, I essentially assigned a score of 1 if the plan addressed them in a paragraph or less). Future studies could bypass this challenge by adopting a binary coding scheme for protocol items (0 = absent; 1 = present), as demonstrated by some existing studies (e.g., Horney et al. 2016). Nonetheless, by using only one coder across all plans, this study avoids *intercoder* reliability issues (e.g., Lombard et al. 2002). Also, the content analysis of all plans was conducted over a relatively short period of time (less than two months), easing concerns about *intra*-coder reliability (Lacy et al. 2015).

Another limitation of the plan evaluation protocol is in its approach to *participation*. Although seven items on the protocol were aimed at measuring participation, they did not capture the extent to which citizens' perspectives were ultimately incorporated. For example, the item *household surveys* would receive a full score if the plan specified when and how the survey

was conducted and what type of questionnaire it was, regardless of the input that it generated and what impacts (if any) that input had. The protocol could be refined for future evaluation studies through taking a more nuanced view of participation.

A caveat to this study's findings is that *outputs* differ from *outcomes* (Koontz and Thomas 2006; 2012); thus, the scored quality of the plan documents (i.e., *outputs* of the planning processes) does not perfectly predict plan implementation or community resilience (i.e., *outcomes*) in the event of natural disasters. However, the implementation items in the evaluation protocol can serve as proxies (i.e., a plan that includes detailed information about intended implementation, such as specific timelines and designated responsibilities, can be reasonably expected to be implemented more successfully than a plan that has not addressed these details). Also, previous work has provided empirical evidence of the idea that higher-quality plans can lead to more resilient communities (e.g., Nelson and French 2002, with regard to reducing earthquake damage to homes in California). Future studies could predict outcomes with greater confidence by similarly tracking disasters in WA and elsewhere, in comparison to plan quality scores and implementation statuses, to assess the extent to which (if at all) HMP quality and/or implementation may negatively associate with communities' losses over time.

Results

In the subsections below, I will report counties' plan quality results in terms of (a) individual item scores (based on the 126 items that I evaluated using the protocol); (b) broader component scores (aggregating the item scores within seven components of high-quality plans, e.g., vision statement); and (c) overall plan quality scores. In terms of individual item scores, similarities might be expected among plans that were prepared by the same consulting firm, as consultants often apply templates to multiple jurisdictions' HMPs, resulting in formulaic plans (e.g., Frazier et al. 2013; Horney et al. 2016; Norton et al. 2005). As the purpose of the PCA was

exploratory, I did not specify other expected results regarding patterns in item scores. We might expect relatively high scores for the component *fact base* and relatively low scores for the components *policies* and *coordination* (Horney et al. 2016; Lyles et al. 2014), along with overall higher scores in urban counties than in rural counties (Frazier et al. 2013). Also, as the state's western counties tend to have greater physical vulnerability to natural hazards than its eastern counties (WA Emergency Management Division 2018), we might expect higher-quality plans in the former than in the latter.

Item scores

The first two principal components cumulatively explain 53.76% of the variance, and the first three components explain 72.83% of the variance. The plot of the first two principal components (Figure 1.2) reveals patterns in item scores across counties, with numbered data points corresponding to alphabetized county names (Table 1.1). For example, counties are clustered by geographic proximity (e.g., counties 13 and 26: King and Snohomish; 17 and 19: Lincoln and Okanogan; 21 and 28: Pend Oreille and Stevens). This pattern suggests potential horizontal diffusion (Chapter 2). As expected, similarities are also evident in plans that share authors; for instance, the consulting firm Northwest Management prepared the plans for both Lincoln and Okanogan counties. In this example, the PCA plot indicates that the two counties share similar *item* scores, while their *overall* scores are also similar (39.80 and 41.38, respectively, out of 70.00).

Three out of 126 items had no variance in scores across counties and, therefore, were omitted from the PCA. Specifically, for item 1.3, each plan received a score of 2, reflecting detailed discussions of each county's hazard issues. Also, for item 4.1, each plan received a score of 2 for describing the county's vulnerability to all identified hazards. For item 16.12, each plan

received a score of 1 for mentioning building codes but not identifying them with maps/locations.

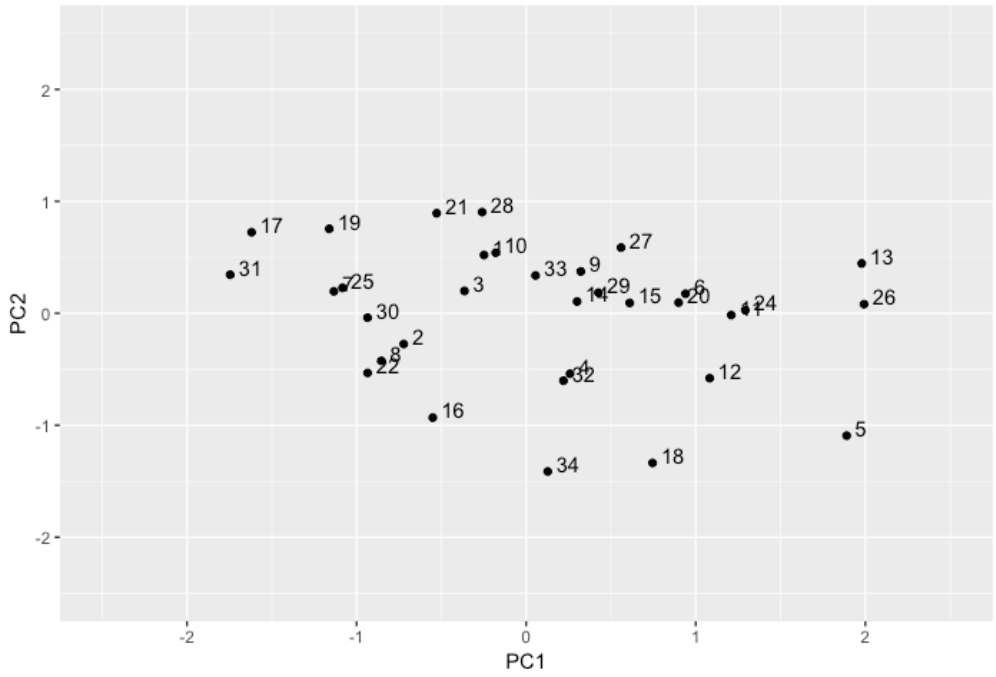

Figure 1.2. First two principal components for item scores, with numbers corresponding to alphabetized county names.

Component scores

Broadening the scope from individual items on the plan quality evaluation protocol to the established components of high-quality plans, component scores (out of a possible 10.00 points) ranged from 2.26 (*policies and actions* in San Juan County) to the full 10.00 (*vision statement* in each of 18 counties). Mean component scores across all counties (Figure 1.3) ranged from 4.39 (for the component *policies and actions*) to 9.21 (for the component *vision statement*). In addition to receiving the lowest score on average, the component *policies and actions* received low scores in nearly all of the individual counties, including those which prepared their own

HMPs (mean = 4.21) and those which hired external consultants (mean = 4.59). Within this component, particularly low-scoring items included downzoning floodplains and density bonuses (each with a mean item score of 0.03 out of 2.00). The component with the least variability was *implementation* (s = 0.83), reflecting the idea that counties spanning low- to high-quality plans (overall) had established relatively comparable strategies for actually carrying out their respective plans. The component with the greatest variability was *coordination* (s = 1.16), with some counties demonstrating strong commitment to interagency work (e.g., Snohomish: 7.37) and others appearing weaker in this area (e.g., Walla Walla: 3.16).

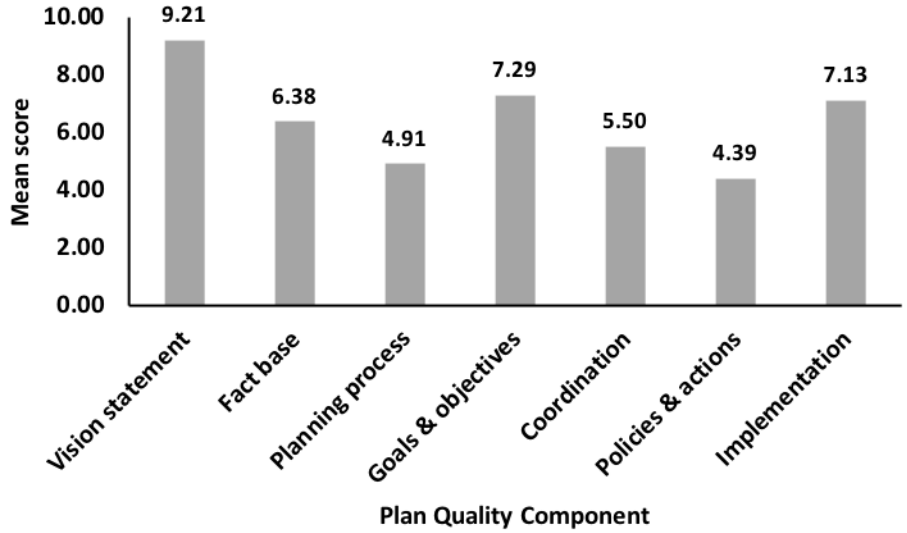

Figure 1.3. Mean quality score (out of 10.00 points) for each of the seven components, across all study counties.

Overall scores in relation to geography and authorship

Summing the scores for plan quality components, the plans' total adjusted scores (out of a possible 70.00 points) were approximately normally distributed (Figures 1.4; 1.5) and ranged from 35.01 (San Juan County) to 54.41 (King County) [Table 1.1], with an overall mean of 44.80. On average, total plan quality scores were higher in *western* counties (mean = 46.07) than

in *eastern* counties (mean = 43.19); this finding was consistent with expectations, due to the higher overall risk in western counties, although the difference was not significant at $\alpha = 0.05$ ($P = 0.08$). Plan quality was essentially the same between *urban* counties (mean = 44.91) and *rural* counties (44.64) [$P = 0.88$]. *Externally* generated plans (i.e., outsourced to consultants; mean = 46.77) received significantly higher scores than *internally* generated plans (i.e., spearheaded by local agencies or committees; mean = 43.05) [$P = 0.03$].

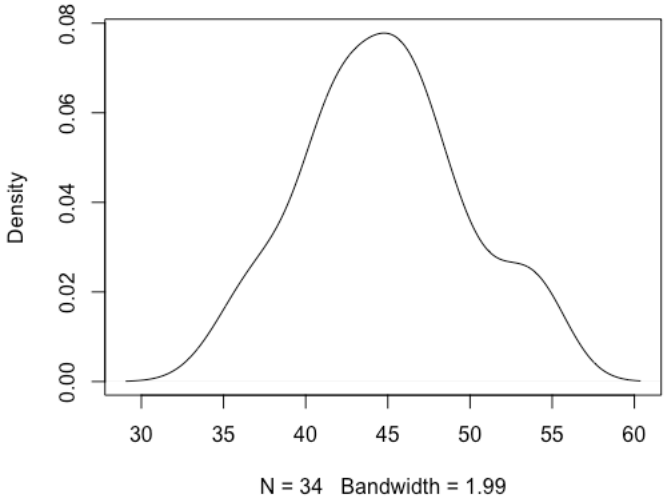

Figure 1.4. Frequency distribution of total plan quality scores.

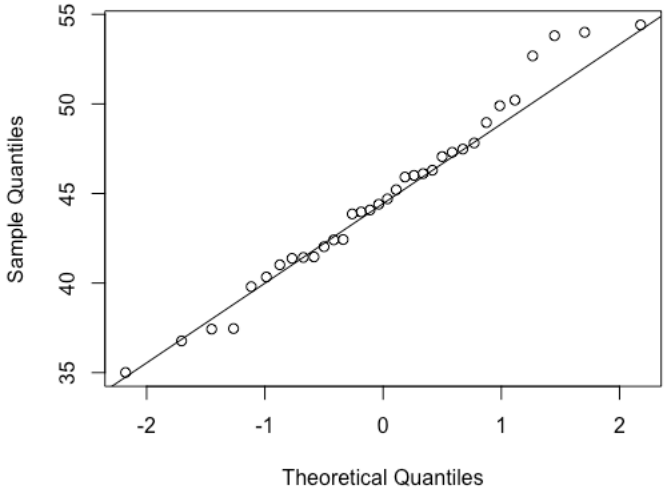

Figure 1.5. Normal quantile-quantile plot for total plan quality scores.

Table 1.1. Total and adjusted plan quality scores for each county, ranked by adjusted score. *Number* corresponds to alphabetical order of the county names, as used in the PCA plot, and *authorship* refers to whether the plan was written by county staff (internal) or a consultant (external).

Number	*County*	Authorship	Total score (out of 252)	Adjusted score (out of 70.00)	Ranking
1	*Asotin, Columbia, Garfield*	external	135	42.43	22
2	*Benton*	internal	131	42.41	23
3	*Chelan*	internal	131	44.08	19
4	*Clallam*	internal	140	44.70	17
5	*Clark*	external	169	54.00	2
6	*Cowlitz*	internal	150	46.11	13
7	*Douglas*	internal	117	37.46	31
8	*Franklin*	internal	125	43.97	20
9	*Grant*	external	144	47.06	11
10	*Grays Harbor*	external	131	44.40	18
11	*Island*	external	159	49.90	6
12	*Jefferson*	internal	146	48.96	7
13	*King*	external	175	54.41	1
14	*Kitsap*	internal	142	47.82	8
15	*Kittitas*	external	146	45.92	15
16	*Lewis*	internal	125	40.34	29
17	*Lincoln*	external	106	39.80	30
18	*Mason*	internal	144	46.30	12
19	*Okanogan*	external	117	41.38	27
20	*Pacific*	external	155	52.68	4
21	*Pend Oreille*	internal	123	42.03	24
22	*Pierce*	internal	121	36.77	33
23	*San Juan*	internal	93	35.01	34
24	*Skagit*	internal	165	50.21	5
25	*Skamania*	internal	118	41.43	26
26	*Snohomish*	external	177	53.81	3
27	*Spokane*	external	146	47.30	10
28	*Stevens*	external	133	45.21	16
29	*Thurston*	internal	149	46.01	14
30	*Wahkiakum*	external	122	41.02	28
31	*Walla Walla*	internal	108	37.43	32
32	*Whatcom*	external	135	41.46	25
33	*Whitman*	external	141	47.48	9
34	*Yakima*	internal	145	43.86	21

Discussion

Strengths and weaknesses of plan contents

Plans received relatively high scores for the components *vision statement* and *goals*, indicating that the authors articulated clear ideas about the issues that they sought to address. This finding is consistent with HMP evaluation literature, which has found strong goals, relative to other components of quality, in various U.S. states (e.g., Horney et al. 2016; Lyles et al. 2014). Moving forward with HMP updates, planners may wish to keep their strong vision statements and goals intact, and to focus their resources on enhancing other components of the plans, as described below, along with linking the vision statements to specific actions.

Despite the plans' clear vision statements and goals, their comparatively low scores for *policies and actions* suggest that the communities' intended hazard mitigation activities might not be carried out. Furthermore, counties seemed to struggle with specific policies and actions across the board (in both internally and externally generated plans), suggesting room for improvement by both local agencies and hired consultants. One strategy for improvement may involve learning from other communities' plans that have successfully outlined their specific policies (i.e., best practices). For example, plans in the states of Georgia and North Carolina have demonstrated relatively high scores for policy components (e.g., Berke and Godschalk 2009; Lyles et al. 2014). While county-level planning professionals in WA might not directly seek out and read the county plans from other states, state-level planners and emergency managers (along with consultants) could potentially help to organize this information and disseminate it to counties. Additional resources for developing mitigation policies and actions are publicly available online (e.g., Center for Sustainable Community Design n.d.) and are geared towards emergency managers, planners, and other stakeholders who work on local-level HMPs.

Policies and actions could also be strengthened by further integrating HMPs with the state's other planning efforts, such as comprehensive plans and shoreline management plans (Burby 2006; Frazier et al. 2013; WA Emergency Management Division 2018). In WA, the state's Growth Management Act prescribes varying degrees of comprehensive planning across the state and requires all cities and counties to address "critical areas," which can include frequently flooded and geologically hazardous areas (MRSC 2018). However, Frazier et al. (2013) found that the majority of their study sites (a subset of counties in WA) did not take advantage of integrating HMPs with comprehensive plans.

In addition to policies and actions, the component *planning process* performed poorly overall in my evaluation, reflecting low scores for plans' descriptions of specific items, such as citizen advisory committees and formal public hearings. The similarly low scores between these two components raise questions about common challenges between producing the plans and selecting specific policies. For example, would an increased emphasis on public hearings yield constructive comments and lead to better mitigation policies? Further research could explore potential relationships between these two components of quality.

The finding of roughly equivalent plan quality between *urban* and *rural* counties differs from a previous study of HMPs in WA (Frazier et al. 2013), which found higher quality in urban counties than in rural counties. However, the scope of that study was limited to eight counties in the western part of the state, whereas this study considered 34 plans statewide. Indeed, this study identified examples of relatively strong plans in rural, eastern counties (e.g., Grant and Whitman counties, which hired the same consulting firm, also hired by some of the urban counties). Hence, Frazier's finding of higher-quality plans in urban counties appears not to generalize across the Cascades to eastern WA.

Plan authorship

On the topic of consultants, although *externally* generated plans generally received higher scores than *internally* generated plans, the similarity (in item scores) between HMPs with shared authorship (i.e., multiple counties' plans written by the same consultant) suggests that consultants may have applied a template to multiple counties, in order to comply with FEMA requirements and unlock eligibility for federal funding. A potential drawback to this approach is that the plans may not be fully customized to the respective communities' needs, as is often the case with boilerplate plans prepared by consultants (e.g., Frazier et al. 2013; Horney et al. 2016; Norton 2005). If counties continue to hire consultants for future updates of their HMPs, they may wish to expand the role of local government staff in informing the consultants about local needs.

Conclusion

In sum, this phase of my research answered descriptive questions (*What is the quality of county-level HMPs in WA?; What types of plans have overall higher or lower quality?)*. I found that overall HMP quality varied among counties, with higher scores (on average) in the western part of the state than in the eastern part, and higher scores in plans that involved outside consultants, as opposed to those that did not. In terms of *components* of plan quality, I found generally high scores for vision statements and generally low scores for specific policies, highlighting a need for future plans to refine their policy sections, in order to increase the likelihood of achieving the objectives outlined in their vision statements (essentially, to protect communities' lives and property by mitigating natural hazards). Although my research focuses on counties in WA, it aligns with the broader literature on plan quality evaluation, which has shown that many local-level HMPs in the United States are insufficient in their specific policies. In the chapters that follow, I will build on my plan quality findings by presenting quantitative

and qualitative evidence of factors influencing quality (i.e., *Why* are some plans better than others?).

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Chapter 2:
What factors predict the quality of hazard mitigation plans in Washington State?

Abstract: Hazard mitigation plans can help to reduce communities' losses when faced with natural hazards, and a growing body of plan evaluation literature seeks to measure the quality of these plans. Processes of collaboration (i.e., joint decision-making by various agencies and stakeholders) and diffusion (i.e., the spread of ideas between jurisdictions over time and space), among others, may influence plan quality, although empirical evidence is limited. This study assessed potential predictors of plan quality for 33 county-level hazard mitigation plans in Washington State, using a combination of survey data, county characteristics, and previously determined plan quality scores. Significant predictors of plan quality included indicators of vertical (state-to-county) and horizontal (county-to-county) diffusion, as well as economic capacity, although indicators of the collaborative dynamics principled engagement and capacity for joint action, along with several other hypothesized predictors, including past disaster experience (i.e., severity) were not significant. Hazard planning professionals at the federal, state, and local levels may benefit from integrating these findings into future work.

Keywords

collaboration, diffusion, evaluation, hazard mitigation

Introduction

Natural hazards are "extreme forces" of nature, and they can result in *disasters* if they occur in populous areas where they harm people and property (Godschalk et al. 1999, p. 4). Communities in the northwestern United States, including Washington State (WA), are vulnerable to many such hazards (e.g., earthquakes, floods, landslides, and wildland fires; WA Emergency Management Division, 2001), and some types (e.g., floods) are expected to amplify with climate change (Miller et al., 2013).

State and local governments in the United States aim to reduce their losses from natural hazards by preparing hazard mitigation plans (HMPs), which can enable them to receive funding from the Federal Emergency Management Agency (FEMA), under the Disaster Mitigation Act of 2000 (MRSC 2015). In addition to obtaining funding, HMPs are also intended to mitigate hazards through establishing safer building practices, as well as securing existing buildings and infrastructure (FEMA 2006). A growing body of literature draws from *plan quality evaluation* (Baer 1997; Berke and Godschalk 2009) to analyze the contents of HMP documents, based on the extent to which they include established elements of high-quality plans; these studies yield numerical plan quality scores that allow comparisons between plans.

Collaborative governance

Collaborative governance refers to formal arrangements in which various state and non-state stakeholders coordinate in producing a joint output, through a deliberative, consensus-oriented process (Ansell and Gash, 2007; Emerson and Nabatchi, 2015). These arrangements are increasingly common in addressing hazard mitigation (e.g., Osland, 2015) and other complex environmental issues (e.g., aquaculture, Leach et al., 2013; biodiversity conservation, Thomas, 2003). Similarly to hazard mitigation, these other issues tend not to fall under the responsibility of a single agency or jurisdiction, and their management can benefit from the perspectives and resources of diverse stakeholders.

Several frameworks exist for studying collaborative governance, and this paper draws from one framework in particular (Emerson and Nabatchi, 2015), as it addresses *collaboration dynamics* that are relevant to hazard mitigation planning processes. Within Emerson's framework, the dynamics of interest (for the study at hand) are *principled engagement* and *capacity for joint action*. Principled engagement consists of stakeholders' *discovery* (identifying shared interests), *definition* (coming up with a common purpose)*, deliberation* (reasoned

discussion, which can include managing disagreements), *and determinations* (short- and/or long-term decisions); these four phases repeat in an iterative manner. Capacity for joint action speaks to a group's ability to accomplish its objectives via *procedural and institutional arrangements* (e.g., rules and regulations), *leadership* (e.g., initiating and convening a group that aims to work together), *resources* (e.g., funding; participants' unique skills), and *knowledge* (e.g., generating and sharing data and expertise). This study omits the framework's third collaboration dynamic (*shared motivation*), as the shared motivation for hazard mitigation planning is assumed to be simply FEMA approval and funding eligibility.

Levels of collaborative dynamics can be measured through established survey indicators (Emerson and Nabatchi, 2015; Ulibarri, 2015). Although a handful of studies (e.g., Frazier et al., 2013) have speculated that more collaborative processes produce higher-quality hazard mitigation plans, my study is the first to evaluate the quality of all available county-level HMPs in WA and to compare this information with indicators of collaborative dynamics. One previous study (Feinberg and Ryan, in review) compared plan quality scores for a subset of HMPs in western WA counties with indicators of five dimensions of collaboration, drawing from another framework (Thomson et al., 2007); those indicators were not significantly associated with plan quality for the sampled counties.

Diffusion

Building on *diffusion of innovations* theory (Rogers, 2003), *policy diffusion* refers to the adoption of innovative policies as they spread from one jurisdiction to another over time (Berry and Berry, 2014; Walker, 1969). Policies can diffuse horizontally (i.e., between governments at the same level) or vertically (i.e., from one level of government to a higher or lower level) [Daley and Garand, 2005; Dolšak and Sampson, 2011; Shipan and Volden, 2006]. More specifically, horizontal diffusion tends to occur between *peer* governments, such as between

counties (Krause, 2012) or economically similar states (Dolšak and Sampson, 2011). The *mechanisms* of diffusion are typically conceived as *learning* (i.e., borrowing a policy because it seems to have worked well in another location), *emulation* (i.e., borrowing a policy because it seems normal, regardless of how well it works), and *competition* (i.e., borrowing a policy to gain an economic advantage) [Gilardi, 2016]. Alternatively, a government may hire an outside consultant who has already learned about the topic of interest (e.g., externally prepared HMPs; Frazier et al. 2013); this approach would bypass the learning that might otherwise occur directly between governments.

Prior studies offer evidence of diffusion with regard to *flood* mitigation policies, in particular (O'Donovan, 2012; Nohrstedt and Nyberg, 2014), as well as *climate action* plans (Bassett and Shandas, 2010). However, this is the first study that explores potential diffusion processes and mechanisms in the broader context of all of the natural hazards considered in HMPs. My study also differs from previous work in that I consider whether diffusion leads to *better* plans, rather than pursuing the binary question of whether or not a plan was adopted (e.g., municipalities' adoption of climate action plans; Bassett and Shandas, 2010). My rationale for making this distinction was that my hypothesized innovation of interest was the *substance* of the HMP, not the HMP itself (since nearly all counties adopt HMPs, unlike climate action plans).

Research questions and hypotheses

Aiming to contribute to the research and practice of hazard planning, this study pursued the following, overarching research question: *What factors lead to higher- or lower-quality county-level HMPs in WA?* Specific research questions and hypotheses are given below, followed by a conceptual model visualizing the hypothesized predictors of plan quality (Figure 2.1). Questions 1 and 2 refer to collaborative dynamics, as measured through survey items; questions 3 and 4 pertain to diffusion; and question 5 seeks to integrate the findings from

questions 1 through 4, in the context of plan quality scores. The study also accounted for counties' respective internal characteristics (past disaster experience; economic capacity; overall physical risk; and plan updates), which are described in the Methods section below.

Research Question 1 (RQ1): *To what extent (if any) do representatives of the planning groups report elements of* principled engagement*?*

Research Question 2 (RQ2): *To what extent (if any) do representatives of the planning groups report elements of* capacity for joint action*?*

Research Question 3 (RQ3): *Do hazard planning strategies spread?* (3a: between counties; 3b: between organizations within a county; 3c: from a higher level of government to a county; 3d: from a lower level of government to a county)

Research Question 4 (RQ4): *Which counties learn from which others (if at all)?*

Research Question 5 (RQ5): *What are the determinants of higher plan quality?*

Hypothesis 1 (H1): *Counties with greater principled engagement have significantly higher-quality HMPs.*

Hypothesis 2 (H2): *Counties with greater capacity for joint action have significantly higher-quality HMPs.*

Hypothesis 3 (H3): *Counties with horizontal diffusion have significantly higher-quality HMPs.*

Hypothesis 4 (H4): *Counties with vertical diffusion have significantly higher-quality HMPs.*

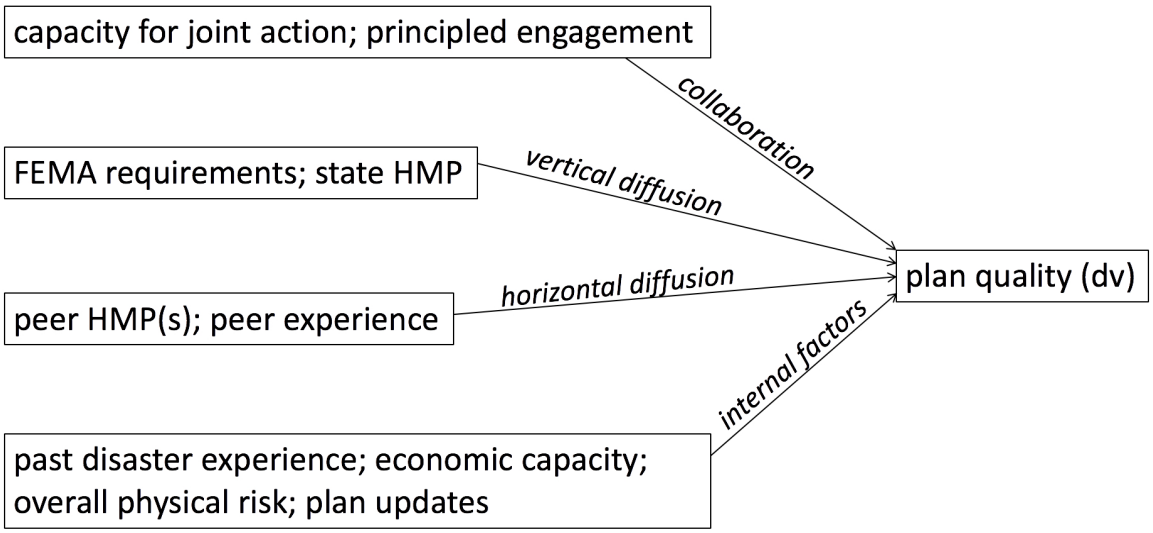

Figure 2.1. Conceptual diagram showing the hypothesized predictors of county HMP quality.

Methods

Broadly, my methods consisted of measuring indicators of the variables in the conceptual model (Figure 2.1) and then running statistical analyses to test the relative influence of each of the independent variables on plan quality score. Specifically, the subsections that follow will describe how I evaluated plan quality; conducted a survey questionnaire of hazard planning professionals from the target counties; collected data on the counties' internal characteristics; and ran a multilevel model, as well as other types of statistical models.

Evaluating plan quality

I determined plan quality (Feinberg and Ryan, in review) using content analysis (Chapter 1), with a customized version of an established protocol (Hazard Reduction and Recovery Center, 2008) and equations from the plan quality evaluation literature (e.g., Brody, 2003; Tang and Brody, 2009). In short, I assigned the HMPs numerical scores based on the extent to which the plan documents included indicators of high-quality plans. These indicators pertained to seven broad components of plan quality: *vision statement*, *fact basis*, *planning process*, *mitigation*

goals and objectives, *inter-organization coordination and capabilities*, *specific mitigation policies and actions*, and *implementation*. Results of this phase of my research (Chapter 1) included that King County had the highest plan quality score overall, while San Juan County had the lowest. In terms of components of quality, vision statement received the highest score (on average), whereas policies and actions received the lowest.

Determining peer groups

As described above, diffusion can occur horizontally, between peer jurisdictions (i.e., those with shared characteristics) at the same level of government. Thus, as part of my investigation of potential horizontal diffusion processes, I organized counties into expected peer groups through assessing a combination of county characteristics (Appendix B), including geography (contiguity of counties and whether they are located east or west of the Cascade Mountains); demographics (rural or urban, based on Rural-Urban Continuum Codes; USDA, 2013); legal status under the state's Growth Management Act (MRSC, 2018); political leanings (Politico, 2016); economic data (income and education; WA OFM, 2018; n.d.); and administrative capacity (in terms of the number of county-level emergency management staff identified in each plan). I later compared these groups with survey responses (described below) to examine whether strategies were diffusing horizontally among the expected peers.

Survey questionnaire

I built an online survey through the University of Washington's Catalyst website, and the survey questionnaire received approval from the University's Human Subjects Division (Study #00004182). Topics of the survey questionnaire (Appendix C) included indicators of the collaborative dynamics *principled engagement* and *capacity for joint action*, as well as diffusion. I refined the survey questions through pre-testing with three hazard planning professionals in the

northwestern U.S., outside of the target population (from Idaho, Oregon, and one from WA who did not work on county-level plans).

I distributed the survey to an initial pool of 746 email addresses associated with individuals whose names had appeared in county-level HMPs in WA (including individuals from all of the target counties), and these individuals could share the link with other colleagues through a snowball-type sampling approach, aimed at increasing the study's sample size (Lofland et al., 2006). I obtained email addresses for the initial pool from the HMPs and through online searches. In order to increase response rate, I sent two rounds of reminders (unless the initial email bounced back as undeliverable or the individual explicitly declined to participate), along with other strategies (e.g., sending individual emails, rather than using a bulk mailing service, to reduce the likelihood of being marked as spam) [Dillman et al., 2009].

I acknowledge potential biases in the study's measurements, resulting from limitations in the survey methodology. For example, nonresponse bias (Dillman et al., 2009) may have occurred due to the uneven receipt of survey responses, skewed towards the counties with higher-scoring plans. In other words, perspectives towards the planning process may have differed between these individuals and the non-respondents from low-scoring counties. Future studies could strive to reduce this bias by recruiting more uniform representation of stakeholders. Also, respondents may have been subject to cognitive biases, such as a halo effect (Leach & Sabatier, 2005; Ulibarri, 2015), in which individuals with more positive views of the planning process assign higher ratings to collaborative dynamics.

Internal characteristics

I gathered counties' internal characteristics from state records (WA Emergency Management Division, 2018) and from the county plans. Specifically, I calculated each county's *past disaster experience* as the sum of its property damage and agricultural damage in the years

1960-2017 (adjusted to 2016 U.S. dollars). I estimated *economic capacity* using Hazard Mitigation Assistance (HMA) planning grant awards in the years 2006-2015; I selected this timeline based on data availability, and it approximately corresponds to the years that the hazard planning groups wrote the HMPs. I approximated overall *physical vulnerability* using the state's cumulative risk rankings (low to high), which I converted to scores ranging from 1 through 5; these rankings reflect exposure to 10 types of natural hazards. I also compiled data regarding each county's number of *plan updates*, up to and including the version that I evaluated, as I expected plan quality to improve with updates. Since Asotin, Columbia, and Garfield counties shared a plan, I summed their economic data and averaged their risk rankings, for the purpose of predicting plan quality using the model.

Multilevel model

Multilevel models, also called hierarchical linear models, can be useful for clustered groups of observations, such as students within classrooms (Goldstein, 2011). In the study at hand, this approach enabled me to cluster the hypothesized predictors (Level 1 of the model; Figure 2.1) within the predetermined peer groups (Level 2), with county plan quality as the dependent variable. I measured *collaboration* dynamics using Likert-scale survey responses (which I averaged for each county, after converting the responses to ordinal scores from 1 through 5). I approximated *vertical diffusion* using dichotomous variables (coded as 1 or 0), based on whether or not each county plan explicitly referenced the FEMA Crosswalk and the state-level HMP. I estimated *horizontal diffusion* using dichotomous variables for whether or not a county plan references at least one peer county's plan, and also in terms of peers' experience (which I calculated as the sum of peers' disaster losses; I hypothesized that peers' losses would motivate a county to produce a high-quality plan, in order to avoid similar losses). After running

the multilevel model, I also ran a regression between the model's predicted plan quality scores and the actual values.

The theoretical equation for the model is below, using notation as follows. I modeled peer group effects as random, rather than fixed, because I was interested in how much of the overall variation was attributable to peer groups, rather than the peer groups themselves (Grace-Martin, 2012). I calculated intraclass correlation (Raudenbush & Bryk, 2002) as a measure of dependence among counties within the same peer group. I did not calculate robust standard errors, as these are more suited to other types of models that have large numbers of clusters (e.g., Cameron & Miller, 2015).

pq: plan quality; dependent variable

β_0: intercept

β_1 through β_9: coefficients for independent variables

γ_j : random effect of peer group j (1, 2, … 7)

ε_i: random error of county i (1, 2, … 33)

$$pq = \beta_0 + \gamma_j + \beta_1(Capacity\ for\ Joint\ Action) + \beta_2(Principled\ Engagement) + \beta_3(Peer\ HMPs) + \beta_4(Peers'\ Experience) + \beta_5(State\ HMP) + \beta_6(FEMA\ Crosswalk) + \beta_7(Past\ Experience) + \beta_8(Economic\ Capacity) + \beta_9(Physical\ Risk) + \beta_9(Plan\ Updates) + \varepsilon_i$$

Other models

In addition to the multilevel model described above, I will report the results of other linear models described below. The purpose of running these additional models was to explore more parsimonious explanations of plan quality predictors, complementing the multilevel model,

which had sought to cover more breadth of theoretical constructs. The simpler models consisted of the following approaches:

(a) removing the second level (peer groups) from the multilevel model and running only level 1;

(b) re-running this simplified version with only the independent variables that had shown significance at $\alpha = 0.05$ and $\alpha = 0.10$; and

(c) isolating just the collaborative dynamics (principled engagement and capacity for joint action), due to theoretical importance, and plotting each of them against plan quality.

Results

Plan quality scores in relation to survey response

As reported in Chapter 1, overall plan quality scores (Appendix D) ranged from 35.01 (San Juan County) to 54.41 (King County), out of a possible 70.00 points (mean = 44.80). Within these overall scores, the strongest component of quality was *vision statement* (mean = 9.21/10.00), and the weakest component was *policies and actions* (mean = 4.39/10.00). Counties in western WA (mean = 46.07) tended to have higher scores than counties in eastern WA (mean = 43.19), although the difference was not significant at $\alpha = 0.05$. Average scores were nearly the same for urban counties (mean = 44.91) and rural counties (44.64).

Counties with higher-scoring plans tended to yield more survey responses (Appendix D) than counties with lower-scoring plans ($r = 0.6276$; Figure 2.2). For example, Snohomish County (with a high plan quality score of 53.81), yielded 22 survey responses, or 13.71% of all responses, whereas the aforementioned, low-scoring San Juan County only yielded one survey response, or 0.60% of all responses. Since I averaged the survey responses within each county,

those from counties with $n > 1$ became composites of the perspectives of each individual who responded.

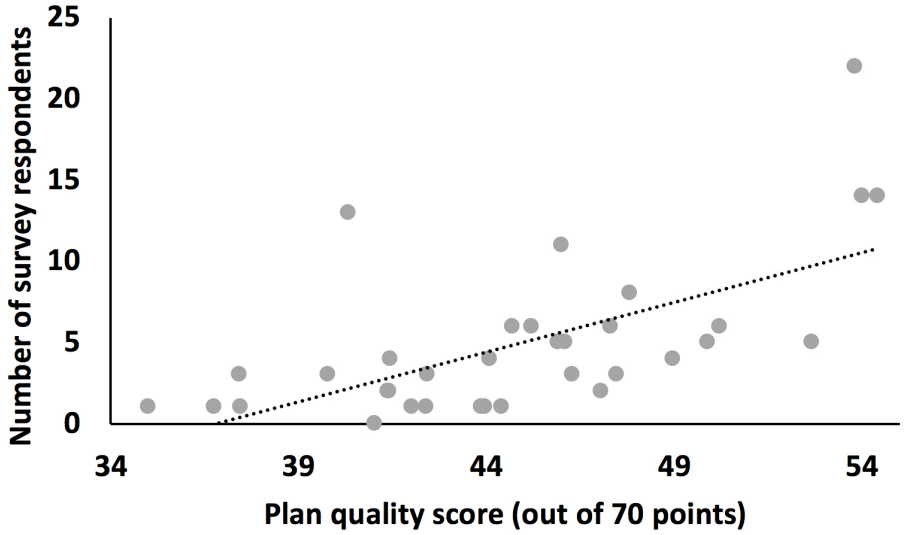

Figure 2.2. Number of respondents from each target county, with respect to plan quality score.

Peer groups

I assigned counties to seven peer groups (Appendix B). Within a given group, I primarily assigned counties so that they would all share similar characteristics in terms of geography (eastern vs. western WA) and demography (rural vs. urban). For instance, Group 1 contains urban counties that are located contiguously in western WA and, hence, physically vulnerable to similar types of natural hazards. Several other features are also common among counties within a given peer group (e.g., all of the counties in Group 1, such as King and Snohomish, are mandated to plan under the state's Growth Management Act). I used the assigned peer groups to determine expected pairings for county-to-county diffusion (e.g., I expected planning strategies to diffuse between two counties within Group 1, rather than between one county in eastern WA and another in western WA, or between an urban county and a rural county).

Collaborative dynamics

I derived evidence of collaboration from the survey, which generated responses from all of the target counties except for Wahkiakum (Appendix D). I could not calculate an exact response rate, since recipients of the survey link could pass it along to colleagues. However, I estimated an approximate response rate of 35.90% by calculating *maximum response rate* (Kaplowitz et al., 2004) as the number of returned surveys (partial plus complete), divided by the number of surveys that I sent which were not undeliverable.

Scaled survey responses (reported as averages in Appendix F) suggest that participants perceived examples of collaborative dynamics in their planning processes, as measured by indicators of the dynamics *principled engagement* and *capacity for joint action*. For example, a survey item drawing from Ulibarri's (2015) indicators of capacity for joint action (*"All of the partner organizations had access to information that was relevant to the hazard planning process"*) received a mean score of 4.18 out of 5.00 (between "somewhat agree" and "strongly agree") for the 167 individuals across all counties who answered that question. Overall, the counties where respondents reported the highest capacity for joint action were Benton, Douglas, Grays Harbor, and Pend Oreille (5.00 each), and the lowest were Franklin and Pierce (2.00 each). The county that reported the highest overall principled engagement was Pend Oreille (5.00) and lowest were Okanogan and Pierce (2.50 each). Since only one person from Pend Oreille County responded to the survey, that county's high scores for both of the collaborative dynamics should be interpreted with caution, as they only reflect the views of the individual who participated in my study.

Although the survey generated evidence of principled engagement, 24 respondents (14.29%) indicated that important stakeholders were missing from the planning processes, and four of these respondents specifically mentioned that *citizens* were missing. The 24 respondents

who reported missing stakeholders were from the following 15 counties, suggesting that this issue spans geography and demographics: Clark (n = 1); Island (n = 2); Jefferson (n = 2); King (n = 4); Kittitas (n = 1); Lewis (n = 3); Lincoln (n = 1); Okanogan (n = 1); Pierce (n = 1); Skagit (n = 1); Skamania (n = 1); Snohomish (n = 3); Stevens (n = 1); Walla Walla (n = 1); and Yakima (n = 1). Within this subset of survey respondents, individuals from the following four counties indicated specifically that *citizens* were missing: King, Okanogan, Skamania, and Snohomish (n = 1 per county). However, respondents within certain counties had conflicting views; for example, nine respondents from King County felt that their planning process included all of the important stakeholders.

Regarding the survey item "*the planning process was contentious*," respondents tended to report that their planning processes were *not* contentious. Specifically, 115 out of 166 individuals (69.28%) who responded to this item disagreed with the statement, 42 respondents (25.30%) neither disagreed nor agreed, and only nine respondents (5.42%) agreed that their planning processes were contentious. These nine respondents were then asked whether the contentious nature inhibited their ability to learn from other participants, and only 1 responded that it did. I acknowledge that, due to the small sample size for this item, more evidence would be needed to draw robust conclusions regarding potential impacts of contentious planning processes on participants' learning.

Horizontal and vertical diffusion

34 out of 168 respondents (20.24%) indicated that they were involved in writing the actual hazard mitigation plan *document*, i.e., the output of the planning process. The survey architecture then directed these 34 respondents to additional survey questions to probe diffusion, and they reported that they *searched for information* through several types of sources (Table 2.1), including other levels of government and other counties, raising the possibility of vertical

and horizontal diffusion, respectively. Furthermore, 8 of these 34 respondents (23.53%) indicated that they specifically *adopted strategies* from other counties, suggesting some moderate horizontal diffusion. It is possible that other respondents also adopted strategies that they initially learned about from other counties, though they may have forgotten specific details in the years that passed between working on the plans and participating in my study.

In particular, these respondents reported that they had adopted several types of strategies (Appendix E) from other counties. Categories of adopted strategies corresponded to the plan quality evaluation protocol and included *general* (e.g., discouraging development in hazardous areas); *regulatory* (e.g., overlay zone with reduced density provisions); *incentive-based* (e.g., participation in the National Flood Insurance Program); *structural* (e.g., levees); *awareness/educational* (e.g., disaster warning and response program); *public facilities/infrastructure* (e.g., retrofitting critical facilities); *recovery planning* (e.g., private acquisition); *emergency preparedness* (e.g., purchasing rescue materials); and *natural resource protection* (e.g., forest and vegetation management in riparian areas).

Table 2.1. Sources of information reportedly used by respondents who were involved in writing the plan documents (each respondent could check more than one option).

Type of source	*Frequency*	*Percentage*
federal government (e.g., FEMA)	27	79.41%
state government(s) (e.g., WA Emergency Management Division)	31	91.18%
other county/counties (in either WA or another state)	21	61.76%
other participant(s) in your county's planning process	24	70.59%
smaller government(s) within your county (e.g., city)	23	67.65%
consultant(s)	17	50.00%
general online search (e.g., Google)	19	55.88%
other	5	14.71%

Seven survey respondents mentioned specific counties from which they had adopted strategies (Table 2.2), showing a mix of expected and unexpected pairings with regard to the

predetermined peer groups (Figure 2.3). One possible explanation for this mix is that counties in WA do not necessarily learn from their peers, while another possible explanation is that my perception of peers (as assigned to the seven peer groups) does not match counties' actual peers. Although some of these pairings reflect variability in demographic characteristics (e.g., urban vs. rural) and are not directly adjacent to each other, they are all sorted by geographic region (eastern vs. western), indicating similar physical vulnerabilities to natural hazards. These survey respondents were then asked for reasons *why* they adopted strategies from other counties. Five responded, and their answers indicated mechanisms of diffusion, namely *learning* ($n = 3$) and *emulation* ($n = 2$), although they did not provide evidence that diffusion was driven by economic competition.

For respondents who were involved in writing the plan document but reported that they did *not* adopt strategies from other counties, the survey asked an open-ended question about other sources from which they *did* adopt strategies; they mentioned the following (suggesting scattered evidence of horizontal and vertical diffusion): planning partners (mentioned by respondents from King and Snohomish counties); other cities (mentioned by respondents from King and Lewis counties; one from Lewis County specifically described using a larger city, Centralia, as a reference for smaller cities); state (by Skagit County); other state: Idaho (by Skagit County); and federal (by Skagit, Stevens, and Thurston counties). While I focused on counties as the study's unit of analysis, respondents' comments about *cities* refer to those within a given county (e.g., representatives of two different city governments participating in the same county-level planning process).

Table 2.2. Counties whose plans survey respondents reported referencing for information, along with whether or not each pairing matched the predetermined peer groups.

County of respondent	County/counties referenced for information	Matches expected peers?
Clark	King, Kitsap, Jefferson	no/no/no
Island	King, Pierce	no/no
Island	Skagit	no
Lewis	Clark, Pierce	no/no
Spokane	Lincoln, Stevens, Whitman	no/yes/no
Thurston	Clark, Grays Harbor, King, Pierce, Skagit	no/no/yes/yes/yes
Whatcom	Thurston	yes

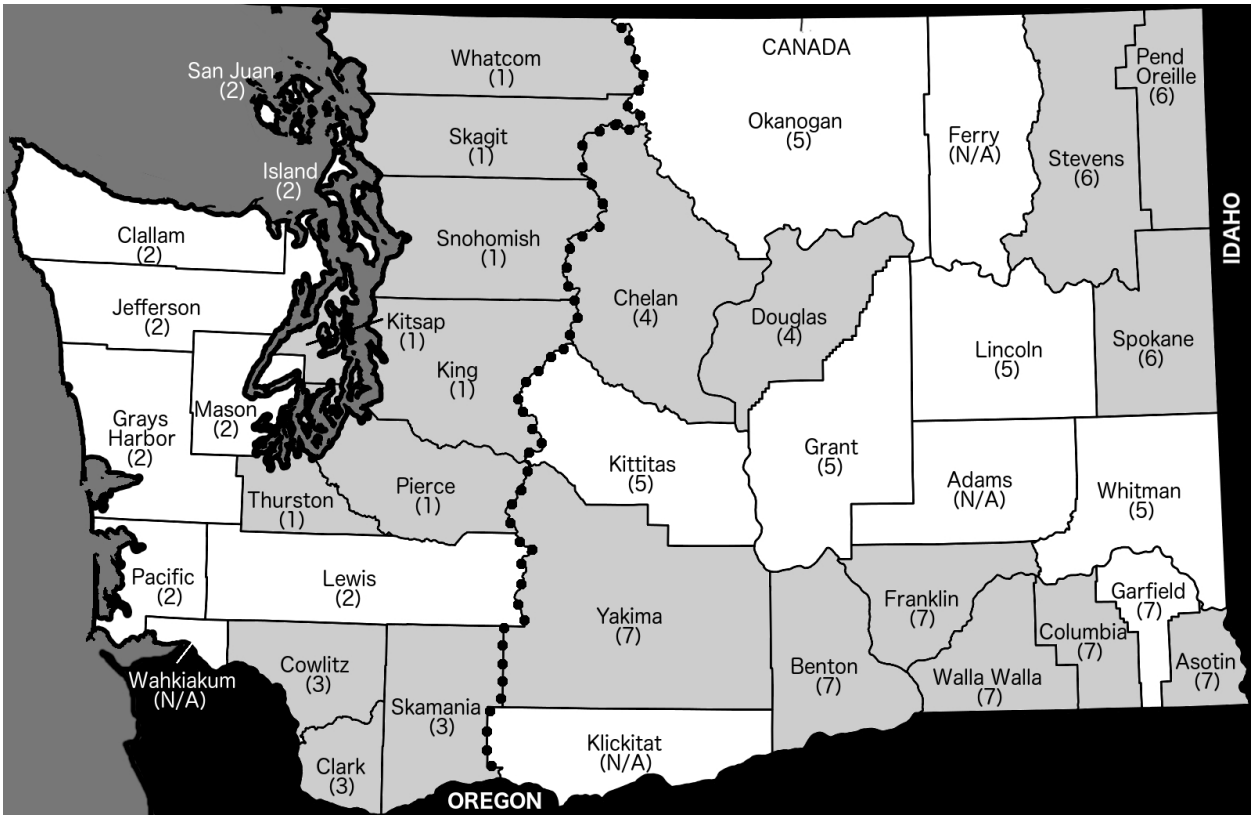

Figure 2.3. Map of counties in WA, with numbers corresponding to the assigned peer groups. Rural counties are white, urban counties are gray, and the dotted line divides eastern and western counties.

Internal characteristics

Counties demonstrated diverse internal characteristics (Appendix F). In terms of *disaster experience*, for example, past losses ranged from approximately $13 million (Pend Oreille County) to $10 billion (Skamania County). Economic capacity also varied, with grants ranging from none (four counties) to $771,989.80 (King County). Every possible *risk* ranking (1 through

5) was represented, with a mean of 3.29. Several counties only had one version of their respective plans at the time of coding (these were each recorded as 1 for the *plan updates* variable), although others had as many as three (e.g., King County; the 2014 plan refers to previous versions from 2004 and 2009). San Juan County was coded as 0 because the original version of its plan had not yet been FEMA-approved.

Influences on quality

The multilevel model identified three factors as significant predictors of plan quality (Table 2.3): (1) peers' experience (suggesting *horizontal diffusion*) [$P = 0.0647$]; (2) referencing the WA State HMP (suggesting *vertical diffusion*) [$P = 0.0428$]; and (3) economic capacity (an *internal* characteristic) [$P = 0.0387$]. Thus, the model provides support for H3 and H4, but it does not provide support for H1 or H2. I used the three significant predictors to run a more parsimonious version of the model (Table 2.3).

I also made several other adjustments to the original, theoretical model. For example, I omitted the independent variable "Peer HMPs," i.e., whether or not a county's plan formally referenced peer counties' plans (suggesting horizontal diffusion), from the model due to instability; I had only coded one county (Grays Harbor) as a 1 ("yes"). Possible explanations for this variable's instability might include that counties referred to peers' plans in an informal manner and did not document these references in their plans; and/or that my assigned peer groups did not reflect counties' true peers. Additionally, I omitted Wahkiakum County from the model due to missing data (no survey responses); thus, $n = 33$ for plan quality, i.e., the dependent variable.

The model exhibited a small standard deviation (0.0002) and intraclass correlation (2.93×10^{-9}), showing that peer group (level 2) did not contribute meaningfully to plan quality, beyond the peer-related information that was already integrated into level 1 variables (e.g., peers'

experience). Running the model without the second level yielded the same coefficients and standard errors as the two-level version, further indicating that the peer group level did not meaningfully impact my results.

Table 2.3. Coefficients and standard errors for hypothesized predictors of plan quality (n = 33 plans), by specific concept and broader category. Model A reflects the detailed, conceptual model, whereas Model B is the simplified version using only the significant predictors from A. Total R^2 is 0.5177 for Model A and 0.3948 for Model B.

		Model A		Model B	
Concept	**Category**	**Coefficient**	**SE**	**Coefficient**	**SE**
Capacity for joint action	Collaboration	1.7677	1.4574	N/A	N/A
Principled engagement	Collaboration	-1.4103	2.3992	N/A	N/A
Peers' experience	Horizontal diffusion	0.0059*	0.0030	0.0052**	0.0024
State HMP	Vertical diffusion	7.3065**	3.3370	5.9876**	2.1780
FEMA Crosswalk	Vertical diffusion	-4.9785	4.5730	N/A	N/A
Past experience	Internal	-0.0109	0.0067	N/A	N/A
Economic capacity	Internal	0.0951**	0.0424	0.0875**	0.0386
Physical risk	Internal	-0.0475	0.8165	N/A	N/A
Plan updates	Internal	1.6872	1.3917	N/A	N/A

*$p \leq 0.10$; **$p \leq 0.05$.

Isolating the collaborative dynamic variables in relation to plan quality scores (Figures 2.4; 2.5), I found that each of the dynamics was slightly, positively correlated with quality (r = 0.2258 for principled engagement; r = 0.2214 for capacity for joint action). However, these correlations were not significant at $\alpha = 0.05$, and the plots show that the highest- and lowest-quality plans deviate dramatically from the trendline. In other words, the indicators of collaborative dynamics seem better at predicting the quality of moderate plans than predicting the scores of particularly good or bad plans. Therefore, I removed the counties with extreme values of plan quality (the four highest and four lowest scores), and re-ran the linear models. However, these models had even weaker correlations (r = 0.1482 for principled engagement; r = -0.1869 for capacity for joint action).

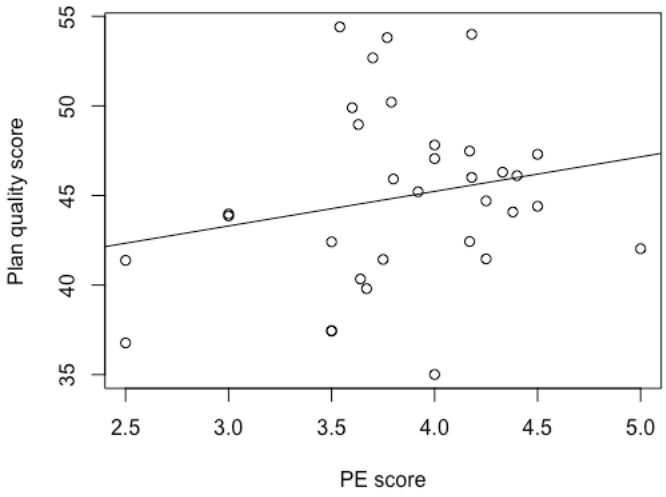

Figure 2.4. Each county's plan quality score, plotted against its average survey response for principled engagement (n = 33 plans; r = 0.2258).

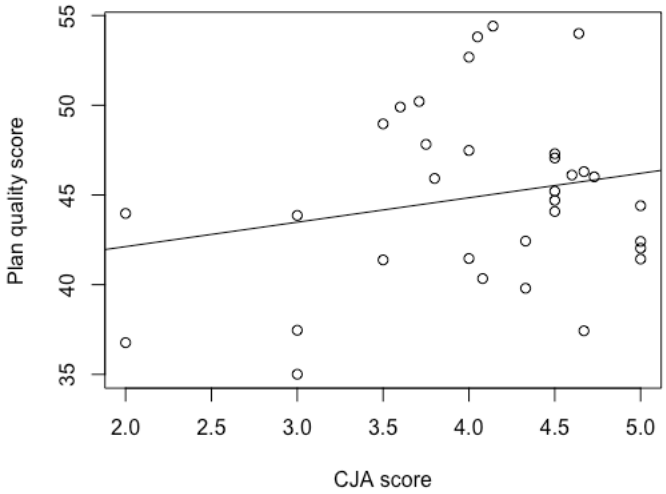

Figure 2.5. Each county's plan quality score, plotted against its average survey response for capacity for joint action (n = 33 plans; r = 0.2214).

Discussion

Although I found evidence of collaborative dynamics in the planning processes (as measured by respondents' perceptions of survey indicators), my study did not find strong support for the idea that these dynamics lead to higher-quality plans. This disconnect is in contrast with

previous literature (e.g., Frazier et al., 2013), which has speculated that collaborative approaches produce better HMPs. Explanations for this disconnect may lie in the characteristics of individual counties, as reflected in the other independent variables that I modeled. For example, economic capacity may override collaborative dynamics, in the sense that a well-funded county is more likely to produce a good plan than a poorly-funded county, regardless of the extent to which each county's planning process demonstrates principled engagement.

Also, an important aspect of principled engagement is balanced stakeholder representation (Emerson and Nabatchi 2015), which was not fully achieved, according to a subset of respondents who were involved in 15 counties' hazard planning processes (corresponding to nearly half of the 33 plans that I evaluated and modeled). Although participants reportedly perceived other indicators of collaborative dynamics between those stakeholders who came to the table, plan quality may have suffered due to the missing perspectives of the absent stakeholders (such as citizens, as noted by respondents from a mix of counties with high- and low-scoring plans). If incorporated in future planning processes, these perspectives could potentially benefit the plans by shedding light on local hazard vulnerabilities, brainstorming mitigation strategies, and building support for implementation.

Survey responses concerning diffusion indicate that some counties, particularly in western WA, adopt hazard mitigation planning strategies from other counties, including through the mechanisms *learning* and *emulation* (Gilardi, 2016). These horizontal diffusion patterns resonate with literature on counties as peers (e.g., Krause, 2012). On the other hand, in counties (e.g., Lewis) where respondents indicated that they did *not* adopt strategies from other counties, planners may have avoided innovative strategies in favor of fulfilling the standard requirements that lead to HMP approval and funding eligibility, as innovation can be stifled by limited resources and associated risk aversion (Hartley et al., 2013). Another potential explanation for

why diffusion was not more prevalent is that eight of the plans were prepared by a single consulting firm that worked in multiple counties during the same time period, and four other plans were written by another consulting firm. While consultants might learn from their own past experiences and reuse elements from plans that they had previously written, such practices would not meet the definition of diffusion, which would require one planning group or agency to learn from *another* over time.

Implications

My findings underscore the important leadership role that states can play in their counties' hazard mitigation planning processes, as two state-related factors (grant funding and referencing the state-level HMP) were significant predictors of county-level HMP quality. This information should be encouraging to state- and federal-level hazard planning professionals, as it suggests a return on their investments. It also supports the idea that states function as key intermediaries between local governments and FEMA, as intended under the Disaster Mitigation Act (e.g., Berke et al., 2012). Although WA is not necessarily representative of all U.S. states, others might similarly find that state-level guidance and funding can lead to strong county-level plans. Since higher-quality plans are more likely to achieve their objectives (Baer 1997; Berke and Godschalk 2009), I infer from my findings that federal and state resources may help to reduce communities' vulnerability to natural hazards by supporting the communities' development of good plans. More specifically, high-quality HMPs may also facilitate communities' adaptation to climate change by addressing climate-related hazards, such as floods, and coordinating with other types of plans, such as climate action plans.

Though less statistically significant than the roles of the state, peers' experience was also associated with plan quality, i.e., counties tended to have higher-quality plans if their peers had experienced greater economic losses from past disasters. Coupled with the aforementioned

survey evidence that some counties learned from others, this finding suggests that counties' may have learned from their peers' losses and subsequently produced higher-quality plans. Although my survey did not explicitly ask hazard planning professionals whether they were influenced by other counties' past losses, future research could do so. Further coordination between counties (e.g., state-facilitated workshops or webinars, in addition to those that already exist) might open additional channels of communication (Rogers, 2003) through which counties could share their success stories, and effective planning strategies could diffuse.

My study makes a novel contribution by suggesting that diffusion can lead to higher-quality plans, unlike previous studies, which have viewed diffusion through the lens of adoption, rather than quality (e.g., Bassett and Shandas 2010 on cities' adoption of climate action plans; O'Donovan 2012 on states' adoption of flood mitigation policies). Since the Disaster Mitigation Act has successfully incentivized nearly all of the counties in WA to create HMPs, having an HMP would not be innovative in and of itself. Instead, the innovations of interest were within the plans; I provided evidence that counties could develop higher-quality plans by learning from other counties (or other levels of government) in terms of what they should include, not whether they should have a plan in the first place. I would encourage future research on HMPs and other types of environmental plans to continue exploring the extent to which plan *quality,* not just plan adoption, spreads over time and space.

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Chapter 3:
Assessing and enhancing stakeholder participation in hazard mitigation planning

Abstract: Hazard mitigation plans can support communities' resilience in the context of natural hazards and climate change, which threaten northwestern North America. The quality of these plans can be evaluated using established indicators; however, research is also needed regarding stakeholders' perceptions, in order to understand aspects of the planning processes that may not be evident in the plan documents. This study builds on previously reported plan quality scores and survey data, to investigate potential collaboration dynamics (principled engagement and capacity for joint action), as well as vertical and horizontal diffusion, which may have occurred during counties' hazard planning processes. Semi-structured interviews were conducted with 20 hazard planning professionals who were involved in preparing county-level hazard mitigation plans in Washington State, USA. Findings (for cases with both high- and low-scoring plans) include evidence of collaboration dynamics, although some important stakeholders (e.g., citizens) were missing from the planning processes, raising concerns about the extent to which the plans reflect local needs. These results are consistent with previous literature, which has demonstrated that citizens often view hazard mitigation as inaccessible and disconnected from their daily lives. The paper concludes with recommendations for how practitioners might go about bolstering participation, thereby increasing the likelihood that plans will be successfully implemented.

Keywords: adaptation • climate change • hazard mitigation • participation

Introduction

Hazard mitigation planning

Natural hazards, such as earthquakes and floods, pose substantial risks to human lives and property in the Pacific Northwest region of North America, including Washington State

(WA) [Oregon Office of Emergency Management 2015; WA Emergency Management Division 2018]. Communities in the United States have the potential to gain federal funding and reduce their losses by preparing hazard mitigation plans (HMPs) [FEMA 2018a]. However, some plans are better than others, as demonstrated through plan quality evaluation, an approach through which researchers analyze the contents of plan documents (e.g., HMPs), and assign numerical plan quality scores based on predetermined elements of high-quality plans (e.g., Baer 1997; Berke and Godschalk 2009).

Climate change is expected to increase the frequency and intensity of some types of hazards (e.g., floods) in WA and other coastal regions (Birkmann and von Teichman 2010; Huppert et al. 2009; Miller et al. 2013), yet the research and practice of *adaptation* to climate change are scarce. Adaptation actions are relatively understudied, as existing research tends to focus instead on vulnerability assessments and natural systems (Berrang-Ford et al. 2011), and in practice, the implementation of adaptation strategies is limited due to insufficient funding (USGCRP 2018) and other factors, such as policy and institutional constraints (Bierbaum et al. 2013; Javeline et al. 2019). In the United States, the Federal Emergency Management Agency (FEMA), which oversees hazard mitigation planning, requires *state*-level HMPs to address "challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels" (FEMA 2015, p. 13). However, local-level (sub-state) HMPs are inconsistent in their approaches to climate change, and clear steps towards adaptation are rare (Stults 2017).

Participation and barriers

Hazard mitigation planning literature (e.g., Britton 2002; Godschalk et al. 2003; Mileti 1999; Pearce 2003) argues that public participation is crucial in building community *resilience*, i.e., the ability to bounce back from a disruption (Norris et al. 2008). To this end, participation

can strengthen plan implementation by fostering a sense of ownership and responsibility (Pearce 2003) and can help to imbue planning processes with community values (Britton 2002), particularly when participation is "sensitive to the diversity, ability, and interests of members" (Norris et al. 2008, pp. 140-1). Although participation in urban planning in the U.S. has historically followed an advisory model (e.g., soliciting public comments through hearings), it has also evolved to include collaborative planning (with citizens and stakeholders involved in shared decision-making) and conflict management among disputing stakeholder groups (Godschalk et al. 2003). Despite its importance, participation in hazard mitigation planning is often low, due to lack of interest from the public (Godschalk et al. 2003) and poor outreach from planners to underrepresented groups (Berke et al. 2012).

In seeking to understand public participation, my study draws from literatures on both hazard mitigation planning and *collaborative governance*, the latter of which can be defined as "a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets" (Ansell and Gash 2007, p. 544). More specifically, I situated this study within part of the collaborative governance framework developed by Emerson and Nabatchi (2015), which includes the collaborative dynamics *principled engagement* and *capacity for joint action*. Principled engagement refers to behavioral elements of collaboration, such as the extent to which (if at all) participants *deliberate* (i.e., engage in inclusive, reasoned discussion that may lead to changed perspectives), and capacity for joint action pertains to functional elements, such as leadership, knowledge, and resources (Emerson and Nabatchi 2015). Although Emerson's framework also includes a third collaborative dynamic, *shared motivation*, I omitted this dynamic from my study, as it did not appear pertinent to hazard mitigation planning processes.

Collaborative governance scholarship highlights the public's ability to contribute local knowledge and understanding that traditional policymakers may lack (e.g., Newig et al. 2018; Scott and Thomas 2017) and argues that participation should involve *balanced representation* "in terms of the ideas, beliefs, and perspectives relevant to the issue at hand" (Emerson and Nabatchi 2015, p. 60). Citizens (i.e., lay actors) can *coproduce* public services with government agents (i.e., state actors) through four phases of the public service cycle: co-commissioning; co-design; co-delivery; and co-assessment (Nabatchi 2017). Whereas traditional governments often fail to prepare for low-probability, high-consequence events, such as natural hazards, collaborative governance can compensate (May 2013).

Diffusion

My study also draws from policy diffusion, i.e., the spread of innovative policies (or plans) over time and space (Bassett and Shandas 2010; Berry and Berry 2014; O'Donovan 2012). Literature shows that diffusion can occur horizontally (from one jurisdiction to another at the same level of government, e.g., Dolšak and Sampson 2011; Krause 2012) or vertically (from one level of government to a higher or lower level, i.e., bottom-up or top-down, e.g., Daley and Garand 2005; Dolšak and Sampson 2011; Shipan and Volden 2006). Previous work has examined whether or not jurisdictions adopted innovative types of plans (e.g., municipal climate action plans; Bassett and Shandas 2010), whereas I looked at the spread of plan *quality* in HMPs. I was especially interested in whether counties *learned* from other counties (a mechanism of diffusion, Gilardi 2016), and whether this learning resulted in better plans.

Objectives and research questions

This study sought qualitative evidence towards answering the overarching research question *What factors contribute to higher- and lower-quality county-level HMPs in WA?* Within this context, specific research questions and hypotheses (drawing from the collaborative

governance and diffusion literatures) are given below; these are essentially qualitative versions of the research questions and hypotheses that I explored in Chapter 2. Previous studies (e.g., Frazier et al. 2013) have claimed that more collaborative planning processes lead to higher-quality HMPs, although these studies do not provide empirical evidence to support this claim, thus leaving a gap in the literature. Also, previous work has looked at the diffusion of climate action plans (Bassett and Shandas 2010) and flood mitigation policies (O'Donovan 2012), but not in the context of plan *quality*, leaving room for further work.

Research Question 1 (RQ1): How (if at all) do hazard planning processes in WA demonstrate *principled engagement* (i.e., shared decision-making through reasoned discussion)?

Research Question 2 (RQ2): How (if at all) do hazard planning processes in WA demonstrate *capacity for joint action* (e.g., leadership; resources; knowledge)?

Research Question 3 (RQ3): How (if at all) do hazard planning processes in WA demonstrate *horizontal diffusion*?

Research Question 4 (RQ4): How (if at all) do hazard planning processes in WA demonstrate top-down and/or bottom-up *vertical diffusion*?

Research Question 5 (RQ5): What factors lead to higher- or lower-quality HMPs in WA?

Hypothesis 1 (H1): Counties that demonstrated principled engagement in their hazard planning processes will have higher-quality HMPs than counties that did not.

Hypothesis 2 (H2): Counties that demonstrated capacity for joint action in their hazard planning processes will have higher-quality HMPs than counties that did not.

Hypothesis 3 (H3): Counties that demonstrated horizontal diffusion in their hazard planning processes will have higher-quality HMPs than counties that did not.

Hypothesis 4 (H4): Counties that demonstrated vertical diffusion in their hazard planning processes will have higher-quality HMPs than counties that did not.

Methods

Survey questionnaire

In a previous study (Chapter 2), I distributed an online survey questionnaire to stakeholders who were involved in creating the county-level HMPs in WA. The purposes of the survey were to gather quantitative data for a statistical model (predicting plan quality scores, as determined through prior plan quality evaluation) and to refine subsequent interview questions. Topics (described in depth below) included potential collaboration, as well as diffusion. At the end of the survey, the respondent had the option of agreeing to a follow-up interview.

Key constructs and indicators

I developed survey questions to measure collaborative dynamics (principled engagement and capacity for joint action) that may have occurred in counties' respective hazard mitigation planning processes. I measured these dynamics through several indicators, including Likert-scale survey items that I adapted from literature on collaborative dynamics leading to common outputs (Ulibarri 2015). For example, an item indicating principled engagement stated, "The hazard planning process – from start to finish – involved *all of the stakeholders* (i.e., all of the people and groups that have a significant interest in the issues and outcome)." I coded and averaged the Likert-scale responses to yield numeric scores signifying each county's reported principled engagement and capacity for joint action. I further explored collaborative dynamics through interviews (described below).

I also asked survey respondents if they were "specifically involved in *writing the county's hazard mitigation plan document*," and those who answered "yes" received follow-up questions exploring potential diffusion processes that may have enhanced the plan documents. For example, one question asked, "During the process of writing your county's plan, did you search for information from any of the following sources?" For this question, respondents could check all answers that applied, such as "federal government (e.g., FEMA)," suggesting *vertical* diffusion from a higher level of government, and "other county/counties (in either WA or another state)," suggesting *horizontal* diffusion at the same level of government. I also asked these respondents if they *adopted any strategies* from other counties' plans, as may occur between counties due to counties' peer-like relationship (e.g., Krause 2012).

Semi-structured interviews and coding

I collected qualitative data in order to complement the prior, quantitative data, as *synthesis approaches* can help to develop a holistic understanding of hazard mitigation planning and recovery efforts (e.g., Horney et al. 2017; Johnson and Hayashi 2012). More broadly, mixed-methods research can achieve the benefits of quantitative methods (i.e., testing hypotheses) and qualitative methods (i.e., identifying causal mechanisms; generating further hypotheses) [Lofland et al. 2006].

I selected interview cases and respondents through a purposive sample (Patton 2002) from counties reflecting a wide range of HMP scores (as I determined by the prior plan quality evaluation) and a mix of eastern and western WA, with the goal of capturing a variety of perspectives. Specifically, I selected the target individuals from the following 12 counties: Clark, Douglas, Island, King, Lincoln, Pierce, San Juan, Snohomish, Stevens, Walla Walla, Whitman, and Yakima. Within these counties, I restricted the target interviewees to self-identified emergency managers and planners (as opposed to all types of stakeholders who were involved in

the planning processes), giving a relatively consistent unit of analysis (Patton 2002), so that comparisons could be drawn across cases. I identified 53 individuals who met these criteria, through a combination of HMP documents, survey responses, and recommendations from other interviewees. I contacted these individuals via email, requesting their participation in interviews. In order to increase response rate and decrease non-response bias, I personalized the email messages, and I sent reminders to non-respondents, following guidance from Dillman et al. (2009).

Given that some of the interviewees had previously participated in the survey and others had not, I prepared slightly different interview guides (Appendix G) for these two segments of the sample, in order to avoid redundancy for participants who took part in both phases of research. Topics of both interview guides pertained to collaboration and diffusion, the latter of which included horizontal and vertical varieties (i.e., between governments at the same level and at different levels, respectively; Daley and Garand 2005). As with the survey, collaboration questions focused on principled engagement and capacity for joint action. For example, a question about the *leadership* element of capacity for joint action asked, "Could you describe how the planning process was managed or facilitated?" The conversation format was semi-structured (Fylan 2005), allowing for interviewees to bring up additional topics. I asked probing questions as needed, if participants did not respond in depth to the primary questions. I pre-tested interview questions for clarity and flow with two hazard planning professionals based in Oregon; I chose that state because its physical vulnerability to natural hazards is similar to that of adjacent WA (Oregon Office of Emergency Management 2015), and hazard mitigation planning for both states falls under FEMA Region 10 (FEMA 2018b), yet Oregon's planning professionals were outside of the study's target population. The interview protocol received approval from the University of Washington's Human Subjects Division (Study #00004182).

With participants' permission, I audio-recorded the interview conversations on speaker phone and transcribed the recordings verbatim, and then I coded passages in the transcripts (Patton 2002) using the qualitative analysis software TAMS Analyzer (Version 4.49b5ahEC, Matthew Weinstein, 2017). Coding involved a hybrid approach, generating themes from both theory (*deductive*) and data (*inductive*); the advantage of this approach is that it can contextualize data within existing frameworks, while also allowing new themes to emerge (Fereday and Muir-Cochrane 2006). I wrote code definitions and then applied them to passages in the text, through an iterative process of reading, coding, and re-reading the interview transcripts. I used cross-case analysis (Mathison 2011) to compare the coded interview data across county cases.

Limitations

I acknowledge that I cannot generalize the study's findings, as the sample is small, nonrandom, and not necessarily inclusive of all hazard planning professionals' perspectives. Interviewees from high-scoring, western counties participated more than individuals from other type of counties, perhaps because the former had more staff available, and/or they were eager to share positive perceptions of the planning processes. Busy emergency managers and planners from resource-constrained counties might not have the capacity to give their time to a voluntary study, and they might be hesitant to describe their planning processes. Also, I cannot reliably quantify the prevalence of emergent themes, given that participants did not receive identical questions (including with regard to citizen participation), as a result of the two variants of the interview guide and the assorted other topics that arose via the semi-structured format and probing questions. I was able to draw more quantitative conclusions from the previously reported survey (Chapter 2), whereas the interviews provide a richer understanding of the perspectives of a smaller group of people.

Results

Descriptive statistics

As reported in Chapter 2, the online survey yielded 168 responses from individuals who had worked on 33 county-level plans, and 24 respondents (14.29%) indicated that certain types of stakeholders were *missing* from the planning process. These 24 respondents had worked on 15 HMPs. 16 of these respondents identified specific types of missing stakeholders, including local agencies, special districts, non-governmental organizations, state agencies, federal agencies, and other (open-ended) [Table 3.1].

Four of the open-ended "other" responses specified that *citizens* (i.e., general public, unaffiliated with the listed organizations) were missing. These four responses were from King, Okanogan, Skamania, and Snohomish counties, which had a mix of high- and low-scoring plans (ranked 1, 27, 26, and 3, respectively). As reported in Chapter 1, three of these four counties (King, Okanogan, and Snohomish) hired external consultants to prepare their HMPs, whereas one (Skamania) was prepared internally by the county's emergency management agency. King, Skamania, and Snohomish are located in the western part of the state, making them vulnerable to different types of hazards than Okanogan, which is east of the Cascades.

Table 3.1 Types of stakeholders reportedly missing from county-level hazard mitigation planning processes in WA (each respondent could select more than one type of stakeholder)

Type of stakeholder	Frequency	Percentage
local agency/agencies	4	25.00%
special district(s)	9	56.25%
non-governmental organization(s)	14	87.50%
state agency/agencies	3	18.75%
federal agency/agencies	7	43.75%
other	6	37.50%

Interview participants and themes

Interview participants consisted of 20 hazard planning professionals (Table 3.2), including 13 who had worked on high-scoring HMPs and 7 who had worked on low-scoring HMPs. The response rate (out of 53 target individuals) was approximately 37.74%. These individuals had worked on plans in seven counties (5 western counties and 2 eastern counties; Fig. 3.1). 13 of the interviewees were known to have previously taken the survey, and the remaining 7 either (a) had not taken the survey, or (b) had taken the survey and chosen to keep their responses anonymous. Since I was only able to recruit one interviewee from Island County, the interview data regarding that county is limited to the perspectives of the individual who participated in my study and may differ from the views of other stakeholders who worked on the Island County HMP.

The conversations yielded four deductive themes (principled engagement, capacity for joint action, vertical diffusion, and horizontal diffusion) and one inductive them (challenges). A given passage of text could receive more than one code (e.g., the codes *capacity for joint action* and *challenges* for a passage about insufficient staffing). Each theme is described below, along with relevant passages from the interviews, and code definitions are provided in Appendix H. Findings across all of the county cases are summarized briefly in Table 3.3.

Table 3.2 Interview participants, by county, region, plan quality, and self-reported profession/role

County	Region	Plan Quality	Interviewee's Profession/Role
Clark	West	High	4 emergency managers; 1 planner
Douglas	East	Low	2 planners
Island	West	High	1 planner
King	West	High	2 emergency managers; 2 planners
Pierce	West	Low	1 emergency manager; 2 planners
Snohomish	West	High	2 emergency managers; 1 planner
Walla Walla	East	Low	1 emergency manager; 1 planner

Fig. 3.1 Map of counties in WA, with shaded study cases; dotted line divides the eastern and western parts of the state

Table 3.3 Case counties' respective regions and plan quality, along with results of cross-case analysis regarding hypothesized predictors of quality. Checkmarks indicate the presence of these factors (as reported by at least one interviewee from a given county), whereas empty boxes indicate absence (i.e., denied or not reported by interviewees)

	County						
	Clark	**Douglas**	**Island**	**King**	**Pierce**	**Snohomish**	**Walla Walla**
region	*west*	*east*	*west*	*west*	*west*	*west*	*east*
plan quality	*high*	*low*	*high*	*high*	*low*	*high*	*low*
PE	✓			✓	✓	✓	
CJA	✓		✓	✓	✓	✓	✓
horizontal	✓			✓	✓	✓	✓
vertical	✓	✓	✓	✓	✓	✓	✓

Planning processes – from both high- and low-scoring counties – appear to have incorporated elements of the collaborative dynamic *principled engagement*. For example, an

individual from Clark County (which had a high-scoring plan) provided evidence of *deliberation* (i.e., reasoned discussion leading to changed perspectives), explaining: *"we were able to generate positive debate,"* in which participants were *"discussing and thinking about mitigation,"* and this debate led to new perspectives, such as *"considering changing county code to put an increased insurance cost if you're in a floodplain."* Similarly, an interviewee from King County (also high-scoring) reported that *"the discussion is always the best part of goal-setting, and the back-and-forth, and the debate…I've never done a plan where there wasn't some degree of debate…I think that's the most constructive part."* An interviewee from Pierce County (low-scoring) described an inclusive process, mentioning that their planning meetings *"brought a lot of people together to discuss [goals]… everybody has that opportunity to have that input,"* and these stakeholders' perspectives *"are all taken into consideration."* Pierce County's hazard planning professionals also considered input by engaging with stakeholders (e.g., members of the Puyallup tribe) at outreach events, such as fairs. The examples of principled engagement in both high- and low-scoring counties suggest that H1 might be unfounded, i.e., indicators of principled engagement in the planning process do not necessarily herald high-quality plans; this finding is consistent with my previous, quantitative results (Chapter 2).

Participants' perceptions of their capacity in terms of *time* and *money* varied across counties. An interviewee from Douglas County (which had a low-scoring plan) explained that their process suffered due to low capacity: *"with limited time and budget… it was just canned language and formatting and wasn't flexible and it really didn't match up well with the community process as far as planning and engaging agencies and setting up local needs and building something through a process; it was just this canned, awful beast that really didn't reflect the community."* An interviewee from King County (a high-scoring plan) conveyed the opposite sentiment from that of the Douglas County participants: *"I didn't ever feel like I was*

really cramped or rushed for time." This contrast provides support for H2 (the hypothesis that counties demonstrating capacity for joint action will produce better plans). However, interview data regarding other aspects of capacity (described below) do not support this hypothesis.

Interviewees' perceptions in terms of *staff* suggest that capacity was limited, on both high- and low-scoring plans, due to participants' competing obligations (wearing several hats). An interviewee from Island County noted that they only had one full-time staff member devoted to hazard planning – *"everybody else has primarily other responsibilities"* (nonetheless, Island County was able to produce a high-scoring plan, with the help of a hired consultant). An interviewee from King County explained that some participating jurisdictions within the county *"didn't even have a full-time emergency manager, maybe they had, like, someone who was a city clerk, or a city manager, who spends 10 to 15% of their time on emergency management,"* although county-level staff and the consultant helped these jurisdictions with their components of the plan. An interviewee from Pierce County (low-scoring) explained, *"you've got a public works director who wears five hats, or… a homeland security person in a fire department."* Another interviewee from Pierce County shared a similar view, explaining that county staff were *"probably very busy with too many planning obligations."* In contrast to the mixed perceptions of time and money described above, interviewees from high- and low-scoring counties seemed to agree that they did not have sufficient staff. Focusing on this element of capacity, my data do not support H2 (the notion that good plans came from counties with high capacity).

In addition to wearing several hats, staff and leadership *turnover* emerged in interviews with representatives of both high- and low-scoring counties, even though this specific aspect of capacity was not part of the interview guide. For example, an emergency manager from Snohomish County (high-scoring) said that *"people just move on"* and could only recall one colleague from their planning process who remained in their position. A planner from Pierce

County (low-scoring) said *"leadership has changed a lot and there's been a lot of turnover in staff,"* and another planner from the same county also mentioned turnover and attributed it to shortages in funding. An emergency manager from Pierce County shared a similar view (*"there's always going to be a big turnover"*) and mentioned that newly hired staff *"didn't have a clue what a mitigation plan was."*

Interviewees tended to report satisfaction with the availability of *information* in the planning process (part of the *knowledge* element in capacity for joint action), although two individuals (one from Clark County and one from Snohomish, both high-scoring) noted that they had insufficient data on the *wildland-urban interface* (WUI), which has implications for wildfire mitigation planning, and two individuals from Snohomish County reported that they did not have enough data on tsunami inundation risk. State agencies may wish to devote resources towards refining and sharing data on these topics.

Responses were mixed regarding *horizontal diffusion*. An interviewee from Pierce County (low-scoring) described learning from previous work by Clackamas County, Oregon, as a shortcut: *"early on, I learned that that the FEMA mitigation standard is the standard, and…why reinvent the wheel."* The same interviewee also expressed the view that borrowing from another county's previous plan *"seemed like an efficient use of the grant dollars that we had."* In contrast, some interviewees pushed back on the idea of adopting strategies from other jurisdictions' prior plans. For example, an emergency manager from Clark County (high-scoring) explained that, although they communicated with hazard planning professionals in nearby Oregon, *"it was more kind of in unofficial capacities with the other planners and coordinators, just kind of finding what we found, or what we were learning about more of the planning process, and not about what we were putting into the plan."* However, another respondent (a planner) from Clark County described referencing strategies from King County's plan. These

examples – showing mixed results for horizontal diffusion, in high- and low-scoring counties – fail to provide support for H3 (that horizontal diffusion leads to better plans).

In some cases, interviewees' views towards adopting other jurisdictions' strategies pertained to their perceived similarities or differences in terms of physical vulnerability. For example, a planner from King County (high-scoring) explained that other jurisdictions' action items *"didn't fit specifically for what we were looking at… we're fortunate to be in an area that doesn't have as many topographical hazards."* A planner from Island County (high-scoring) described having looked at other counties' plans but observing physical differences in vulnerability, due to the other counties' locations in mainland WA. On the other hand, an emergency manager from King County's neighbor Snohomish (also high-scoring) explained, *"We have looked at King County's [plan] in the past, and some of their information is relevant to ours; for instance, the Tolt River Reservoir is in King County… if that dam fails, it flows into Snohomish County,"* although this interviewee stated that the similarity in vulnerability did not lead Snohomish to adopt specific action items from King ("*it's not so much that we look to them as a resource, so much as trying to coordinate our information*"). Similarly, a planner from Walla Walla County (low-scoring) recalled looking at plans from nearby counties in eastern WA due to similar hazard vulnerabilities, although they could not recall specific examples of strategies that they adopted from those plans.

Descriptions of *vertical diffusion* occurred in counties with both high- and low-scoring plans and indicated that diffusion processes were *top-down* (i.e., from higher levels of government to counties), as well as *bottom-up* (i.e., from lower levels to counties). As examples of top-down diffusion, an interviewee from Douglas County (low-scoring) described integrating geological hazard data from the state-level Department of Natural Resources, and an individual from Island County (high-scoring) referred to templates from the state's Emergency Medical

Services. As an example of bottom-up diffusion, an interviewee from Clark County (high-scoring) mentioned adopting action items (e.g., home elevation) from the City of Snoqualmie's prior HMP, since these items were seen as successful in garnering federal grants (thus also implying a top-down effect). While my interviews suggest that vertical diffusion occurred, they do not necessarily demonstrate that vertical diffusion resulted in better plans, contrary to H4.

The inductive theme of *challenges* helps to answer my overarching research question by identifying factors that may inhibit plan quality. Within this theme, *participation* (or lack thereof) emerged as an issue for interviewees from counties with low-scoring plans, even though it was not part of the original interview guides. This issue also pertains to the study's objective of assessing principled engagement, given that balanced representation is needed in carrying out this collaborative dynamic. An interviewee from Douglas County, for example, elaborated on the dearth of citizens in their process: *"it tends to be difficult to get people involved in something like that unless they feel, for example, that their property rights are being infringed on…something in their backyard that's exciting them or revving them up."* Another interviewee from Douglas County recalled sending a survey to property owners and businesses to request their input on the goals of the HMP, although response was low, and the interviewee did not recall incorporating feedback from the survey into the plan document. Members of the public attended planning meetings in Walla Walla County, but the two interviewees from this county indicated that the citizen attendees did not provide input for the plan; one interviewee stated that the meetings "*did not get a very good turnout*" and that for members of the public, the HMP was "*not at the top of their minds, or they may not think that there's a significant risk*." The same interviewee contrasted the hazard mitigation planning process with the county's general land use planning, explaining that "*when we do get turnout [for land use planning], it's usually because there's some specific development proposal that's right next-door, or going to impact them in a tangible*

and immediate way." An interviewee from Pierce County suggested that increasing participation might help to generate ideas about affordable planning strategies: *"When you get local momentum going upward instead of a top-down thing, I think that really helps, 'cause people are really creative and innovative, they can find solutions without a lot of money."*

Interviewees from counties with high-scoring plans (which tended to have greater economic capacity than counties with low-scoring plans, as determined in Chapter 2) similarly brought up the absence of citizens and perceived that their plans would have turned out better with citizen input. For instance, an interviewee from King County noted that, despite planners' efforts to promote public meetings, *"the public finds these arcane government processes to be boring, and it's hard for them to see how they're relevant to them"* and that if the public were more involved, *"we'd have a better plan."* An interviewee from Snohomish County had a similar view: *"if you're not talking to people that already have a vested or high interest in emergency management and hazard reduction… people just aren't terribly interested,"* and another interviewee from Snohomish said, *"the people [that the plan] actually really, really affects in the long run didn't really participate… they're busy milking the cows."* An interviewee from Snohomish also expressed the view that citizens' apathy towards hazard planning played a role in elected officials' lack of support for the planning efforts, since citizens complained to their elected officials about more immediate issues, such as potholes and homelessness, rather than natural hazards. An interviewee who was involved in the Snohomish County plan had also worked on a city-level HMP (for Everett, WA) and mentioned that, in contrast to the county, the city had successfully incorporated citizens' perspectives through a *storytelling* approach; the interviewee suggested that this might be effective in future planning efforts at the county level, as well.

In some cases, the challenge of participation extended beyond citizens to entire districts or agencies that were missing from the hazard planning process. For example, an interviewee from Walla Walla County (low-scoring) explained, *"there's [a] school district in our county that is the second largest school district, and we gave them an opportunity, reached out to them multiple times, and then they never showed up."* In the event of a disaster, missing entities such as this may benefit from countywide mitigation strategies (e.g., building codes), yet they may also suffer from insufficient attention to their specific needs, since they did not contribute their expertise or perspectives to the planning process.

Discussion

Missing stakeholders

Even though interviews uncovered some evidence of collaborative dynamics, data also suggest a disconnect between citizens and their counties' HMPs. The reported absence of citizens and other types of stakeholders raises concerns about some planning groups' ability to carry out principled engagement in preparing the plans, since this collaboration dynamic relies on balanced representation (Emerson and Nabatchi 2015). Furthermore, the incomplete participation may have implications for the plans' implementation (Pearce 2003) and long-term effectiveness in reducing communities' losses. Increasing participation has the potential to foster and strengthen *networks* (Newig et al. 2018), which can support implementation by bringing together participants' knowledge and capacities, and networks appear particularly important in light of the resource constraints and staff turnover that interviewees described. Although sample size was small for this item, survey results suggest that the absence of citizens might be more prevalent in *externally* prepared plans (i.e., by a hired consultant) than internally prepared plans (i.e., by county staff). This observation further supports the argument from Chapter 1 that external plans follow a consultant's template, rather than fully addressing a community's local

needs, with potential threats to the plans' implementation. The discussion that follows will address participation research and limitations thereof, along with offering recommendations for practitioners who aim to increase participation in their planning processes.

The challenge of incorporating citizen participation in hazard planning is not unique to the county HMPs described in this paper. Although this study did not interview citizens directly, previous literature (regarding HMPs, as well as hazard mitigation elements of comprehensive plans) suggests that many citizens "view hazard mitigation as a technical program with little salience to their needs" (Godschalk 2003, p. 140). In case studies of hazard mitigation policies within county-level comprehensive plans from the states of WA and Florida, Godschalk et al. (2003) found that "citizens generally felt that they lacked the ability to provide input on issues related to engineering and building codes," and that "public participation was motivated by concrete concerns and here-and-now issues, such as neighborhood protection from unwanted land uses or relief from traffic congestion" (p. 751). Additionally, Berke et al. (2012) found that WA's state-level HMP (which is expected to provide guidance to counties), showed moderately low participation relative to other coastal states' HMPs. Theoretically, if the state were to strengthen its approaches to participation, they could diffuse vertically down to county-level planning processes.

Citizen involvement is also important in *climate change adaptation*, in order to avoid perpetuating the notion that adaptation is a top-down "elite project" (Dolšak and Prakash 2018, p. 2.18). By incorporating diverse stakeholders' perspectives, hazard mitigation planning (with regard to floods, for example) could potentially serve as an entry point for local governments to garner citizen support for broader climate change adaptation. Hazard planning professionals seeking to incorporate climate change adaptation may wish to work with *boundary organizations* (e.g., consultants; non-profit groups) that help to communicate between scientists and

practitioners, as practitioners may find that their information needs are not directly met by scientists (Graham and Mitchell 2016; Guston 2011; Tribbia and Moser 2008). Such an arrangement could potentially reduce the type of disagreement that an interviewee from Clark County mentioned, stemming from stakeholders' perceptions of insufficient data on climate change. In that example, Clark County did hire a consulting firm, and while private firms have the potential to serve as boundary organizations (as noted by Graham and Mitchell [2016]), it is not clear from the data whether the firm working for Clark County functioned as such. Also, given that 14 survey respondents indicated that non-governmental organizations were missing from their planning processes, these organizations could potentially be added to fill the role of boundary organizations.

Strategies for increasing participation

Godschalk et al. (2003) provide several recommendations for raising citizen interest in hazard mitigation. Their ideas include creating targeted education programs (concentrating on specific hazards and population groups); coordinating HMPs with comprehensive plan elements and ensuring that both types of plans are updated regularly; connecting mitigation policies with citizens' concerns regarding quality of life; and crafting plans for small areas that have significant hazard vulnerabilities (as citizens may relate to neighborhood-scale efforts). Although these strategies were proposed in the context of comprehensive plans, they could be helpful for HMPs as well. While the study at hand did not provide direct evidence that citizens were not interested in hazard planning, it did show planning professionals' perceptions that citizens were more concerned about other topics (e.g., their property rights). Moving forward, hazard planning professionals and scholars in WA may wish to focus efforts on working directly with citizens in identifying the issues that are most important to them; these issues could then be prioritized and connected with hazard mitigation strategies (e.g., protecting property) to foster citizens' buy-in.

Hazard planning professionals could also incorporate lessons from the typology of coproduction (Nabatchi et al. 2017), which describes public services and policies that are produced by a combination of both government professionals and laypeople. This typology involves three levels (individual, group, and collective) and four phases of the service cycle (commissioning, design, delivery, and assessment). In the case of hazard mitigation planning, this type of approach could include promoting ongoing citizen involvement after the plans have been written – through a co-assessment phase – and could aid in the implementation and monitoring of the HMPs.

Another potential strategy for enhancing participation is to facilitate *storytelling*, as mentioned by an interviewee. This notion is supported by literature, as well; for instance, Crow and Jones (2018) delve into the Narrative Policy Framework and point out that citizens may share compelling stories, concerning "policy effects, societal problems that must be solved, and the impacts of political decisions on their everyday lives" (p. 230). Also, empirical evidence from Jones and Song (2014) indicates that stories can influence cognition with regard to climate change. Hazard mitigation planning groups could consider integrating storytelling into their planning processes as a means of learning about key concerns in their communities and amplifying citizens' voices, as well as improving education and outreach.

Past experience with natural hazards may also influence planning groups' efforts to involve citizens in mitigating future hazards. Albright and Crow (2013) studied communities in Colorado and found that those with the most severe flood damage were motivated to initiate new participatory processes (e.g., public advisory committees), even though the same communities were the most resource-constrained. Counties in WA, including those that appeared to have relatively low capacity for joint action, might similarly be able to learn from their losses and take into account citizen perspectives to help prevent future damage. However, hazard planning

professionals should note that the public's attention may only last for a short window of opportunity after a disaster (i.e., focusing event; Prater and Lindell 2000).

Conclusion

In summary, although this study found qualitative evidence of some indicators of collaborative dynamics and diffusion, it also presented data showing that important stakeholders were missing from county-level hazard mitigation planning processes in WA. This finding suggests that the participants in the planning processes may have faced challenges regarding principled engagement (speaking to RQ1), with potential consequences for the resultant HMPs and their implementation. Low citizen participation is consistent with many previously reported planning processes and efforts to engage in collaborative governance. A suite of strategies is available to emergency managers and planners who wish to increase participation, which may, in turn, help to support hazard mitigation and climate-resilient communities.

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Appendix A. Plan quality coding protocol *(continued on next pages)*

Title of Plan:	
Organization that prepared document:	
Date adopted:	
Date of most recent plan update:	

Hazards evaluated (yes or no)

Avalanche	
Dam/Levee Failure	
Drought	
Earthquake	
Flood	
Landslide	
Severe Storm	
Tsunami/Seiche	
Volcano	
Wildfire	
Others (specify)	

Name of coder:	
Date coded:	
Time spent coding:	

Coding categories:

0 = not mentioned in plan

1 = no detailed coverage

2 = detailed coverage of topic in plan

Items		Score	Page No. Reference	Comment
Vision Statement (0 – No mention, 1 – mentioned, 2 – described in detail)				
1. Problem description	1.1 Description of community and historical hazard threats			2- only if community profile and the hazards situation are both discussed; 1- if partly or obliquely mentioned
	1.2 Description of the local hazard's impact on the entire			1- if there is only a mention of relationship with state; 2- if the nature of relationship and

				consequences are discussed
	1.3 Current or potential hazards issues			1- a mere mention of issue; 2- a more detailed discussion of hazard issues
2. Vision	2.1 A statement identifying an overall image of sustainable and hazard resilient community			2- only if the statement seems holistic and satisfactory
	2.2 General goals and objectives			1- if goals are not followed with objectives or reasoning; 2- if the goals and objectives seem comprehensive and holistic
Fact Base (0 – No data, 1 – some data, 2 – detailed data/satisfactory data)				
3. Hazard Identification	3.1 General description of projected growth and population			0- no data, 1- some data, 2- detailed data/satisfactory data
	3.2 Descriptions of natural hazards			
	3.3 Prioritization of mitigating hazards			2- describes which hazard should have priority for mitigation as low, medium, and high priority; 1- mentions only hazard threats, does not mention priority; 0- not mentioned
	3.4 Delineation of natural resource			1- resource areas are mentioned and identified (they exist), includes poor quality maps; 2- areas are mapped legibly
4. Vulnerability Assessment	4.1 Identifies all hazards to the study area			2- describes the county's vulnerability to all of the identified hazards; 1- only for some hazards
5. Emergency Management	5.1 Emergency shelter demand and capacity data			2- estimate of shelter demand and capacities; 1- one of the above is missing; 0- no estimates
	5.2 Evacuation clearance time data			2- details of methodology and

				the final estimates; 1- one of the above is missing
	5.3 Location of emergency shelter			2- only if mapped location of shelters along with designation (nuclear, general, etc.)
Planning Process				
6. Description	6.1 General description of the process to develop a plan			2- how the planning team was formed, how the team members were involved, and how the plan was prepared; 1- just a mention of the process
7. Proposed participation techniques in proposed actions	7.1 Formal public hearings			2- when, how, where, and why the hearings happened; 1- just mentioned
	7.2 Open meetings			2- when, how, where, and why the open meeting was held; 1- just mentioned
	7.3 Workshops or forum			2- when, how, where the forum was organized and who participated; 1- just mentioned
	7.4 Call-in hot lines			2- yes, with data on usage; 1- yes but no details
	7.5 Citizen advisory committees			2- yes with details; 1- yes, but no details
	7.6 Household surveys			2- when and how they conducted the survey, and what kind of questionnaire; 1- just mentioned
	7.7 Interviews with key stakeholders			2- who was interviewed as key stakeholders, what and why are they interviewed; 1- identified but not detailed
Mitigation Goals & Objectives (0- not mentioned, 1- just mentioned, 2- mentioned with some detail)				
8. Economic impacts	8.1 Any goal to reduce losses or protect from loss			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects

	8.2 Any goal to minimize fiscal impacts of hazards			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	8.3 Any goal to distribute hazard mitigation cost equitably			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
9. Physical and environmental impact	9.1 Any goal to reduce hazard impacts on and preserve open space and recreation areas			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	9.2 Any goal to reduce hazard impacts on and maintain good water quality			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	9.3 Any goal to reduce hazard impacts on and protect wetlands/forests (critical natural areas)			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
10. Public interest	10.1 Any goal to protect safety of population			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	10.2 Any goal to promote hazard awareness program or improve information exchange			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	10.3 Any goal to use available resources efficiently			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	10.4 Any goal to improve preparedness and response to hazard			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	10.5 Any goal to promote partnership with other agencies			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
Inter-organization coordination & capabilities (0- not mentioned, 1- mentioned, 2- identified with detail)				

11. Cooperation	11.1 Identification of other govt. organizations			2- identify all levels (federal, state and other local governments), 1- mention some of them
	11.2 Identification of representatives			2- mention specific names or titles of representatives
	11.3 Identification of other stakeholders			Other stakeholders include interested parties such as business industry, professional associations, non-profit groups and community representatives (neighborhood groups)
	11.4 Identification of representatives for each of above			2- mention specific names or titles of representatives
	11.5 Consistency with state plan/ state mitigation plan			2- mentioned with detail
	11.6 Integration with other local comprehensive plan			1- just describes the existing plans; 2- describes the existing plans and then describes how they consolidated the actions from other plans and what actual actions result from integration
	11.7 Integration with FEMA mitigation programs and initiatives (for example, Flood Mitigation Fund)			1- just describe the existing programs and initiatives; 2- describe the existing programs and then describe how they consolidated the actions from other programs and what actual actions result from integration
	11.8 Integration with other independent governments such as Municipal Utility Districts and Independent School Districts			1- just mention other independent governments; 2- describe other independent governments and describe how they will integrate with them (includes any

				other special districts)
	11.9 Intergovernmental agreements			2- identified with sufficient detail; 1- just mentioned or need identified
12. Information sharing on the planned actions	12.1 Brochures or other literature			2- yes, with details of steps taken for higher efficacy; 1- yes
	12.2 Newsletters			2- yes, with details of steps taken for higher efficacy; 1- yes
	12.3 TV			2- yes, with details of steps taken for higher efficacy; 1- yes
	12.4 Video			2- yes, with details of steps taken for higher efficacy; 1- yes
	12.5 Internet (e.g., social media, website)			2- yes, with details of steps taken for higher efficacy; 1- yes
13. Capacity Development	13.1 Funding sources for citizen participation and cooperation with other organizations			2- identified with fund availability; 1- mention of sources
	13.2 Staffing levels (FTE, part time staff, etc.)			2- includes technical, advisory and administrative staff; 1- just a simple estimation or identification of need
	13.3 Joint database			2- describes what kind of database (for example, GIS), purpose, and the process through which the database was developed; 1- identifies the need of creating a joint database
	13.4 Technical assistance to other organization or citizen			2- kind of assistance along with access details; 1- identification of the need/ just mention
14. Conflict Management Strategy	14.1 Specification of conflict management			2- details of conflict resolution procedures along with identification

	procedures and processes			or responsible organization/agency; 1- identification of the need
Specific Mitigation Policies & Actions (0- no mention, 1- mention, 2- specific details – when/where/how)				
15. General Policy	15.1 Discourage development in hazardous areas			2- identifies areas with maps/locations; 1- identifies the need
	15.2 Support adoption of new regulatory legislation at local level			2- mentions what legislation; 1- identifies/ mentions the need to do so
16. Regulatory tool	16.1 Permitted land use			2- identifies areas with maps/locations; 1- identifies the need
	16.2 Low density conservation or other hazard zone			2- identifies areas with maps/locations; 1- identifies the need
	16.3 Overlay zone with reduced density provisions			2- identifies areas with maps/locations; 1- identifies the need
	16.4 Down zoning of floodplains			2- identifies areas with maps/locations; 1- identifies the need
	16.5 Dedication of open space for hazards			2- identifies areas with maps/locations; 1- identifies the need
	16.6 Policy to locate public facilities in zone not subject to hazards			2- identifies areas with maps/locations; 1- identifies the need
	16.7 Transfer of development rights			2- identifies areas with maps/locations; 1- identifies the need
	16.8 Cluster development			2- identifies areas with maps/locations; 1- identifies the need
	16.9 Setbacks			2- identifies areas with maps/locations; 1- identifies the need
	16.10 Site plan review			2- identifies areas with maps/locations; 1- identifies the need
	16.11 Special study/impact			2- identifies areas with maps/locations;

	assessment for development in hazard zones			1- identifies the need
	16.12 Building standards/building code			2- identifies areas with maps/locations; 1- identifies the need
	16.13 Land and property acquisition			2- identifies areas with maps/locations; 1- identifies the need
	16.14 Impact fees			2- identifies areas with maps/locations; 1- identifies the need
	16.15 Retrofitting of private structures			2- identifies areas with maps/locations; 1- identifies the need
	16.16 Separate hazard mitigation plan			2- identifies areas with maps/locations; 1- identifies the need
	16.17 Relocation of structures out of hazard zones			2- identifies areas with maps/locations; 1- identifies the need
17. Incentive-based tool	17.1 Tax abatement for using mitigation			2- identifies areas with maps/locations; 1- identifies the need
	17.2 Density bonus			2- identifies areas with maps/locations; 1- identifies the need
	17.3 Low interest loans			2- identifies areas/ population groups where it is required; 1- identifies the need
	17.4 Participation in National Flood Insurance Program (NFIP)			2- identifies areas with maps/locations; 1- identifies the need
	17.5 Join CRS (Community Rating System)			2- identifies areas with maps/locations; 1- identifies the need
18. Structural tool	18.1 Levees			
	18.2 Seawalls			
	18.3 Riprap			
	18.4 Bulk heads			
	18.5 Detention ponds			
	18.6 Channel maintenance			

	18.7 Wetland restoration			
	18.8 Slope stabilization			
	18.9 Storm water management			
	18.10 Maintenance of structures			
19. Awareness/ Educational tool	19.1 Educational Awareness			
	19.2 Real Estate Hazard Disclosure			
	19.3 Disaster warning and response program			
	19.4 Posting of signs indicating hazardous areas			
	19.5 Technical assistance to property owners for mitigation			
	19.6 Maps of areas subject to hazards			
	19.7 Inclusion of floodplain boundaries			
	19.8 Education and training in several languages			
	19.9 Hazard information center			
20. Public Facilities and Infrastructure	20.1 Capital Improvements Plan			
	20.2 Retrofitting public structure			
	20.3 Retrofitting critical facilities			
21. Recovery Planning	21.1 Land use change			
	21.2 Building design change to meet enhanced safety standards			
	21.3 Moratorium			
	21.4 Recovery organization			
	21.5 Private acquisition			
	21.6 Financial recovery			
22. Emergency Preparedness	22.1 Evacuation			
	22.2 Contingency plan			
	22.3 Preparedness plan			

	22.4 Require emergency plans			
	22.5 Purchasing rescue materials			
23. Natural Resource Protection	23.1 General description of best management practice			
	23.2 Forest and vegetation management in riparian areas			
	23.3 Sediment and erosion control regulations			
	23.4 Stream dumping regulations			
	23.5 Urban forestry and landscape			
Implementation (0- no mention, 1- mention, 2- mention with sufficient details)				
24. Implementation	24.1 Description of implementation process			
	24.2 Identification of process for prioritizing assistance to local governments			
	24.3 Clear designation of responsibility for implementation			
	24.4 Provision of technical assistance for implementation			
	24.5 Identification of costs for implementation			
	24.6 Identification of funding sources			
	24.7 Provision of sanctions			
	24.8 Clear time-table for implementation outlined			
	24.9 Enforcement specified			
25. Evaluation, Updating, and Monitoring	25.1 Description of the overall evaluating, updating, and monitoring process			2- Description of overall process and concrete time schedule for the update, evaluation, and monitoring

	25.2 Identification of participants in the evaluating process			
	25.3 Clear designation of responsibility for evaluating, updating, and monitoring process			
	25.4 Evaluation of funded mitigation projects			

Appendix B. County data considered in assigning peer groups. *W/E* refers to location (western or eastern WA), and *R/U* refers to rural or urban counties. At a minimum, each county within an assigned peer group shares the same characteristics for both of these categories, with the exception of Garfield, a rural county that is grouped with urban counties because it participated in a combined plan with two urban counties. *Legal* refers to each county's status regarding comprehensive planning, under the state's Growth Management Act. Results of the 2016 U.S. presidential election are used as a proxy for *political* views. *Income* is reported by median household (in U.S. dollars). *Education* was derived from the percentage of population age 25 and above holding bachelor's or higher degree (1 is lowest; 4 is highest). *Staff* refers to the number of county-level emergency management staff indicated in each HMP.

County	**Group**	**W/E**	**R/U**	**Legal**	**Political**	**Income**	**Education**	**Staff**
King	1	W	U	mandated	Clinton	80,998	4	3
Pierce	1	W	U	mandated	Clinton	59,566	3	8
Skagit	1	W	U	mandated	Clinton	56,322	3	2
Snohomish	1	W	U	mandated	Clinton	75,292	3	4
Whatcom	1	W	U	mandated	Clinton	54,522	3	1
Kitsap	1	W	U	mandated	Clinton	65,156	3	2
Thurston	1	W	U	mandated	Clinton	61,676	3	2
Clallam	2	W	R	mandated	Trump	46,241	3	2
Jefferson	2	W	R	mandated	Clinton	52,887	4	1
Mason	2	W	R	mandated	Trump	53,633	2	4
Island	2	W	R	mandated	Clinton	59,961	3	1
San Juan	2	W	R	mandated	Clinton	59,260	4	2
Grays Harbor	2	W	R	critical areas	Trump	43,902	1	1
Lewis	2	W	R	mandated	Trump	47,143	1	2
Pacific	2	W	R	opting	Trump	40,677	1	3
Clark	3	W	U	mandated	Clinton	63,639	3	5
Cowlitz	3	W	U	critical areas	Trump	49,997	1	2
Skamania	3	W	U	critical areas	Trump	53,196	2	2
Chelan	4	E	U	mandated	Trump	53,068	3	2
Douglas	4	E	U	opting	Trump	50,886	2	n/a
Grant	5	E	R	mandated	Trump	50,067	1	4
Kittitas	5	E	R	opting	Trump	46,904	3	1
Lincoln	5	E	R	critical areas	Trump	49,276	2	1
Okanogan	5	E	R	critical areas	Trump	41,426	2	2
Whitman	5	E	R	critical areas	Clinton	43,379	4	2
Pend Oreille	6	E	U	opting	Trump	41,111	2	1
Spokane	6	E	U	mandated	Trump	48,189	3	1
Stevens	6	E	U	opting	Trump	42,417	2	1
Yakima	7	E	U	mandated	Trump	46,422	1	n/a
Asotin (A), Columbia (C), Garfield (G)	7	E	U (*A*, *C*); R (*G*)	critical areas (*A*); opting (*C*; *G*)	Trump (all 3)	46,107 (*A*), 39,807 (*C*), 46,616 (*G*)	2 (*A*), 3 (*C*; *G*)	4
Benton	7	E	U	opting	Trump	62,071	3	n/a
Franklin	7	E	U	opting	Trump	57,664	1	1
Walla Walla	7	E	U	opting	Trump	49,619	3	3

Appendix C. Survey questionnaire *(continued on next pages)*

Introductory statement: Thank you for taking this survey. I will be asking about your perspectives towards the hazard mitigation planning process of a county in Washington State. The goal of this research is to gather information that could help emergency managers and planners. Your responses are anonymous and confidential, and you may choose to skip questions (although answering all of them would be very helpful). The survey takes about 15 minutes. On a mobile device, the survey looks best when the device is turned sideways.

(1) Did you have a role in a county's hazard mitigation planning process in Washington State? *(yes/no)*
   a. *(if yes)* Which county? (if you were involved in more than one county, please choose the one where you spent the most time working on hazard planning) *[dropdown menu with list of counties]*
   b. *(if yes)* What was your role? *(open-ended)*
   c. *(if yes)* During what part of the process were you involved? *(answer choices:* towards the beginning; throughout the entire process; towards the end*)*
   d. *(if no)* Thank you for your time; however, this survey is intended for people who were directly involved in a county's hazard mitigation planning process. Could you please suggest 1 or more people who were involved, along with their email address(es) if possible? *(open-ended; then end survey)*

<u>For the following statements, please indicate the extent to which you agree or disagree (if at all).</u>
Questions 2-5 were followed by Likert-scale options: strongly disagree, somewhat disagree, neither disagree nor agree, somewhat agree, strongly agree.

(2) The hazard planning process – from start to finish – involved *all of the stakeholders* (i.e., all of the people and groups that have a significant interest in the issues and outcome).
   a. *(if disagree)* Who was missing from the planning process? *(please check all that apply)*
      - local agency/agencies
      - special district(s)
      - non-governmental organization(s)
      - state agency/agencies
      - federal agency/agencies
      - other *(open-ended)*
   b. *(if disagree)* Could you provide any further details about who was missing from the planning process? For example, if you indicated "local agency/agencies," which one(s)? *(open-ended)*

(3) Representatives of different partner organizations agreed – from the beginning – about the *goals* of the hazard mitigation plan (Defining *partner organizations* as other agencies, businesses, or non-profit groups participating in a county's hazard planning process).

(4) The planning process was contentious.
   a. *(if agree)* You mentioned that the planning process was contentious. Did that inhibit your ability to learn from others? *(yes/no)*

(5) All of the partner organizations had *access to information* that was relevant to the hazard planning process.

(6) Were you specifically involved in *writing the county's hazard mitigation plan document*? *(yes/no/other [open-ended])*

a. *(if yes, continue to question 7)*
b. *(if no or other, skip to question 20)*

(7) During the process of writing your county's plan, did you **search for information from any of the following sources**? *(please check all that apply)*
- o federal government (e.g., FEMA)
- o state government(s) (e.g., WA Emergency Management Division)
- o other county/counties (in either WA or another state)
- o other participant(s) in your county's planning process
- o smaller government(s) within your county (e.g., city)
- o consultant(s)
- o general online search (e.g., Google)
- o other *(open-ended)*

(8) Could you provide any further details about where you searched for information? For example, if you searched in other county plan(s), which county/counties? *(open-ended)*

(9) During the process of writing your county's plan, did you *adopt any strategies* from other county/counties? (These counties could be in WA or other states.) *[yes/no/other (open-ended)]*

a. *(if yes, continue to question 10)*
b. *(if no or other)* Although you did not mention adopting strategies from other counties, did you *adopt strategies from any other source(s)*? If so, could you mention any particular source(s), and what strategies you adopted from them? *(open-ended; then skip to question 20)*

<u>The next set of questions will ask about hazard planning strategies that you may have adopted from other counties.</u>

(10) During the planning process, did you adopt any of the following *general* strategies from other counties? *(please check all that apply)*
- o Discourage development in hazardous areas
- o Support adoption of new regulatory legislation at local level
- o Other *(open-ended)*

(11) During the planning process, did you adopt any of the following *regulatory* strategies from other counties? *(please check all that apply)*
- o Permitted land use
- o Low density conservation or other hazard zone
- o Overlay zone with reduced density provisions
- o Down zoning of floodplains
- o Dedication of open space for hazards
- o Policy to locate public facilities in zones not subject to hazards
- o Transfer of development rights
- o Cluster development
- o Setbacks
- o Site plan review
- o Special study/impact assessment for development in hazard zones
- o Building standards/building code
- o Land and property acquisition
- o Impact fees
- o Retrofitting of private structures
- o Separate hazard mitigation plan
- o Relocation of structures out of hazard zones

- Other *(open-ended)*

(12) During the planning process, did you adopt any of the following *incentive-based* strategies from other counties? *(please check all that apply)*
- Tax abatement for using mitigation
- Density bonus
- Low interest loans
- Participation in National Flood Insurance Program (NFIP)
- Join Community Rating System (CRS)
- Other *(open-ended)*

(13) During the planning process, did you adopt any of the following *structural* strategies from other counties? *(please check all that apply)*
- Levees
- Seawalls
- Riprap
- Bulkheads
- Detention ponds
- Channel maintenance
- Wetland restoration
- Slope stabilization
- Storm water management
- Maintenance of structures
- Other *(open-ended)*

(14) During the planning process, did you adopt any of the following *awareness/educational* strategies from other counties? *(please check all that apply)*
- General awareness
- Real estate hazard disclosure
- Disaster warning and response program
- Posting of signs indicating hazardous areas
- Technical assistance to developers or property owners for mitigation
- Maps of areas subject to hazards
- Inclusion of floodplain boundaries
- Education and training in several languages
- Hazard information center
- Other *(open-ended)*

(15) During the planning process, did you adopt any of the following *public facilities/infrastructure* strategies from other counties? *(please check all that apply)*
- Capital Improvements Plan
- Retrofitting public structure
- Retrofitting critical facilities
- Other *(open-ended)*

(16) During the planning process, did you adopt any of the following *recovery planning* strategies from other counties? *(please check all that apply)*
- Land use change
- Building design change to meet enhanced safety standards
- Moratorium
- Recovery organization
- Private acquisition
- Financial recovery

- Other *(open-ended)*

(17) During the planning process, did you adopt any of the following *emergency preparedness* strategies from other counties' plans? *(please check all that apply)*
- Evacuation
- Contingency plan
- Preparedness plan
- Require emergency plans
- Purchasing rescue materials
- Other *(open-ended)*

(18) During the planning process, did you *adopt any of the following* natural resource protection *strategies from other counties' plans*? *(please check all that apply)*
- General description of best management practice
- Forest and vegetation management in riparian areas
- Sediment and erosion control regulations
- Stream dumping regulations
- Urban forestry and landscape
- Other *(open-ended)*

(19) <u>You are almost finished with the survey.</u> Did you adopt strategies from other counties for any of the following reasons? *(please check all that apply*)
- The strategies were successful in mitigating hazards in the other county/counties.
- The strategies seemed normal because the other county/counties had already adopted them.
- The strategies could help your county to compete economically with the other county/counties.
- Other *(open-ended)*

(20) Lastly, would you be open to scheduling a follow-up interview?
   a. *(if yes)* Please provide your name and email address, so that I can contact you about possibly setting up an interview. *(open-ended)*

Closing statement: Thank you very much for your time. Your responses will be helpful in informing research and practice of hazard mitigation planning.

Appendix D. Number of survey respondents by county and percentage out of total respondents, after screening for responses that met the criteria for the target population (i.e., individuals who were involved in creating county-level HMPs in WA), along with the counties' respective plan quality scores.

County	***n***	**%**	**Plan quality score (out of 70.00)**
Asotin/Columbia/Garfield	3	1.80	42.43
Benton	1	0.60	42.41
Chelan	4	2.40	44.08
Clallam	6	3.59	44.70
Clark	14	8.38	54.00
Cowlitz	5	2.99	46.11
Douglas	1	0.60	37.46
Franklin	1	0.60	43.97
Grant	2	1.20	47.06
Grays Harbor	1	0.60	44.40
Island	5	2.99	49.90
Jefferson	4	2.40	48.96
King	14	8.38	54.41
Kitsap	8	4.79	47.82
Kittitas	5	2.99	45.92
Lewis	13	7.78	40.34
Lincoln	3	1.80	39.80
Mason	3	1.80	46.30
Okanogan	2	1.20	41.38
Pacific	5	2.99	52.68
Pend Oreille	1	0.60	42.03
Pierce	1	0.60	36.77
San Juan	1	0.60	35.01
Skagit	6	3.59	50.21
Skamania	2	1.20	41.43
Snohomish	22	13.17	53.81
Spokane	6	3.59	47.30
Stevens	6	3.59	45.21
Thurston	11	6.59	46.01
Wahkiakum	0	0.00	41.02
Walla Walla	3	1.80	37.43
Whatcom	4	2.40	41.46
Whitman	3	1.80	47.48
Yakima	1	0.60	43.86

Appendix E. Strategies that survey respondents reported having adopted from other counties **(**respondents could select more than one strategy in each category). Open-ended "other" included "Plan format/layout" (n = 1) and several ambiguous responses, such as "unknown." *(continued on next pages)*

General strategies adopted from other counties (n = 8):

Strategy	Frequency	Percentage
Discourage development in hazardous areas	5	62.50%
Support adoption of new regulatory legislation at local level	3	37.50%
Other	3	37.50%

Regulatory strategies adopted from other counties (n = 5):

Strategy	Frequency	Percentage
Permitted land use	1	20.00%
Low density conservation or other hazard zone	1	20.00%
Overlay zone with reduced density provisions	1	20.00%
Down zoning of floodplains	0	0.00%
Dedication of open space for hazards	0	0.00%
Policy to locate public facilities in zones not subject to hazards	1	20.00%
Transfer of development rights	1	20.00%
Cluster development	0	0.00%
Setbacks	0	0.00%
Site plan review	0	0.00%
Special study/impact assessment for development in hazard zones	0	0.00%
Building standards/building code	2	40.00%
Land and property acquisition	0	0.00%
Impact fees	1	20.00%
Retrofitting of private structures	0	0.00%
Separate hazard mitigation plan	1	20.00%
Relocation of structures out of hazard zones	0	0.00%
Other	2	40.00%

Incentive-based strategies adopted from other counties (n = 3):

Strategy	Frequency	Percentage
Tax abatement for using mitigation	1	33.33%
Density bonus	0	0.00%
Low interest loans	0	0.00%
Participation in National Flood Insurance Program (NFIP)	1	33.33%
Join Community Rating System (CRS)	0	0.00%
Other:	1	33.33%

Structural strategies adopted from other counties (*n* = 5):

Strategy	Frequency	Percentage
Levees	3	60.00%
Seawalls	1	20.00%
Riprap	1	20.00%
Bulkheads	0	0.00%
Detention ponds	2	40.00%
Channel maintenance	2	40.00%
Wetland restoration	1	20.00%
Slope stabilization	2	40.00%
Storm water management	2	40.00%
Maintenance of structures	3	60.00%
Other:	1	20.00%

Awareness/educational strategies adopted from other counties (*n* = 6):

Strategy	Frequency	Percentage
General awareness	5	83.33%
Real estate disclosure	0	0.00%
Disaster warning and response program	2	33.33%
Posting of signs indicating hazardous areas	0	0.00%
Technical assistance to developers or property owners for mitigation	0	0.00%
Maps of areas subject to hazards	2	33.33%
Inclusion of floodplain boundaries	2	33.33%
Education and training in several languages	1	16.67%
Hazard information center	0	0.00%
Other:	1	16.67%

Public facilities/infrastructure strategies adopted from other counties (*n* = 5):

Strategy	Frequency	Percentage
Capital Improvements Plan	2	40.00%
Retrofitting public structure	1	20.00%
Retrofitting critical facilities	4	80.00%
Other:	1	20.00%

Recovery planning strategies adopted from other counties (*n* = 3):

Strategy	Frequency	Percentage
Land use change	1	33.33%
Building design change to meet enhanced safety standards	0	0.00%
Moratorium	0	0.00%
Recovery organization	1	33.33%
Private acquisition	1	33.33%
Financial recovery	0	0.00%
Other:	2	66.67%

Emergency preparedness strategies adopted from other counties (*n* = 5):

Strategy	Frequency	Percentage
Evacuation	3	60.00%
Contingency plan	3	60.00%
Preparedness plan	2	40.00%
Require emergency plans	2	40.00%
Purchasing rescue materials	1	20.00%
Other:	1	20.00%

Natural resource protection strategies adopted from other counties (*n* = 4):

Strategy	Frequency	Percentage
General description of best management practice	3	75.00%
Forest and vegetation management in riparian areas	2	50.00%
Sediment and erosion control regulations	2	50.00%
Stream dumping regulations	0	0.00%
Urban forestry and landscape	0	0.00%
Other:	1	25.00%

Appendix F. Data used for independent variables in multilevel model. CJA is capacity for joint action, and PE is principled engagement (averaged from Likert-scale survey responses). For ease of model interpretation, economic capacity is reported in tens of thousands of U.S. dollars; peers' experience and past experience are measured in tens of millions of dollars.

County	**CJA**	**PE**	**State HMP**	**Cross-walk**	**Physical risk**	**Plan updates**	**Peers' experience**	**Past experience**	**Economic capacity**
Asotin, Columbia, Garfield	4.33	4.17	1	1	1.67	1	80.17	4.27	11.20
Benton	5.00	3.50	0	1	2.00	1	82.19	2.26	7.00
Chelan	4.50	4.38	1	1	4.00	2	23.61	48.80	6.00
Clallam	4.50	4.25	0	0	4.00	2	159.08	26.11	8.12
Clark	4.64	4.18	1	1	4.00	2	1343.79	23.96	12.88
Cowlitz	4.60	4.40	1	1	4.00	2	984.20	383.55	11.50
Douglas	3.00	3.50	1	1	3.00	2	48.80	23.61	4.00
Franklin	2.00	3.00	1	1	2.00	2	79.62	4.83	2.91
Grant	4.50	4.00	1	1	3.00	2	72.78	4.88	5.00
Grays Harbor	5.00	4.50	1	1	4.00	2	157.13	28.05	17.50
Island	3.60	3.60	1	1	4.00	2	178.61	6.57	15.00
Jefferson	3.50	3.63	1	1	3.00	2	157.13	28.06	11.68
King	4.14	3.54	1	1	5.00	3	325.73	266.82	77.20
Kitsap	3.75	4.00	1	1	3.00	2	561.49	31.06	0.00
Kittitas	3.80	3.80	1	1	3.00	1	66.71	10.94	27.15
Lewis	4.08	3.64	1	1	5.00	3	147.42	37.76	0.00
Lincoln	4.33	3.67	1	1	1.00	1	70.41	7.25	8.50
Mason	4.67	4.33	1	1	3.00	2	155.66	29.52	13.45
Okanogan	3.50	2.50	1	1	5.00	1	24.83	52.83	0.00
Pacific	4.00	3.70	1	1	4.00	2	160.14	25.05	6.00
Pend Oreille	5.00	5.00	1	1	1.00	2	8.99	1.30	7.33
Pierce	2.00	2.50	0	1	5.00	2	479.43	113.12	51.54
San Juan	3.00	4.00	0	0	2.00	0	181.11	4.07	5.10
Skagit	3.71	3.79	1	1	5.00	3	575.74	16.81	11.28
Skamania	5.00	3.75	1	0	5.00	1	407.51	960.24	5.40
Snohomish	4.05	3.77	1	1	4.00	3	564.17	28.38	45.00
Spokane	4.50	4.50	1	1	1.00	2	2.71	7.58	55.00
Stevens	4.50	3.92	1	1	2.00	1	8.89	1.41	8.24
Thurston	4.73	4.18	1	1	4.00	1	466.94	125.61	53.50
Walla Walla	4.67	3.50	1	1	2.00	2	64.18	20.26	5.00
Whatcom	4.00	4.25	1	1	5.00	2	581.80	10.75	0.00
Whitman	4.00	4.17	1	1	1.00	1	75.90	1.75	13.49
Yakima	3.00	3.00	1	1	4.00	2	31.62	52.83	6.67

Appendix G. Interview guides *(continued on next pages)*

Interview Guide I (for subjects who previously took the survey)

Script: Hello, my name is Daniel Feinberg, and I am a graduate student at the University of Washington, focusing on how communities in Washington State are planning for natural hazards, such as earthquakes, floods, and wildfires. The purpose of my research is to understand the types of planning processes that can help to make communities safe. I am interested in following up on your survey responses and learning more about your experiences planning for hazards in [insert county name]. Your participation is voluntary and anonymous, and you may skip any questions that you do not wish to answer. Is it OK if I create an audio recording of our conversation so that I can transcribe it later?

(if yes, start recording)

(1) To start off, what was your role in creating the [insert county name] hazard mitigation plan?

For the next few questions, I am interested in your thoughts on your planning process and other participants in the process (such as representatives of government agencies, businesses, or non-profit groups, who may have come together to work on your county's hazard mitigation plan).

(2) How did you and the other participants decide on the goals of the hazard mitigation plan?

Potential probing questions for principled engagement (depending on response to question 2):

- How did the planning group decide what was *needed* in the plan?
- How did you and the other participants approach finding *solutions* to meet these needs?

(3) Could you describe how your planning process was managed or facilitated?

Potential probing questions for capacity for joint action (depending on response to question 3):

- Could you describe how any ground *rules* for the planning process were established?
- Could you describe the availability of *information* to you and other participants during the planning process?

(4) *(if survey response indicated that the planning process was contentious)* You mentioned on the online survey that the planning process was contentious. Could you tell me more about any contentious issues that came up during the process?

I have a few more questions, which relate to the planning strategies that you adopted from elsewhere *(question 5 will reference each subject's survey responses and will be followed by prompts as needed, focusing on learning, emulation, and competition, e.g., "What seemed to work well about that strategy?" "Did it help to prevent economic losses?" For survey responses that indicated a lack of diffusion, the interview questions will be adjusted, e.g., "Why did you* not *adopt strategies from other counties?").*

(5) Could you describe why you adopted the strategy of [strategy from survey response] from [other plan mentioned in survey response]?

(6) Given the kinds of questions that I have been asking, is there anything else that you would like to mention about the planning process?

(7) Lastly, could you please suggest any emergency managers or planners who contributed to the hazard planning process and who might be willing to help with my research?

Thank you very much for your time.

Interview Guide II (for subjects who did *not* take the survey)

Script: Hello, my name is Daniel Feinberg, and I am a graduate student at the University of Washington, focusing on how communities in Washington State are planning for natural hazards, such as earthquakes, floods, and wildfires. The purpose of my research is to understand the types of planning processes that can help to make communities safe. I am interested in learning about your experiences planning for hazards. Your participation is voluntary and anonymous, and you may skip any questions that you do not wish to answer. Is it OK if I create an audio recording of our conversation so that I can transcribe it later?

(if yes, start recording)

(1) To start off, did you have a role in a county's hazard mitigation planning process in Washington State?
if yes:

- Which county?
- What was your role?
- During what part of the process were you involved? *(continue below)*

if no: Thank you for your time; however, this interview is intended for someone who was directly involved in a county's hazard mitigation planning process. Could you please suggest 1 or more people who were involved, along with their email addresses if possible? *(end interview)*

For the next few questions, I am interested in your thoughts on your planning process and other participants in the process (such as representatives of government agencies, businesses, or non-profit groups, who may have come together to work on your county's hazard mitigation plan).

(2) How did you and the other participants decide on the goals of the hazard mitigation plan?
Potential probing questions for principled engagement (depending on response):

- How did the planning group decide what was *needed* in the plan?
- How did you and the other participants approach finding *solutions* to meet these needs?

(3) Do you remember any contentious issues that came up during the planning process?
if yes: Could you tell me more about how these issues were addressed?

(4) Could you describe how your planning process was managed or facilitated?
Potential probing question for capacity for joint action (depending on response):

- Could you describe how any ground *rules* for the planning process were established?

(5) Would you say that participants in the planning process were able to find all of the information that they needed, or can you think of any examples of information that was not available?

I just have a few more questions.

(6) Were you specifically involved in writing the county's hazard mitigation plan document?
if yes, continue to question 7.
if no, skip to question 9.

(7) During the process of writing your plan, where did you search for information? *(adapted from survey question)*
Potential probing questions for diffusion (depending on response to question 7):

- Did you search in a Washington State hazard mitigation plan? (*if yes:* Why?)

- Did you search in other counties' plans? (*if yes:* Which counties? Why?)
- Did you search online?
- Did you ask a consultant?
- Did you search in any other places?

(8) Did you adopt any strategies from other counties' plans? These counties could be in Washington or other states. *(adapted from survey question)*
if yes: Which counties? Which strategies? Why? *(followed by prompts as needed, focusing on learning, emulation, and competition, e.g., "What seemed to work well about that strategy?" "Did it help to prevent economic losses?")*

if no: Why not?

(9) Given the kinds of questions that I have been asking, is there anything else that you would like to mention about the planning process?

(10) Lastly, could you please suggest any emergency managers or planners who contributed to the hazard planning process and who might be willing to help with my research?

Thank you very much for your time.

Appendix H. Interview themes, descriptions, and types, as developed through hybrid coding

theme	description	type
principled engagement	interviewees' descriptions of discovery, definition, deliberation, and determinations (Emerson and Nabatchi 2015), including responses to the question "How did you and the other participants decide on the goals of the hazard mitigation plan?"	theory-driven (collaborative governance)
capacity for joint action	interviewees' descriptions of procedural and institutional arrangements, leadership, resources, and knowledge (Emerson and Nabatchi 2015), including responses to the question "Could you describe how your planning process was managed or facilitated?"	theory-driven (collaborative governance)
horizontal diffusion	interviewees' descriptions of searching for information from other jurisdictions at the same level of government (e.g., a county representative referring to another county; a city representative referring to another city), including responses to questions that specifically asked where they searched for information and whether they adopted strategies from those sources	theory-driven (policy diffusion)
vertical diffusion	interviewees' descriptions of searching for information from higher or lower levels of government (e.g., county representative referring to state resources), including responses to questions that specifically asked where they searched for information and whether they adopted strategies from those sources	theory-driven (policy diffusion)
challenges	interviewees' descriptions of barriers to productive planning: contentious issues; lack of participation; staffing problems (e.g., turnover; wearing several hats)	data-driven