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Opportunities and constraints to hazard mitigation planning

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A B S T R A C T

Hazard mitigation plans (HMPs) play a critical role in the reduction of societal loss from natural and human-caused hazards and disasters. The occurrence of hazardous events cannot be prevented but hazard mitigation planning when diligently applied has proven to be an effective tool for enhancing local community resilience and reducing societal losses. HMPs are planning documents that aim to increase community preparedness and resiliency, and decrease vulnerability in the event of a hazard. However, due to a variety of reasons many communities often fail to address criteria that could protect against future societal losses. For instance, minimum requirements, as stipulated by the Disaster Mitigation Act 2000, are all that is needed to qualify for federal mitigation grant funding regardless of plan quality or appropriateness of HMPs to local hazards and risks. Additionally local emergency managers and planners also face constraints like integration of HMPs into comprehensive plans and a standardized tool to evaluate plan quality. In essence most communities in the US have HMPs but lack a method of evaluating the quality and effectiveness of their plans for mitigating hazards. Building on the standard HMP minimum requirements, additional criteria established in prominent hazard literature, and information culled from interviews, this study develops an evaluation matrix to assess local HMP quality. Based on the factors mentioned above, researchers explored the opportunities and constraints to HMP development faced by jurisdictions within our Western Washington study area. Conclusions reveal that available resources, level of sophistication, and political complexities affect the quality of HMP development and the actual implementation of mitigation planning strategies.

Introduction

Society is vulnerable to natural hazards. Natural hazards, when intersected with populations and development, can result in natural disasters that may lead to loss of life, human suffering, devastating impacts to incomes and livelihoods, and loss or damage to property. The occurrence of natural hazard events cannot be prevented; however, impacts can be lessened and risks and vulnerability of affected populations and property can be minimized through proactive planning such as hazard mitigation planning (Burby, 1999; Burby, Deyle, Godschalk, & Olshansky, 2000; Cutter, Boruff, & Lynn Shirley, 2003; Frazier, Wood, & Yarnal, 2010; Godschalk, Beatley, Berke, Brower, & Kaiser, 1999; Wood, Church, Frazier, & Yarnal, 2007). Hazard mitigation planning (HMP) is comprised of pre-disaster measures aimed at minimizing or preventing losses and long-term risk to people and property from natural hazard events and their impacts with an overall goal of reducing a community's vulnerability and creating more hazard resilient communities (FEMA, 2008; Godschalk, 2003).

In the US, states and counties are required by the Federal Government to prepare HMPs in order to qualify for mitigation grant funding from the Federal Emergency Management Agency (FEMA). The Disaster Mitigation Act of 2000 (DMA) institutionalized hazard mitigation planning as a model process, a requirement for receipt of federal hazard mitigation grant funds for local governments, and to receive an increase of Federal post-disaster recovery funds (Berke, Song, & Stevens, 2009; Godschalk, 2003). The Disaster Mitigation Act establishes minimum requirements that focus on physical exposure and the identification of relevant mitigation actions for each HMP. Probabilistic hazard mapping is more effective in targeting scarce mitigation resources than deterministic hazard mapping (Burby et al., 2000; Frazier, Wood, et al., 2010). However, HMPs often are marginalized by a lack of probabilistic hazard mapping thus reducing the effectiveness and accuracy of these

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types of vulnerability assessments. Socio-economic vulnerability factors that are important for assessing community vulnerability and recovery and the guidance of hazard mitigation are also not specifically required by DMA and are thus frequently absent in HMPs (Berke & Godschalk, 2009; Burby, 2006; Frazier, Wood, Yarnal, & Bauer, 2010).

FEMA, as the responsible agency for overseeing the hazard mitigation process, has outlined the required elements of HMPs in the FEMA Plan Review "Crosswalk". The Crosswalk is based on the *Local Multi-Hazard Mitigation Planning Guidance* published by FEMA in June 2008. Accordingly, HMPs must include documentation of the planning process; a risk assessment of the area identifying and profiling hazards and assessing general vulnerability; mitigation strategies, which encompass goals, and identification and implementation of mitigation actions; and a maintenance section, which includes monitoring, evaluating and updating the plan and continued public involvement (FEMA, 2008; Godschalk et al., 1999). These elements are typically identified in building codes and floodplain management and land-use regulations aimed to protect communities from natural hazard events (Berke & Smith, 2009; Burby, 1998; Burby et al., 2000; Godschalk, 2003).

Counties generally prepare HMPs that meet base level criteria required by FEMA. These criteria are established on a national scale, which can result in overly broad plans not specific to the hazards present in local communities (Burby et al., 2000). HMPs are intended to be flexible, evolving instruments that adapt over time through continual revisions and updates adjusting to changing conditions (Brody, 2003). However, copy-and-paste plans or plans drafted by external consultants may result in less dynamic, more fixed plans that are not reflective of local hazards. Plans with specific goals linked to local conditions and policies denoted by action words such as will or must rather than might or should generate higher quality plans (Berke & French, 1994). As such, local context would seem imperative to increasing plan quality. Consideration of the local commitment to hazard mitigation, local capacity to plan and implement action items, and concern and perceived threat from hazards are all necessary in the development of an HMP if local hazard mitigation is the primary goal (Berke & Roenigk, 1996).

A major element that challenges HMP quality involves a lack of local capabilities, knowledge, experience, education attainment level, and/or resources to develop plans of sufficient quality. Previous studies have discussed the importance of plan development and plan quality (Baer, 1997; Berke, Crawford, Dixon, & Ericksen, 1999; Berke & Godschalk, 2009; Berke & Roenigk, 1996; Berke, Song, et al., 2009; Brody, 2003) and have attempted to establish a methodology for evaluation and assessment of local plans. However, widespread acknowledgment of the difficulties inherent in defining and measuring plan quality is evident throughout the literature. Berke and Godschalk (2009) noted that it is particularly difficult to evaluate the outcomes of plans whose effects will be realized in the future. Given increased development of FEMA approved state and local hazard mitigation plans, it is surprising that a standardized methodology with accepted plan quality standards to use in evaluation of plans does not currently exist.

Due to the difficulties in preparing and evaluating local HMPs, the goals of this study are developing a framework for the purposes

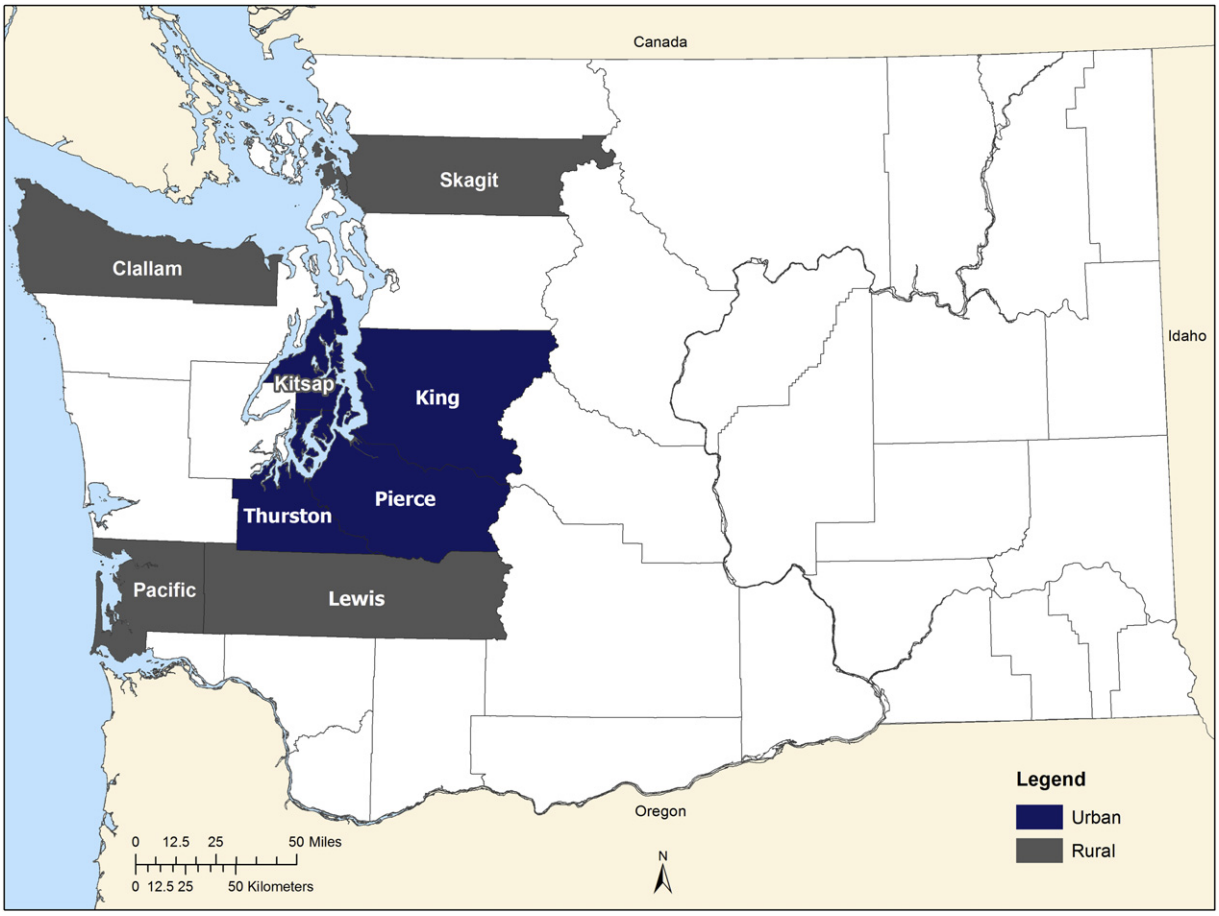

Fig. 1. Study site.

of evaluating current natural hazard mitigation strategies, determining opportunities and constraints to natural hazard mitigation planning that would enable jurisdictions to prepare higher quality plans better fitting local communities. This study examines HMP quality, looking at both the criteria required by FEMA to receive federal mitigation grants funding and extended criteria (above FEMA requirements) that can enable local jurisdictions to increase resiliency and thus reduce vulnerability to a natural hazard event. Plan quality, in this study, is focused on how well an HMP matches local hazards and local issues. Quality also refers to plan thoroughness, level of analysis provided, organization, and ease of application by local community.

This study attempts to accomplish it goals by developing an evaluation matrix to assist local jurisdictions in the development, assessment and evaluation of their hazard mitigation plans. Evaluation with the matrix is based on a number of criteria including externally generated versus locally generated plans; plans for predominantly urban versus predominantly rural counties; overall hazard assessment; risk assessment; inclusion of socio-economic factors; level of integration into local comprehensive plans; adequacy of addressing local issues from a hazard perspective, and execute-ability of plans. This framework could aid jurisdictions and plan preparers in the development of local HMPs and in the review process of updating plans. The major objectives of this study include a determination of the metrics that would allow for the effective evaluation of local HMPs, determination of key components that lend toward high quality plans, and an evaluation tool for communities to evaluate the effectiveness of their HMP with consideration of local conditions and local hazards.

Methods

Study area

To assess local HMP effectiveness, this study focuses on eight counties in the state of Washington, west of the Cascade Mountains: Clallam, King, Kitsap, Lewis, Pacific, Pierce, Skagit, and Thurston Counties (Fig. 1).

Due to the range of geographic diversity, the state of Washington is not only a region that attracts a multitude of people to visit and live, but is also vulnerable to numerous natural and human-caused hazards (Washington Military Department, Emergency Management Division, 2010). Washington State's Enhanced Hazard Mitigation Plan (EHMP) has identified nine natural hazards faced by the state: earthquake, flood, landslide, tsunami, volcano, wildfire, avalanche, drought, and severe storm (Washington Military Department, Emergency Management Division, 2010). These identified hazards do not affect all counties equally, resulting in differential vulnerability and varied mitigation actions required. As population continues to increase in the region, the risks associated with natural hazards are expected to increase.

The study site selection consisted of applying the following inclusion criteria: an equal proportion of predominately urban and predominately rural counties; counties that experience a broad range of hazards that are geographically representative of western Washington; and counties with a combination of internally and externally generated hazard mitigation plans. The initial task of identifying counties that were predominantly rural and predominantly urban was conducted by consulting Rural–Urban Continuum Codes (RUCC), developed by the United States Department of Agriculture, Economic Research Service, Washington State Office of Financial Management's Rural Economically Distressed Counties, and Washington State Department of Health guidelines for Rural–Urban Classification Systems. Population density, median household income, and median home price were also taken into account during the site selection process. Within rural category, researchers chose one jurisdiction with an HMP that was internal (locally generated), one that was external (contracted out to a consultant), and two that were jointly prepared with a combination of internal and external sources. However, for the urban category, none of the HMPs were completely external. Therefore, two urban jurisdictions have an HMP that was internal and two have an HMP that was jointly prepared with a combination. Table 1 details the HMPs included this study and the preparer of the plan.

HMP plan evaluation

The literature identifies core principles and elements consisting of facts, goals and policies upon which HMPs should be evaluated (Berke, 1994; Berke & French, 1994; Berke, Song, et al., 2009; Brody, 2003; Nelson & French, 2002). More recent studies have expanded upon these principles adding issue identification and visioning, internal consistency, implementation, monitoring and evaluation, organization and presentation, and integration and coordination with other plans and compliance with governmental mandates (Berke, Smith, & Lyles, 2012; Godschalk et al., 1999; Hoch, 2002; Hopkins, 2001). Further organization of key principles across two conceptual dimensions (internal plan quality and external plan quality) has been suggested (Berke & Godschalk, 2009; Berke, Godschalk, & Kaiser, 2006; Berke, Song, et al., 2009). Internal plan quality relates to the content of the plan and applies to the following components: issue identification and vision; fact base; goals; policies and implementation, monitoring and evaluation. External plan quality principles related to how well the plan fits local conditions and includes coordination efforts and participation in the process (Berke, Song, et al., 2009). These plan components can be measured through a number of indicators allowing for an evaluation and analysis of plan quality (Brody, 2003). Previous literature supports this method for plan evaluation (Berke & Godschalk, 2009; Godschalk et al., 1999) with a very recent article by Berke et al. (2012) providing the most relevant support for our research. Although a good step forward in hazard mitigation plan evaluation, Berke et al. (2012) evaluate HMP plan quality at larger scales (state level) and do not address how local plans are integrated into state hazard plans. Berke et al. (2012) also do not establish the influence of local emergency managers and does not explore the role of political will and the limitations of local resources on plan and mitigation strategy development and implementation. This study addresses these limitations through the development of a plan evaluation matrix that evaluates plan quality at the local level and stakeholder interviews designed to provide local context to the hazard mitigation planning and implementation process.

A qualitative approach was used to address the main research goals for this study. A content analysis of eight county hazard

Table 1
Study site hazard mitigation plans.

County	External	Internal	Combination
King			✓
Kitsap			✓
Pierce		✓	
Thurston		✓	
Clallam			✓
Lewis			✓
Pacific	✓		
Skagit		✓	

Table 2
Main sections of FEMA crosswalk and evaluation matrix.

Basic sections of FEMA crosswalk and evaluation matrix
FEMA requirements: HMPs must pass these basic level requirements to qualify for FEMA mitigation grant funding
• Mitigation strategies (aligns with internal consistency elements: fact base, goals, policy, implementation, monitoring and evaluation)
- Identifies goal, state and local policies, programs and capabilities; mitigation actions; and funding sources
• Monitoring and implementation (aligns with internal consistency element: implementation, monitoring and evaluation)
- Monitoring, evaluating and updating the plan and monitoring progress of mitigation actions
• External plan quality
• Planning process (aligns with external consistency elements)
- Documents the planning process, coordination among agencies and program integration
FEMA recommendations and recommendations expanded upon: based on the literature and interviews with county personnel
• Internal plan characteristics
• Issue identification and vision
• Fact base hazard assessment (aligns with internal consistency element: fact base)
• Mitigation strategies (aligns with internal consistency elements: fact base, goals, policy, implementation, monitoring and evaluation)
- Identifies goal, state and local policies, programs and capabilities; mitigation actions; and funding sources
• Policies/policy framework (actions)
- Serve as a general guide to decisions regarding development and aim to assure that plan goals are achieved
• Monitoring and implementation (aligns with internal consistency element: implementation, monitoring and evaluation)
- Monitoring, evaluating and updating the plan and monitoring progress of mitigation actions
• External plan characteristics
• Planning process (aligns with external consistency elements)
- Documents the planning process, coordination among agencies and program integration
• Coordination of local hazard mitigation planning (aligns with external consistency elements)
• Organization and presentation

mitigation plans in western Washington was conducted using an evaluation tool drawn from FEMA guidance documents (Berke, Song, et al., 2009), the hazard mitigation literature, and a series of qualitative interviews within the study area.

Interview process

Semi-structured interviews consisting of 10 questions (Appendix A) were conducted in person with key agency personnel responsible for plan development and implementation. Interview topics ranged from questions about hazard preparations, plan quality, and integration of HMPS into local comprehensive plans. Interviews were analyzed and used to inform and support the research, gather information on opportunities and constraints at the local level, determine unique attributes, needs and hazards of the individual jurisdictions and gain perspective on hazard mitigation planning in the study area. Interviews conducted informed the development of the evaluation matrix including emerging themes and issues and unique local characteristics and needs previously not addressed in the literature. Interview participants were recruited from county websites and referrals provided by Dr. Nathan Wood, a research scientist with United States Geological Survey (USGS) Vancouver, Washington office, whose primary task is focusing on hazards, vulnerability, resilience, disasters and disaster recovery. On multiple occasions, recruitment followed a snowball effect in which research participants indicated others suited for inclusion in the interview process.

Evaluation matrix development

An assessment tool used to conduct the content analysis of the HMPs and establish coding procedures was developed drawing on the FEMA Crosswalk and prominent hazards literature. The evaluation matrix was developed in an attempt to support the generation, updating, and evaluation of local HMPs. Built on the foundational elements required by FEMA, the matrix expands upon the basic required elements found in the Crosswalk to include criteria recommended but not required by FEMA, and suggestions and guidance found in hazards literature. Criteria were also added through information gleaned from interviews conducted with Federal, State and County Hazard Mitigation Planners and Emergency Management personnel. Table 2 illustrates the main sections of the FEMA Crosswalk and the developed evaluation matrix.

Coding procedures

For each of the eight local hazard mitigation plans, content analysis of the minimum federal requirements, and expanded criteria, was coded in a manner established in the literature (Berke, Gavin, & Lyles, 2009). Scoring using the evaluation matrix was conducted applying binary and ordinal scoring methodology depending upon the criteria being assessed. For criteria assessed on a binary scale, a score of 0 denotes the criteria were not included in the HMP and a score of 1 denotes the criteria were included. For ordinal scoring, a score of 0 denotes the item was not included or discussed in the plan. A score of 1 denotes the inclusion of the criteria but with limited detail and depth or is not required by the plan as characterized with terminology such as should or ought. A score of 2 indicates a clear and detailed narrative description with tables, maps, and figures where applicable (Berke, Song, et al., 2009) and/or is a mandatory element characterized with terminology such as shall, will, must, or require. This combination of scoring types to produce the final county score occurs because certain elements can only be included or excluded (binary), while other elements are categorical in nature (ordinal). Table 3 summarizes the scoring types and their functions.

Evaluating with the matrix

Each hazard mitigation plan was evaluated using the matrix and coding protocols established for this study by two independent coders. Those requirements as stipulated by FEMA for

Table 3
Hazard mitigation plan evaluation matrix scoring scheme.

Hazard mitigation plan evaluation matrix scoring scheme	
Binary	Indicators measured from 0 to 1 0 = Not identified 1 = Identified/addressed
Ordinal	Indicators measured from 0 to 2 0 = Not identified/addressed 1 = Suggested or identified but not detailed 2 = Fully detailed/mandatory

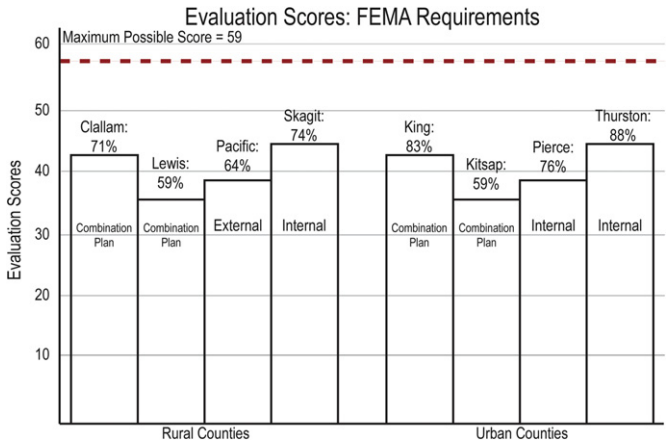

Fig. 2. Evaluation score results: FEMA required criteria.

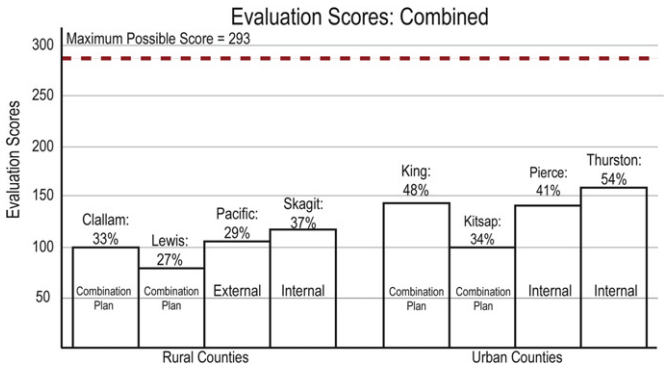

Fig. 4. Evaluation score results: combined criteria.

mandatory inclusion as a condition of receipt of federal mitigation grant funding were separated from the expanded criteria elements as each approved plan in existence meets, at a minimum, those base minimum requirements. Although it was assumed that current HMPs met these base requirements (established in FEMA's Crosswalk), the evaluation process scored these criteria in the same manner as the expanded criteria (above FEMA's Crosswalk). After each initial HMP evaluation, a word search for common words found in hazard literature was conducted to catch any missed criteria during the assessment process. Once each plan was scored, the data was analyzed to determine overall strengths and weaknesses, general plan quality, and if there was distinct, or nuanced, differences in quality between predominantly urban and predominantly rural counties and between plans that were internally or externally generated. Interviews conducted during phase two of this study were used to support the findings of the HMP evaluation.

Results

Evaluation results

Results from plan evaluations using the matrix show slight differences among the plan qualities (Figs. 2–4). Table 4 provides an example of the detailed scoring for the Planning Process subsection that is under the External Plan Characteristics section of the evaluation matrix for Clallam, Pacific, King and Pierce County. Results from Figs. 2–4 also indicate that HMPs developed internally, regardless of being urban or rural, scored higher than their externally generated counterparts. Measurable variables in the evaluation matrix were scored either based on a 0–2 ordinal scale or inclusion/non-inclusion criteria. For the inclusion/non-inclusion scoring, score variation indicates that some plans included criteria but were limited in detailed description, while others included criteria that were more detailed and descriptive.

Results from FEMA required elements (Fig. 2) show that urban counties scored higher than rural counties. The total possible score for FEMA required criteria is 59 and all the scores were converted into percentages. Thurston County, which is classified as urban received the highest score of 88%, while Lewis (rural) County received the lowest score of 59%. Listed in Figs. 2–4 are both the matrix evaluation scores and these scores converted to percentages for each county for the FEMA required elements and for the FEMA expanded and combined elements.

The FEMA required elements for the matrix evaluation results show that rural counties received a score of 2 for some elements, meaning that they provided detailed information or mandatory wording. The urban counties received a score of 2 on nearly twice as many elements, resulting in overall higher scores.

The expanded elements' results show a total possible score of 232. Results from the expanded elements (Fig. 3) of the matrix show more variation between the urban and rural plans with Thurston County (urban) receiving the highest score of 46% and Lewis County (rural) scored lowest with 18%.

The combined elements show a total possible score of 293. Results from the combined evaluation (Fig. 4) of the matrix indicate a slight variation between urban and rural plans. For this matrix, Thurston and Lewis counties scored the highest and lowest once again with the scores of 54% for Thurston County and 27% for Lewis County, respectively.

The evaluation matrix also shows great variation between urban and rural counties for risk analysis, capability assessment, mitigation strategies and internal consistency for plan developments. The risk analysis results demonstrate that the urban counties included a probability assessment of the impacts on structures and populations in the event of a hazard and addressed the probabilities of losses for the range of possible hazard events. The rural counties did not address the need for probability mapping as an indicator for risk assessment.

Results indicate that the capability assessment elements were lacking in the majority of plans. Most of the counties did not address any indicator in the capability assessment, which discusses federal, state and local programs, policies or actions and identifies changes needed in current policies and programs. Only

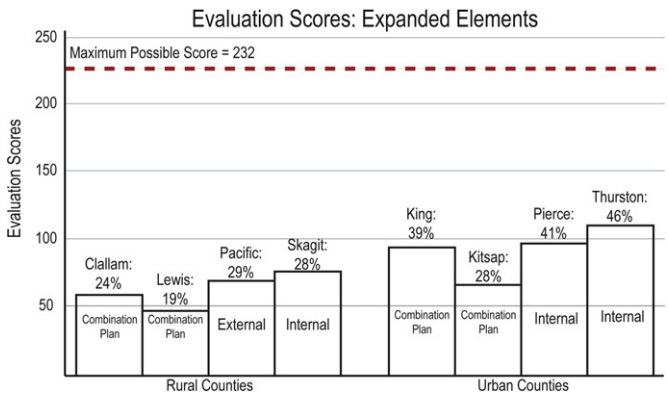

Fig. 3. Evaluation score results: expanded criteria.

Table 4
Detailed scoring example for the evaluation matrix for Clallam, Pacific, King and Pierce county.

Evaluation matrix						
Content	Indicators	Scoring method	Clallam	Pacific	King	Pierce
External plan characteristics			2nd Internal 1st external	External	Internal but pieces external	Internal
Planning process (aligns with external consistency elements)						
Documents the planning process, coordination among agencies and program integration						
Organizational involvement, coordination and integration:						
Involved in plan development process:	Federal agencies	Binary	1	1	1	1
	State agencies	Binary	1	1	1	1
	Local and regional agencies	Binary	1	1	1	1
	Non-profit/non-governmental	Binary	0	0	0	0
	Explanation of why the organizations identified in the plan were involved?	Ordinal	1	0	1	1
	Identification of those involved in the update process not originally involved in plan development?	Ordinal	0	0	1	0
	Indication of coordination among agencies and how that has changed over time between original plan and updated plan?	Ordinal	1	0	1	0
	Identification of which agencies/organizations provide data in the plan?	Ordinal	1	1	1	0
	Identification of which agencies/organizations provide technical assistance in plan preparation?	Ordinal	0	0	1	0

one of the urban county (Thurston) plans was able to identify these policies and programs that increase and decrease vulnerability. Based on the evaluation of mitigation strategies, the results show that the proactive strategy, land-use planning, is more frequently used by urban jurisdictions. In terms of recovery in the event of a disaster, financing recovery was not addressed in most of the plans. The indicators for mitigation, such as educational awareness, warning and response programs and inclusion of capital improvement, were consistently addressed by each urban and rural plan.

Externally versus internally generated HMPs

The results demonstrate that external plan characteristic scores were consistent among the plans. Each plan involved state agencies as well as local and regional agencies in the plan development process. Based on specific indicators, such as public and community involvement, organization and presentation and focus groups, urban counties were more consistent when compared to rural counties. Table 2 shows the average scores of internally and externally generated plans for rural and urban counties as well as the scores for those counties with a combination of both internal and externally generated plans. On average, the internally generated urban county's plans scored the highest with rural county's externally generated plans scoring the lowest. Results also indicate that none of the urban county plans were completely contracted out to external consultants (Table 5).

Interview results

Results from interviews with key agency personnel from each study site, as well as with the State Mitigation Strategist and two FEMA personnel (Appendix B) revealed that the predominant difference between urban and rural counties is in their perspective toward hazard mitigation. Interviews with stakeholders and analysis of corresponding HMPs show that urban counties were more apt to approach hazard mitigation planning from a preventative perspective. Urban counties focused efforts on mitigation of hazard events to reduce the need for response and recovery while rural counties focused on efforts to enhance response and recovery. As a result, rural county plans were seen as more hazard response plans instead of true hazard mitigation plans. Multiple interviewees indicated that rural communities are more resource challenged than urban community resulting in limited access to resources available for devotion to enhancing plan quality.

It was also stressed by the interviewees that there is a need to make the value of mitigation higher; otherwise, jurisdictions will continue with a more response and recovery approach to natural hazards as opposed to a more proactive approach (Deputy Director; Lewis County Sheriff's Office, Division of Emergency Management, 2011). An interviewee from one county stated, "mitigation is pay me now or pay me later" with the interviewee stating that emphasis needs to be placed on pays me now: "mitigation should be increased, which may lessen response and recovery". In short, the interviewee expressed a preference to spend resources to mitigate rather than to respond and recover. Findings from interviews also cite lack of political will and funding as the main reasons behind the disconnect between HMPs and local comprehensive planning. For instance, many capital improvement projects with the potential of increasing community resilience are often expensive, long-term projects (e.g., improved storm water system) or controversial projects (e.g., restricting development in hazard zones) that have the potential to create adverse political fallout for those seeking reelection. Mitigation actions that extend beyond the typical two-year political term have a more difficult time being implemented.

Table 5
Comparison of internal/external – urban/rural plans.

	Urban	Rural
Internal	150.25	116.5
External	N/A	93.25
Combination	120.75	99

Integration with local comprehensive plans

Results demonstrate that the majority of HMPs evaluated for this study are not integrated with the local comprehensive plan with the exception of partial integration in a few urban counties (Thurston, King and Pierce Counties). Findings indicate that the urban counties integrated land-use ordinances and regulations from the comprehensive plans into the HMP but the rural counties HMPs omitted integration completely. Integration of natural hazard elements was limited in comprehensive plans if even attempted to any degree, by either urban or rural jurisdictions. Rural counties noted that lack of awareness was not to blame for this omission, but lack of political and financial support was the issue. For instance, one of the rural counties described the lack of integration with the local comprehensive plan as a direct result of political influence not due to a lack of awareness (Director; Pacific County Emergency Management, 2011). Alternatively, urban counties noted that the local plans are integrated, although each mentioned the need for a more thorough integration. In this particular case study, the Washington State Legislature does not require a natural hazard element in comprehensive plans, and there seems to be a general lack of motivation and support for integration of HMPs into local comprehensive plans. It was noted by Clallam County that their plans are not integrated, but the County recognizes the need to do so. However, lack of staff time and resources prevents the needed attention to integrate the local plans without an existing state or federal mandate (Program Coordinator; Clallam County Department of Emergency Management, 2011).

Discussion

The planning community faces challenges to develop a more localized and focused approach to better address the local opportunities and constraints to hazard mitigation planning. Currently, there is no accepted metric for determining what constitutes a high quality plan that adequately addresses local hazards, issues and needs. Available resources, plan preparer, integration with other local plans and regulations, and unique local needs and issues all factor into product output and generate plans of variable quality. Although it is usually possible to distinguish between high quality and low quality plans, there is difficulty in explicitly defining the characteristics of plan quality (Berke, 1994; Berke & Roenigk, 1996; Berke et al., 2006). The planning profession has generally avoided the normative question of what constitutes a good plan and instead has focused on the methods and processes of plan development (Berke & French, 1994; Berke et al., 2006). Differing views on a plan's purpose, the unique character of a plan designed to fit the needs and objectives of a particular area, the subjective nature of evaluation and the range of local regulations and policies all factor into the difficulties of evaluation and influence plan quality (Berke, 1994; Berke & Godschalk, 2009). In this paper, we evaluate the hazard mitigation plan quality at local level based on three primary perspectives: externally verses locally generated plans, urban versus rural counties and level of integration into local comprehensive plans.

Results indicate that the differential levels of sophistication between the urban and rural counties could help account for the disparities in plan quality. With varying levels of analysis and detail along urban–rural lines, the urban counties are more often addressing relevant hazard mitigation issues and implementation strategies that promote pre-disaster mitigation. Rural counties remain focused on post-disaster response and recovery. The analysis also indicates that jurisdictions with greater access to resources increase local capabilities and ensure access to new information, technology, and training opportunities (Smit & Wandel, 2006). This and other research (Berke & Godschalk, 2009; Burby, 1999) exposed several areas of weaknesses in both rural and urban HMPs. There were similar findings between this research and the study conducted by Berke, Song, et al. (2009). Both studies conclude that the static non-probabilistic risk assessment and fact basis elements of HMPs are generally the strongest sections. Sections requiring more analysis and time-consuming detail and review, such as socio-economic analysis and identification of special needs populations, are often weaker and less developed in both urban and rural plans. Whether it is a fundamental lack of resources or a lack of incentive based on the structure of federal mitigation versus response dollars, many jurisdictions are either unwilling or unable to allocate recourses to produce high quality HMPs (Berke, Song, et al., 2009). This fact is especially obvious in rural communities where economically distressed inhabitants are most in need of federal assistance but where, due to internal financial constraints, federal assistance is often unattainable.

Analysis from the evaluation metric shows that counties with plans prepared internally were on average of higher quality than those developed externally by consultants. Rural communities often lack internal expertise to prepare HMPs in-house; they also tend to lack the expertise to evaluate those plans prepared by consultants. Plans prepared by consultants may end up as a document on the shelf and not referred to by local jurisdictions under these circumstances. This analysis demonstrates that local knowledge and local plan preparation are imperative to higher quality plans. However, plans must also be supported by the high quality data and analysis. Capabilities to access data and conduct more in-depth analysis tend to come from more sophisticated jurisdictions.

Integration of hazard mitigation planning with local comprehensive plans is essential to mitigating natural hazards and their impacts effectively. It is also strongly correlated with sophistication and available resources. The hazard mitigation literature shows that community resilience has the most success when mitigation actions and strategies are integrated with local comprehensive plans and land-use planning processes (Srivastava & Laurian, 2006) rather than left to post-disaster recovery (Burby et al., 2000). Analysis from evaluations shows that hazard mitigation policy and program changes are also imperative to developing high plan quality. For mitigating natural hazards at the local level, attention should be directed at conflicts among local hazards, vulnerability and exposure instead of federal programs with the most funding to offer.

Interview results indicate that political support is required to allow local jurisdictions to mitigate. Allocation of resources (Prater & Lindell, 2000) best reflecting benefits that correspond with current political terms of office can inhibit hazard mitigation, leaving communities more vulnerable to natural hazards and their impacts. Political entities implement strategies that are tangible and beneficial during their time in office, which will in turn benefit the politician during the next election cycle (Frazier et al., 2010). Political will tends to override other factors in decision-making processes (Tribbia & Moser, 2008), undermining mitigation planning strategies and needs.

Allocation of funding through political will and policy changes is imperative in reducing community vulnerability and increasing local resilience. Local resource limitations coupled with few incentives to prepare higher quality HMPs based on FEMA requirements (Berke, Song, et al., 2009; Brody, 2003) limit the quality of HMPs. Difficult fiscal choices, complexities in applying for and receiving mitigation grant funding, and federal policy and programs, which provide incentives through post-disaster funding, may motivate local jurisdictions to take hazard risks they otherwise might not (Berke, Song, et al., 2009). It has been shown that for every dollar spent on average, four dollars of benefits were

produced (Rose et al., 2007), yet the four dollars saved is federal dollars. Rose et al. (2007) also highlighted that federal investments in mitigation activities benefit society four times greater than the costs of mitigating hazards and that the benefits to a community go beyond monetary. Without incentive to spend local dollars and having to make tough fiscal decisions (Prater & Lindell, 2000) between immediate needs versus mitigation, local governments will likely opt to produce the bare minimum needed to qualify for FEMA funding. Local decision-makers might wonder, what incentive is there to mitigate natural hazards before an event when post-disaster response funding is available regardless of prior mitigation actions or current resources (Berke, Song, et al., 2009; Burby, 1998). To increase plan quality and community resiliency, a more holistic approach to hazard mitigation planning is needed (Cutter et al., 2008).

Conclusions

The quality of hazard mitigation plans is significantly influenced by a myriad of factors. The factors leading to variations in plan quality include available resources, political support, local expertise, experience and knowledge, and educational attainment. Federal hazard mitigation programs also precipitate variations in plan quality and associated levels of preparedness and vulnerability. Political will and appropriate decision of resource allocation are imperative for long-term mitigation action; otherwise, hazard mitigation planning will likely continue to be pushed to the bottom of the list below more immediate community needs. Incentives are also needed to motivate local jurisdictions to prepare HMPs that match local hazards, conditions and needs. It is imperative that planners as well as emergency managers have a hand in HMP development. Each specialty has the expertise needed in corresponding sections of the plans. This study demonstrates that a more place-based approach to hazard mitigation planning, as opposed to the current federal one-size-fits-all approach, may result in plans of higher quality that better match local hazards and local issues. A collaborative, interdisciplinary approach to hazard mitigation planning and HMP development has the potential of increasing overall plan quality. This in turn increases community resilience and reduces vulnerability.

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Appendix A. Interview questionnaire

1. What are the main hazard concerns in the county?
2 & 3. What hazard is the county best/least prepared for? How are you differentiating that preparation?
4. Is your HMP adequately addressing the hazards of the area?
5. How do you evaluate plan quality?
6. Are there recognizable weaknesses in the county HMP?
7. What could/should the county do/be doing to improve their HMP?
8. Above and beyond those elements required by FEMA, are there other elements that ought to be included to create a plan of higher quality/increase community preparedness and resiliency?
9. Is the local HMP integrated with the local comprehensive plan, and if so, to what degree?
10. Is there anything you would like to add? Is there something I am missing and/or should consider?

Appendix B. List of interview participants

County	Participant title
Urban counties	
King	Director; Office of Emergency Management
King	Project Program Manager III, River and Floodplain Management Section
Kitsap	Emergency Planner; Department of Emergency Management
Pierce	Program Coordinator; Department of Emergency Management
Thurston	Senior Planner; Thurston Regional Planning Council
Rural counties	
Clallam	Program Coordinator; Department of Emergency Management
Lewis	Deputy Director; Lewis County Sheriff's Office, Division of Emergency Management
Pacific	Director; Emergency Management & Deputy Director; Emergency Management
Skagit	Coordinator; Department of Emergency Management
State and federal	
State	Washington State Hazard Mitigation Strategist; Washington State Emergency Management Division
FEMA	Mitigation Planning Manager; FEMA Region X
FEMA	Planning Program Specialist; Response Division, FEMA Region X
USGS	Research Geographer, USGS

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