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Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption

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An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption

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Problem, research strategy, and findings: Conventional hazard mitigation and pre-disaster recovery planning processes typically begin with hazard scenarios that illustrate probable events and analyze their impacts on the built environment. The processes conclude with responses to the hypothetical disruption that focus on "hardening" buildings or structures or removing them from threatened areas. These approaches understate the importance of natural and social sources of adaptive capacity. Three "proof-of-principle" exercises designed to strengthen the Federal Emergency Management Agency (FEMA)'s Risk MAP (Risk Mapping, Assessment, and Planning) process in Washington State suggest how better to conduct hazard mitigation and recovery planning. Each begins with workshops where stakeholders identify built, natural, and social assets that contribute to human wellbeing (HWB) before introducing earthquake scenarios that affect HWB. Participants then identify assets that could facilitate adaptation to changed circumstances (a "new normal"). Participants discuss how these assets would achieve the goals of comprehensive community planning as well as hazard mitigation and recovery from disaster. Neighborhood-scale social organization emerges as an important priority.

Takeaway for practice: Asset-based approaches enable communities to better recover from disaster and adapt to a post-disaster "new normal." By premising planning discussions on a more holistic set of assets, communities can balance physical recovery goals with qualities that help them to adapt to future change. Furthermore, thinking about recovering before an event actually occurs can enlarge the menu of mitigation strategies. Planning for adaptation can also help communities achieve many non-risk-related objectives.

Keywords: resilience, Risk MAP, risk assessment, disaster recovery, hazard mitigation, social capital, natural capital, built capital.

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"We need stronger neighborhoods, increased walkability, greater sense of place, mixed land uses, closer neighbor and family ties and trust": These were conclusions from tabletop exercises held in the cities of Redmond, Everett, and Neah Bay in Washington State. These outcomes might have been expected if the exercise focused on smart growth, but stakeholders were addressing earthquake risks. Individuals mentioned traditional earthquake mitigation measures such as retrofitting or strengthening structures, developing redundant energy sources, and improving emergency response, but those did not drive the discussions. This new approach to earthquake risks began with an inventory of community assets—built, natural, and social "capital"—instead of vulnerabilities, and it prompted stakeholders familiar with emergency preparedness to broaden their thinking about how to plan for disasters.

The experience of these tabletop exercises demonstrates how both mitigation and recovery planning can benefit from incorporating general land use and community planning goals for everyday betterment. This could lead to successful integration of mitigation and recovery planning with comprehensive planning, a goal that has proven alluring and elusive to disaster planners (Pearce, 2003; Wamsler, 2006). Progress has been made toward integrating hazards mitigation and recovery planning into other types of planning through

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mandating mitigation elements in comprehensive plans and through incorporating best practices and techniques of mitigation into zoning codes, subdivision codes, and other instruments (Federal Emergency Management Agency [FEMA], 2013a; Schwab, 2010). There is still a need, however, to enable greater stakeholder participation in creative discussions about mitigation practices and disaster recovery.

Conventional disaster planning views the mitigation–preparation–response–recovery sequence in linear terms, dependent on an ability to predict events and their impacts, largely to preserve or restore pre-event conditions (Beatley, 2009). Such planning typically depends on a vulnerability analysis. The association of vulnerability reduction with resilience underlies the FEMA National Mitigation Framework (FEMA, 2013b). In the Framework, FEMA suggests that communities and businesses can reduce long-term vulnerability when they "build and sustain resilient systems, communities, and critical infrastructure and key resources lifelines to reduce their vulnerability to natural, technological, and human-caused incidents by lessening the likelihood, severity, and duration of the adverse consequences related to the incident" (FEMA, 2013b, p. 24).

Recent efforts to incorporate sustainability into disaster recovery recognize that restoration of the status quo ante is practically impossible and often socially and ecologically undesirable (Paton & Johnston, 2006; Smith & Wenger, 2007). Sustainability scholars view "hazards" as uninvited but important "change agents," and "resilience" describes the capacity to adapt to change rather than to "bounce back" from it (Davoudi, 2012; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). "Adaptive capacity" is the ability to respond to a disruption by adjusting to a new normal and to build back better, whereas communities define "better" according to their cultural and social values as well as principles of sustainability (Chan et al., 2012; Millennium Ecosystem Assessment, 2005). Adaptive capacity may become apparent after a disruption, but it develops in the course of a community's ongoing development based on social strengths, self-organization, and connection to place (Berkes & Ross, 2013).

Adaptive approaches are appropriate for situations of gradual change, or for repetitive and spatially limited hazards such as flooding (Alberti, 2008; Burkett, 2012; Freitag, Bolton, Westerlund, & Clark, 2009). In contrast, events such as earthquakes present challenges to planned adaptation; they are relatively rare, have short warning times and high consequences, and do not occur in well-defined areas (Deyle, French, Olshansky, & Paterson, 1998, p. 150). Communities have difficulty conducting an adaptive planning process in advance of an event (Lee, Preston, & Green, 2012), especially when the process begins with a scenario of destruction that emphasizes the vulnerability of the community (Orchiston, 2011). Community members find such exercises discouraging, and they tend to focus on immediate responses to the emergency, emphasizing its physical effects. The conventional focus on physical, built assets exacerbates this challenge, particularly when it ignores nonmaterial social and cultural capital and values as well as related ecosystem services (Stokols, Lejano, & Hipp, 2013).

An Appreciative Inquiry Approach to Using Hazard Scenarios in Participatory Adaptive Planning

While other studies in this issue describe recovery from actual disasters, we present findings from a set of predictive scenario planning exercises in which the goal was to highlight local assets that promote human wellbeing (HWB) and adaptive capacities for recovery after an imagined disaster. The asset-based approach de-emphasizes the specifics of the risk scenario itself. Instead, it prompts stakeholders to compare comprehensive planning goals to potential mitigation, recovery, and adaptation strategies. The approach differs from methods that focus on asset protection rather than on adaptive capacity (e.g., Siembieda, 2010). FEMA provided funding for these exercises to explore new ways to increase community participation in the FEMA Risk MAP (Risk Mapping, Assessment, and Planning) discovery process, and to better integrate Risk MAP into communities' ongoing land use planning.[1] FEMA directed the research to explore ways to introduce community participation earlier in the Risk MAP process and motivate people to see reducing risk as part of their daily lives.

Unlike most risk assessment efforts, mitigation planning processes, or even pre-disaster recovery plans, our protocol does not begin with presentations of exposure and vulnerability. Rather, we first ask participants to list the sources of HWB in their community. What do they like about their community? What makes their community unique? What brings them joy? Only then do we present the hazard, or "change agent," for discussion on how the community might prepare for it, respond to it, recover, and rebuild. We present recovery as a broad process that depends on built, natural, and social forms of capital, similar to the Roadmap for Adapting to Coastal Risk (NOAA Coastal Services Center, 2012), which has participants develop a profile of "the local population" ("societal"), "the built environment" ("infrastructure"), and "important

natural resources" ("ecosystem"). However, the NOAA Roadmap describes a hazard scenario in detail first, and seeks to identify vulnerabilities and strengths primarily in the context of that specific hazard scenario. Our approach differs significantly in that we present the hazard or "change agent" only after the participants have profiled the unique attributes of their respective communities using HWB categories. Moreover, instead of cataloging dysfunctions or vulnerabilities, we ask questions that lead from the community's strengths. In effect, we are applying principles of asset-based community development to disaster planning (Green & Haines, 2012), specifically the idea that creative thinking leads from strength-based positive approaches to inquiry and action, as expressed in the Appreciative Inquiry (AI) model (Emery & Flora, 2012). This project was specifically designed to explore what happens when a positive emphasis can prompt ideas for disaster response that are more adaptive than is usually the case in hazards mitigation and pre-disaster recovery planning exercises.

We are also interested in how a broader, more balanced, and integrative consideration of assets—not just built, but also natural and social capital—can prompt more adaptive thinking. Communities rely on goods and services provided by built, natural, and social capital in varying degrees and at different times. Capital typologies differ; Green and Haines (2012) categorize community capital as physical, human, social, financial, environmental, political, and cultural. We draw our simpler classification from the Millennium Ecosystem Assessment (2005) literature and particularly from Mulder, Costanza, and Erickson (2006), leaving out human capital ("personal growth and development"), and define three key categories as follows:

1. *Built capital:* things built by humans for rather specialized purposes, and with significant ecological footprints—examples include bridges, buildings, dams, and machinery;
2. *Natural capital:* environmental features that yield a flow of ecosystem services and tangible natural resources—examples include forests, wetlands, mangroves, soil, sand dunes, agriculture, and fossil fuels;
3. *Social capital:* networks and associations of human relationships based on mutual trust, common interest, or particular skills—examples include service providers, regular festivals and gatherings, clubs, and faith-based organizations.

These categories are not exclusive. A park, for example, might be considered a source of ecosystem services, but if it is engineered for a special purpose (as in a baseball field), it might be considered built capital. If it functions as a gathering place (as in a farmers' market), it might be considered social capital. The classification allows us to see how the quality of life provided by one type of asset or capital might be provided by a different type under changed conditions after a disruption. Since this interchangeability may not be evident on its face, we hoped to discover this capacity and make it explicit for recovery planning.

The project involved workshops with three Washington State communities: Redmond, Everett, and Neah Bay. In all three communities, the project team had previously worked with local community members on hazards mitigation planning. The project intended to assist the communities with ongoing planning, as well as yield findings for FEMA policy. The approach addressed the needs of the whole community in support of the National Disaster Recovery Framework (NDRF) emphasis on core principles, such as individual and family empowerment and partnership, inclusiveness, and a reliance on state, local, and tribal leadership and participation of community members in decision making.

Officials advertised the workshops to networks of stakeholders in hazards mitigation planning. The objective of the workshops was to test the format for discussion among people already familiar with emergency and disaster planning. This limited the perspectives and responses of participants to a narrower range than might be found in the general public. On the other hand, the participants were not necessarily used to thinking explicitly about their community's whole quality of life in the context of hazards mitigation and recovery planning.

In all three communities, we expected to find disagreement regarding the definition of "better" in discussions of how to "build back better." We were surprised by the level of enthusiastic agreement that we actually observed.[2]

The community meetings were held in Redmond in September 2013, in Everett in October 2013, and in Neah Bay in January 2014. Findings from the three workshops are reported and discussed below.

Exercise Procedure

The exercise consisted of three rounds of discussion (which we refer to as "play") lasting a total of 2.5 hours. We recorded responses on a prepared template (Figure 1). We provided community maps and encouraged participants to make notes on the maps. After introduction by a local official, the lead facilitator described the purpose of the exercise as a pilot effort that offered a different way of identifying risks. Risk was defined as the chance that a community would not be resilient to a change such as an earthquake. The definition of resilience was adapted from

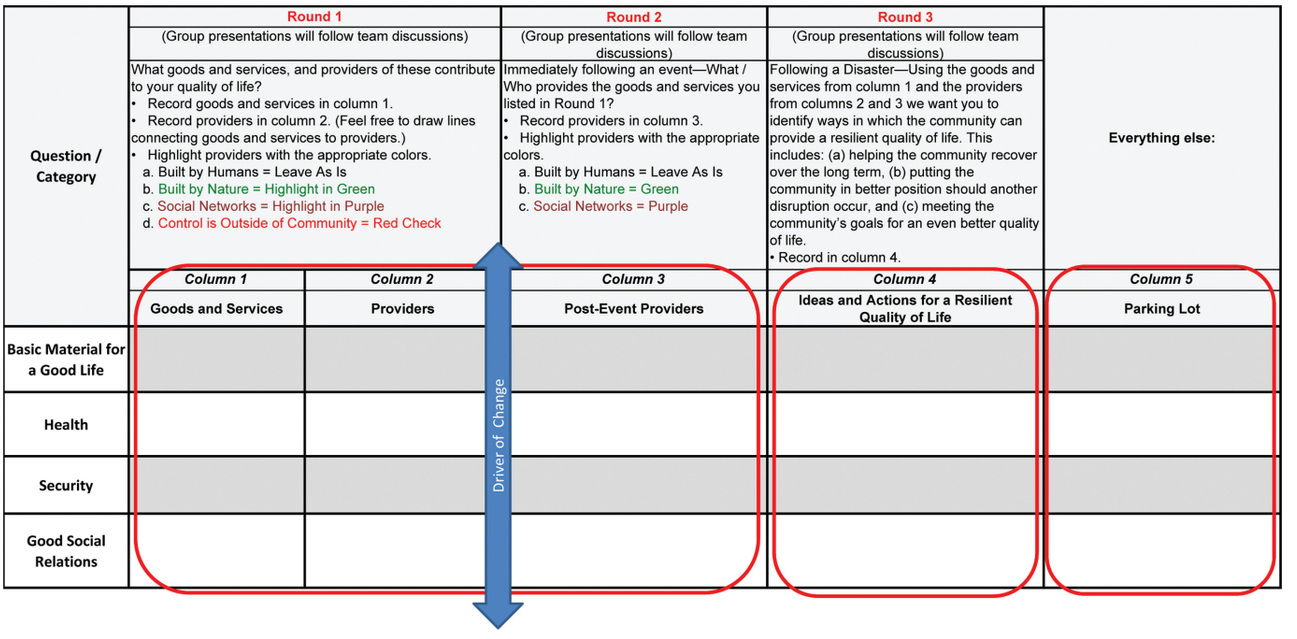

Figure 1. Worksheet used during community exercises.

Walker and Salt (2012), where resilience is defined as the capacity of a community to absorb change from an event and retain its identity while reorganizing to provide goods and services necessary for quality of life.

To focus the discussion, participants were divided into groups that corresponded to Millennium Ecosystem Assessment (2005) categories of goods and services for HWB,[3] including basic material for a good life, health, security, and good social relations.[4] A facilitator was assigned to prompt each group for ideas focused on the group's assigned category of goods and services.

Round one ("pre-disruption") began with a presentation of the community's overall profile, including information from comprehensive planning and mitigation plan documents. Participants then characterized their community in terms of the goods and services that constitute its quality of life, and the sources and providers of those goods and services. Goods and services included material things and activities such as water, exercise, and medicine; nonmaterial things like information and cultural expression; and combinations of material and nonmaterial things such as refugee services and social gathering over food. Sources and providers were specific to the community and could be located on a map, although they could also include spatially dispersed or mobile organizations or networks. At the end of the round, participants circled the three to five most important sources or providers, and placed a red check next to the sources or providers outside of community control. Facilitators also highlighted each source or provider as a form of either built, natural, or social capital. Each group then assigned a spokesperson to present highlights to the room (Figure 2).

Round two began with the introduction of a hazard or change agent. An earthquake scenario highlighting the maximum probable event was used as the change agent. The earthquake event varied based on locality: a Seattle fault earthquake in Redmond, a South Whidbey fault event in Everett, and a Cascadia Zone event in Neah Bay. For Redmond, Everett, and Neah Bay, the impacts were modeled with FEMA's HAZUS software using local data drawn from preexisting hazards mitigation plans.

The simulation described impacts experienced by neighborhoods based on their building stock, infrastructure service, accessibility, soil condition, and magnitude of shaking. The presentation did not describe site-specific impacts, except for the probabilities of disruption to facilities such as highways, hospitals, and fire and police stations. Participants then discussed how, in the week following the earthquake, they would obtain the goods and services identified in the first round. Participants could add to the initial lists of goods and services and sources or providers at any time during the exercise.

Round three ("new normal") began with an introduction to the concept of re-visioning the community so that it represents a new normal (i.e., "acknowledges irreversible change"), has greater resilience (i.e., "is more adaptable to change"), and reflects common [local] values, goals, and aspirations for quality of life. The lead facilitator then presented community goals and objectives as laid out in

Figure 2. Activity during Everett (WA) exercise.
Source: Photo by Robert C. Freitag.

the comprehensive plan, hazards mitigation plan, and other key policy documents. Participants were encouraged to consider the implicit values and explicit goals and strategies reflected in these documents, and to think of new strategies based on the previous rounds. The facilitator took care not to suggest measures and plan recommendations. Participants then reviewed the sources and providers of quality of life listed in the earlier rounds, and identified those that would: a) best help the community recover from the modeled disruption over the long term; b) put the community in better position should another disruption occur; and c) meet the community's goals for an even better quality of life. Participants also added new sources or providers that would increase community resilience but could be implemented as part of an evolutional planning process.

Finally, at the end of round three, the groups rotated from table to table according to a World Café procedure: Members from each team, minus each team's reporter, who remained at the original table, moved to another table, where they were briefed by that table's team reporter, and then could add a new perspective from different HWB categories to concepts generated by the original team. After about 15 minutes, all teams rotated to yet another table and repeated the activity. The exercise concluded with each table reporting back to the full room, and then each participant filling out individual forms evaluating the exercise.

Relevant Characteristics of the Project Communities and Their Participants

Certain characteristics of the three communities provide background for interpretation of the workshop results. The first workshop took place in Redmond, a suburb of Seattle that has grown quickly from a small agricultural railroad town to a polycentric incubator for high-tech

industry, including firms such as Microsoft and Nintendo. While these companies' campuses have significant physical footprints, we expected the community to be more reliant on the social capital of software and social media networks that reach beyond Redmond than on the built capital of physical infrastructure. Microsoft in particular has a sophisticated system for maintaining operations given disruption in Redmond or other important centers.

Redmond's residential population is smaller than its employee population, and residents are on average young, well-educated recent arrivals, many of them from Asia. The commercial downtown lies on vulnerable alluvial soils in a valley prone to flooding and liquefaction during an earthquake, but is also rapidly densifying with mixed-use multifamily housing and retail. On the more seismically stable surrounding hills, single-family housing predominates in single-use residential neighborhoods with large office parks (the Microsoft campus is on one of the hills). The upland residential areas have little walkable retail or neighborhood services. The city's comprehensive plan, Redmond 2030, calls for extending the trail system to connect residential communities and creating limited mixed-use areas within existing residential communities (City of Redmond, 2011). The hazards mitigation plan notes that these communities may be isolated following an earthquake.

The Redmond workshop took place in the police training center, and involved 24 participants, including a city councilor, a city planner, a risk management official for the school district, a security consultant for Microsoft, a number of Community Policing Advisory Board members, Community Emergency Response Team (CERT) trainees, and members of the general public. The scenario modeled a magnitude 7.2 earthquake that produced the greatest damage from shaking in the Overlake neighborhood, home to Microsoft's main campus as well as strip-type commercial areas. Shaking and liquefaction also would disable most of the public and commercial facilities in the downtown. Access to the nearest large urban centers of Bellevue and Seattle would likely be compromised.

Everett is an established industrial center along the Interstate 5 (I-5) expressway corridor that runs the north-south length of the U.S. Pacific coast. Since it is home to one of Boeing's largest aircraft plants as well as an important naval base, we expected the community to rely most heavily for quality of life on the built capital of its specialized physical infrastructure. The population of Everett is largely working-class and ethnically diverse, with a substantial number of recently arrived immigrants. The city's prewar central business district and older neighborhoods of small blocks with sidewalks are located at the tip of a peninsula isolated by Puget Sound to the west and the Snohomish River delta to the east, overlooking a port that includes extensive naval facilities. Newer postwar strip development predominates on the main arteries leading from the expressway to the central business district. The large Boeing plant has its own connection to the expressway, but is otherwise surrounded by newer residential areas. These are neighborhoods of single-family housing on loop roads and cul-de-sacs with few sidewalks. The more expensive homes occupy a coastal bluff, and more modest homes are located in the interior. Everett's 2025 Comprehensive Plan calls for improving the marina and for urban expansion up to the edge of the Snohomish floodplains in the north and northeast (City of Everett, 2005). The hazards mitigation plan addresses vulnerabilities associated with the older building stock and isolation of the coastal neighborhoods, and provides guidance for construction within coastal hazards areas.

The Everett exercise also took place in a police station and involved 33 participants, including representatives from a wider array of public, private, and nonprofit entities than those who had attended the Redmond workshop. Everett participants included representatives from a host of municipal departments, including city planning; neighborhoods; economic development; police and fire; housing authority; transit; utilities; elderly, social work, and social service agencies; a legislative aid; and representatives of industries, including Boeing, Puget Sound Energy, and insurance and real estate companies. In Everett, the event was a 7.4-magnitude earthquake on the South Whidbey Island crustal fault. This included greatest damage from shaking in the area of Boeing's Everett plant and residential neighborhoods to its northwest, south, and southeast, and damage from liquefaction and unstable soils throughout the Snohomish River valley and estuary. The I-5 corridor would likely be compromised both north and south of the city, and older structures with unreinforced masonry construction in the city center would experience widespread damage.

Neah Bay is a small coastal community located on Makah tribal lands on the Olympic Peninsula. With only 865 residents (according to the 2010 U.S. Census), but home to one of the largest tribal fisheries in the United States and a growing forest resources and eco-tourism industry, it exemplifies a community that relies on "natural capital." Located at the northwesterly tip of the 48 contiguous United States, Neah Bay is an isolated community. There is a single two-lane road connecting the town with surrounding communities that is subject to blockage by landslides following heavy rains. Nonetheless, the community has strong and long-established family and tribal networks, and relies on this form of capital for quality of life as well as to access its environmental assets.

The exercises in Neah Bay were held in the tribal marina, and organized by the tribe's emergency preparedness coordinator. Ten community members participated, including the chief of police, a tribal elder, an entrepreneur in developing new ecological food products, and other residents. The exercise was driven by a 9.0-magnitude earthquake event along the Cascadia Subduction Zone. The scenario included a tsunami that would wash over much of the community with a 30-minute to 1-hour warning. The scenario assumed that residents warned by the shaking ground and knowledge of tsunami threats would evacuate to available high ground. The event would isolate the community since the only access would be by air or sea. Most built capital in homes and commercial and government structures would be destroyed. Current providers of food, water, and health services would not be functional. The Makah Tribe has been well aware of the risks that a Cascadia Subduction Zone earthquake and the resulting tsunami pose to their community, and has already moved some of its critical buildings and services above the tsunami inundation zone. With plans to move other critical buildings and services in coming years, the community also practices regular tsunami drills. Within the previous two years, the community has undertaken both a general hazards mitigation plan as well as a plan for new tsunami vertical evacuation facilities.

During the day of the scheduled exercise there was a conflicting community activity that required the exercise play to be shortened by 30 minutes, and the smaller number of Neah Bay participants allowed for only two HWB teams of five to six people each. The social relations team was combined with health, and the basic materials team was joined with the security team. The smaller number of participants also allowed us to dispense with the World Café round. The project team did not feel that this detracted from the ability of the participants to identify providers of goods and services for the three rounds of play, and to consider the tribe's recent mitigation plans in light of existing community social and economic development plans.

Discussion: Exercise Results

A number of themes emerged from participant discussions (refer to Table 1).

1. Institutional (governmental or large-scale commercial) sources or providers of HWB would be less reliable in the aftermath of the simulated earthquake. Regardless of which theme (i.e., basic materials, security, health, or social relations), participants listed institutional sources or providers as necessary for quality-of-life goods and services under current normal conditions. These included schools, buses, hospitals, chain supermarkets, city housing and social service agencies, radio stations, and major arenas for recreational and cultural activities. After the disruption, all groups listed immediate neighbors, neighborhood-based organizations, and the less formal networks supporting them, as well as more decentralized infrastructures for information dissemination (ham radios), water (cisterns), food (backyard and neighborhood groceries), and movement (walking or individual forms of movement as opposed to transit). Participants believed that most businesses would be unreliable or run out of supplies in the immediate aftermath of an earthquake. In contrast to the urban communities of Redmond and Everett, participants in Neah Bay felt more traditional food and shelter providers would be available through exploitation of natural capital (fishing, shellfish, and forest wildlife) and social relations (friends and family resources).
2. Institutional facilities that can adapt and serve multiple functions would be valuable after the simulated earthquake. Institutions that were listed as important providers of one type of good or service before the disruption (churches, mosques, temples for worship; schools for education; and trails, parks, and arenas for recreation) became important for other purposes after the disruption: for example, churches, mosques, temples, and schools for shelter and food distribution; trails for movement when roads are broken; parks for shelter (camping) and refuge and assembly; and arenas for shelter, assembly, and information.
3. Participants viewed decentralized technology and infrastructure as useful to a community-level response, though participants in Redmond felt that social media also could extend this response beyond the immediate community. Participants in Neah Bay felt that the informal structure of their community networks made them more resilient and less reliant on formal planning. They spoke of the sharing of housing and food as a reliable cross-community asset for survival in the aftermath of the disruption. Participants in all workshops discussed alternatives to large centralized systems, primarily in the context of reliance on neighbors and social networks.

For the round three discussion on how to increase adaptive capacity in anticipation of a new normal, the themes listed above emerged in different ways:

4. There was consensus that neighborhood centers would be one of the most effective means of putting residents in a better position should an earthquake occur.

Table 1. Summary statement by category for each community.

Item	Redmond	Everett	Neah Bay
Reliance on institutions for basic materials vital for HWB	Institutional (governmental or large-scale commercial) providers of HWB would be less reliable and most businesses would be unreliable or run out of supplies post-earthquake.		Would rely very little on regional institutions (except perhaps Coast Guard station); rely instead on traditional ways of living with the land and sea, kept current through tribal cultural education.
Change in institutional roles and use of multifunctional facilities	Institutions and facilities that were listed as important providers of one type of good or service before the disruption would provide alternative goods and services; e.g., churches and schools for shelter and food distribution; trails for alternative access; parks for shelter (camping) and assembly, etc.		Changes in institutional roles did not emerge as a major theme due to the existing multifunctional role of most institutions in this small, tight-knit community.
Post-disruption reliance on social capital	Would rely on immediate neighbors, family and friends, neighborhood-based organizations, and the less formal networks that support them. In general, emphasized social capital over built and natural capital.		Heavy reliance on family, friends, and neighbors through informal social networks enabling mutual aid, communication, improvisation, and flexibility.
Post-disruption reliance on built capital	Emphasized spatially decentralized infrastructure, emergency services, and public facilities.		Would rely very little on built capital, with exception of boats and logging road as emergency access
Post-disruption reliance on natural capital	Community gardens could provide some food temporarily, and park space for camping, refuge. Redmond mentioned some foraging and trapping possible in parks. Everett concerned about safety of fish supply due to pollution.		Would rely on available natural capital for basic materials; e.g., fish, shellfish, and game for food; streams for water; forests and available flat land for shelter.
Redundancy and relocation of services	Clear desire for distributed system redundancy, including increased self-sufficiency and diversification of facilities and services through the creation or strengthening of neighborhood centers outside of liquefaction, landslide, or other high-risk areas.		Some critical facilities already relocated above the tsunami inundation zone and have plans to move other critical buildings and services in coming years. Separate upland neighborhoods would need some redundant emergency supplies and means of communication across the Reservation.
Alternative routes	Need safer alternate transportation routes that increase connections between the hilly areas.	Need for safe alternative routes, strengthening of bridges over ravines, and links to inland areas to mitigate post-disruption isolation of coastal bluff-top houses.	Need to improve existing logging roads to provide an alternative emergency access.
Walkability	Neighborhood centers should be walkable from most residences, via trails and walkways that improve accessibility.		Community does regular tsunami drills, but needs improved trails across wetlands and up slopes to elevated land.
Need for community nodes and centers	Desire for new neighborhood centers, including branch municipal services, health care, and emergency medical facilities; food and water sources such as community gardens; shopping for daily necessities; places for both programmed and spontaneous gatherings; and multifunctional space to accommodate the different programmatic ideas that participants listed, e.g., ham radio station, community bulletin boards, kitchens, and pantries. Zoning changes should support this.		Central facilities outside the tsunami inundation zone would contain community caches of emergency supplies such as medicine, food, and water.
Points of contact	Implicit concurrence but not mentioned directly.	To improve communications, the community needs to develop points of contact, strengthen neighborhood networks, and create emergency communication hubs, which includes ham radio volunteer networks and space in the centers for them.	Specific people were identified for specific community responsibilities following the disturbance.

(*Continued*)

Table 1. (*Continued*) Summary statement by category for each community.

Item	Redmond	Everett	Neah Bay
Anomalies in the different workshops and observations by the project team	• No specific government team in Redmond. • Participants mentioned that social capital was not necessarily neighborhood-based. Social networks extended outside the city and county. • Planner participants were interested in using and strengthening existing policy to support mixed-use service centers in neighborhoods; elected official participant concerned about popular resistance to this.	• The local government table maintained that most goods and services would continue to come from government. • Need for more resilient transportation systems (new bridges, wider and broader streets, etc.). • There was an emphasis on personal preparedness through better training and communication, home generation of electricity, and home storage of water. • Disaster information and preparedness training should be disseminated within neighborhoods and implemented in K-12 school curriculum, with the help of increased translation capability. • The Incident Command Structure should be brought to the neighborhood level. • A standard disaster language and vocabulary should be developed. • Neighborhood centers would also include decentralized energy districts.	The tribe appeared more resilient due to the following conditions and attitudes mentioned and expressed by the participants: • Tighter and better organized informal social structure allowing less reliance on formal planning procedures; • An abundance of natural capital along with knowledge of how to exploit this resource; • Better prepared due to being much more aware of the risks that the change event pose to their community; • Members generally keep their fridges and pantries well stocked because of their remoteness; • Homes have a secondary heat source: wood stove or propane; • Community does regular tsunami drills; • The change event is seen as an opportunity to make use of traditional ways of living with the land and education, not just a catastrophe causing displacement; and • Because of the above mentioned, Makah would survive, as they have in this area for thousands of years.

Note: Comments often reflect summaries of several supporting statements.

Neighborhood centers should be within walking distances from most residences and include branch municipal services, health care and emergency medical facilities, grocery and other shopping for daily necessities, and places for programmed and spontaneous gatherings. Zoning codes should be changed to accommodate the mixing of uses and building types necessary to develop such centers. The consensus was expressed both within each table group (i.e., in the context of discussing just one of the four categories of HWB), as well as in the mixed-category discussions generated by the World Café–style rotation among tables.[5] In Neah Bay, the community had already considered moving community centers and gathering places to high ground. Since most new housing on the reservation has been built in two hillside neighborhoods that would be isolated from each other in the event of a tsunami, there was discussion about how to strengthen these neighborhoods' self-sufficiency.

5. There was consensus that programming of space and activities on a neighborhood scale should have the goal of building trust and increasing communication among neighbors. Ideas included organization of amateur ham radio or walkie-talkie operators to be able to coordinate and communicate with neighbors in an emergency event; translation services and "universal" symbols and guides for multilingual communities; time-banking or mutual aid of needed skills such as home repair; community gardening; and shared growing, preparation, storage, and dispensing of food (which might take place as regular events even outside of any emergency situation).
6. Residents of Redmond and Everett saw parks and habitat restoration areas as potential sources of water and food during an emergency. Participants recognized the importance of clean water bodies and aquifers. Participants in Neah Bay felt confident that they could exploit post-event natural capital, with access to stream water, fish, and shellfish.
7. The built, social, and natural capital emphasized separately in the three points above were linked in participants' comments. New neighborhood

centers should include multifunctional space to accommodate the different programmatic ideas that participants listed. Ham radio volunteers, for example, should be known and accessible to their neighbors, and could have space in the neighborhood centers, along with community bulletin boards, kitchens, and pantries. Trails and walkways throughout neighborhoods would improve the accessibility of these facilities to a larger number of residents. Decentralized technologies, including community gardens in the urban areas and the environmental assets of Neah Bay, would be accessible through the social capital of neighborhood and family networks.

In one example of how the connection between hazards mitigation and recovery planning and more general planning became obvious, urban form was at least as important as the geologic characteristics of the simulated earthquakes in prompting the direction of discussion. The emphasis on neighborhood isolation and self-reliance in both the Redmond and Everett workshops derived in part from the nature of crustal fault earthquakes in those communities. Although the types of earthquakes simulated for the Redmond and Everett scenarios were similar, and their areas of strongest shaking coincided with the locations of the two cities' most important businesses (Microsoft and Boeing), other impacts on the two cities were quite different. In Redmond's scenario, the downtown center was severely damaged, while the upland residential neighborhoods on the stable soils experienced less damage but became "islands" surrounded by liquefaction and shaking in the central and surrounding valleys. In Everett, the liquefaction and shaking were not at the center of the city, but at its periphery. The downtown experienced relatively little damage except for individual older buildings, and its mix of uses and grid of small blocks enhanced internal accessibility to important providers of good and services; however, because it was located on a peninsula with a narrow neck, it was easily cut off from the rest of the city. In both cities, the layout of the street network and current land use zoning in most areas exacerbated these problems, making each neighborhood internally less walkable, and providing few connections to other parts of the city.

Evaluations of the workshops were very positive. Participants in all three workshops were supportive of the exercise. While changes were made after the Redmond workshop to both the Everett and Neah Bay workshop protocols, none of these changes seemed to diminish the enthusiasm for the activities or the conclusions.

Conclusions

The exercises constitute a partial "proof of principle" for an asset-based Appreciative Inquiry approach to community discussions about disasters. Based on three participating community exercises, we find themes that provide direction for further research. We also find guidance to improve hazards mitigation and disaster pre-disaster recovery planning

Our work suggests that FEMA's Risk MAP process would benefit from using HWB to drive discussion of community values. Residents can express these values by responding to questions regarding which qualities of their community provide HWB goods and services:

a. What do you like about your community?
b. What helps define the quality of life?
c. What community characteristics provide assurance that you and your community will recover from a major change?
d. How can these be incorporated into daily life?

By starting the exercise with a broad definition and inventory of assets for everyday quality of life, and then returning to a summary of the comprehensive plan after discussing the earthquake scenario, we found that it was relatively easy for participants to link mitigation and pre-disaster recovery planning with ideas for enhanced wellbeing in general (i.e., things they want to do regardless of a threat, but which would also be especially helpful if a threat is realized).

An important principle underlying the exercise is the role of social capital in enhancing a community's adaptive capacity. In the immediate aftermath of a disruption, social capital is a crucial substitute or backup for vulnerable large, complex systems and institutions and built infrastructure. Neah Bay in particular demonstrated the importance of social and natural capital in supplementing the goods and services traditionally provided by the built environment. It was as if the HAZUS output, with its emphasis on the vulnerability of built capital, not only provided minimal direction in promoting community resilience—defined as the ability to self-organize—but even misdirected the effort. Where a community is not as dependent on built capital, as in Neah Bay, physical loss estimates are not instructive. Beyond this, however, participants also recognized that social capital is not created overnight; it must develop gradually, through organizations and in facilities that are place based and functional on a daily basis. Participants therefore implicitly acknowledged another function of social capital in resilience: It enables a community to self-organize. This is not something that hazard mitigation can provide on its own.

The U.S. eastern coastal barrier islands damaged by Hurricane Sandy offer a case in point; even if all built capital were rebuilt or retrofitted to FEMA's advisory base flood elevations, many of these islands would still not be resilient to emergency climate threats (McKay, 2013). Sea levels are rising, the frequency of severe storms is increasing, and sand is blowing inland or washing out to sea. The mitigation of built capital on such shifting sands may even reduce community resilience if the community is financially or socially less prepared to adapt to future changes. Communities increasing their indebtedness in pursuit of bouncing back to a historic normal, replacing lost infrastructure, and complying with higher FEMA standards may be less resilient: less able to recover when these assets are destroyed in future disasters. FEMA maps and regulations do not address risks associated with sediment-starved waterfronts, retreating shorelines, or climate change–induced increases in the frequency of extreme events or sea level changes. Such debt-encumbered communities would be less able to assemble the assets needed for recovery.

An approach based on a more ecological concept of resilience emphasizes a community's total capacity not just to survive a disruption, but also to adapt to the irreversible, unpredictable, and ongoing changes that follow it. Large investments in mitigating the impacts of specific low-probability (but high-consequence) events are often difficult to justify, and they may not be necessary if a community's adaptive capacity is otherwise high. This capacity depends on a broad combination of goods and services provided by built, natural, and social capital to differing degrees and at different times. By thinking about recovery in advance of an event, and premising discussions on this more holistic definition of assets, communities can more easily see how to balance their reliance on a robust built environment with an ability to adapt to change.

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Notes

1. Risk MAP is a FEMA program that provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens.

2. We define "better" as "community-defined HWB." However, our exercise did not challenge the group to make tradeoffs or define priorities.

3. We refer to HWB for purposes of this analysis, but used "quality of life" in presentations during the exercise.

4. Millennium Ecosystem Assessment categories include "freedom of choice and action" as a fifth category. During this exercise, each group was asked to consider choice in a general way, although it also emerges in the range of sources and providers listed for any given good or service.

5. By "consensus" we mean that no dissension was expressed. We employed no mechanism to determine whether any participants held dissenting views but kept them private.

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