

**How Can An Asset-Based Appreciative Inquiry Risk Assessment Model Improve FEMA's  
Risk MAP Process To Help Communities Become More Resilient?**

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## **Abstract**

How can an asset-based appreciative inquiry risk assessment model improve FEMA's Risk MAP process to help communities become more resilient?

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Communities are facing ever increasing risk. There is a growing awareness among risk professionals (analysts, emergency managers, planners etc.) that the tools and processes for assessing risk and helping communities become resilient are inadequate. In order to strengthen the nation's resilience, FEMA should modify its Risk MAP process so that it addresses the ever changing conditions and risks communities face.

In this system analysis, an asset-based appreciative inquiry risk assessment model (referred to in this thesis as the "ABAIRA Model") is compared to the Federal Emergency Management Agency's Risk MAP process. The ABAIRA Model expands upon an asset-based approach to Risk MAP (referred to in this thesis as the "Workshop Model") that the author helped develop and test at the request of the Federal Emergency Management Agency. Eight main problem areas for improvement are addressed. These include: (1) defining community resilience; (2) a risk assessment process that focuses on what really matters to a community, most importantly their human well-being; (3) effective community engagement; (4) incorporating community goals and plans into the risk assessment process; (5) identifying assets beyond just built capital, by including natural and social capital; (6) assessment of community capability; (7) identification and assessment of mitigation, risk reduction and resilience opportunity; and (8) incorporating risk assessment into other community planning processes. This analysis expands upon the Workshop Model's concepts and approach.

## Preface

Over the past year, Professors Robert Freitag, Daniel Abramson, Manish Chalana, myself and many others explored new ways to increase community participation in the Federal Emergency Management Agency (FEMA) Risk MAP process, and to better integrate Risk MAP into communities' on-going land use planning. We developed an asset-based approach to Risk MAP (referred to in this thesis as the "Workshop Model"), which we tested by conducting workshops in three communities: Redmond, Everett and Neah Bay. FEMA provided funding for these workshops as part of the project. This work culminated in a report titled, *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption*, as well as an article with the same title submitted to the Journal of the American Planning Association (JAPA). The article is currently in revision (see Appendix G for a draft copy). Much of the language of this thesis appears in the report and article, and although I contributed to them as a co-author with Professors Freitag, Abramson and Chalana, it has not been possible to cite the author of every idea. This thesis would not have been possible without the opportunity to contribute to this project; the skills and knowledge I obtained during the pursuit of my concurrent master's degrees; and all the hard work from the other project team members.

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# 1 Introduction

The world is changing rapidly. Communities are facing greater and more complex risks, i.e. climate change, cyber vulnerabilities and terrorism. Infrastructure systems are becoming more complex and expensive to build and maintain. In 2013 the American Society of Civil Engineers (ASCE) gave US infrastructure a D grade. The tools, processes and approaches we use today to assess and manage risk are becoming outdated and inadequate. In order for our nation to become resilient, our communities must become resilient by better managing risk.

Risk assessment provides information about risk to help governments, businesses and communities make better risk management decisions. This can help communities become “more resilient and better able to withstand the impacts of disaster.”<sup>1</sup> In order to analyze risk, organizations must be able to analyze what community stakeholders value. Typically, when conducting risk assessment, the mapping of what is considered valuable and important to the broader community is not explicitly stated and debated among the majority of stakeholders. Instead there is an assumption that all stakeholders implicitly agree on community assets, including infrastructure, that are both necessary and vulnerable. Stakeholders however often have different opinions on what is important, which often results in the pursuit of irreconcilable goals.<sup>2</sup>

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<sup>1</sup> Federal Emergency Management Agency. *FEMA's Risk Mapping, Assessment, and Planning (Risk MAP): Fiscal Year 2011 Report to Congress*. Federal Emergency Management Agency, 2011.

<sup>2</sup> Becker, Per and Henrik Tehler. “Constructing a Common Holistic Description of What is Valuable and Important to Protect: A Possible Requisite for Disaster Risk Management.” *International Journal of Disaster Risk Reduction* 6 (2013): 18–27. 19 and 20.

Risk MAP is a process that helps communities map, assess and plan for risk, which helps them to take action to reduce their risk.<sup>3</sup> Through collaboration with State, Local, and Tribal entities, this process helps communities identify, assess, communicate and mitigate risk (mainly involving flooding and earthquakes). It also enhances maps (mainly flood maps); provides risk information (in the form of reports) to help communities enhance their mitigation plans; and guides and encourages them to communicate risk to their constituents.<sup>4</sup>

Risk MAP also supports the following FEMA Administrator's Priorities: (1) the priority to strengthen the nation's resilience to disasters; and (2) FEMA's strategic priority to foster a national community-oriented approach to emergency management that strengthens local institutions, assets, and social networks to build sustainable and resilient communities.<sup>5</sup>

The Risk MAP process and products are useful for showing communities what built assets are currently at risk, especially regarding flood data and insurance. It produces useful mapping layers, maps and data. It gives a good overview of different types of hazards (mainly flood and earthquake), mitigation actions (mostly focused on built capital), what funding is available for such actions and what some areas of concern are regarding structures. It also ties in hazard mitigation planning, and to some extent comprehensive planning. All of these elements make Risk MAP strong in technical and visual areas, and traditional hazard mitigation planning. The Risk MAP process can however be much more than delivering quality data.

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<sup>3</sup> Federal Emergency Management Agency. *Community Resilience Upper Spokane Watershed*. PowerPoint Slideshow. Federal Emergency Management Agency, 2012.

<sup>4</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 36.

<sup>5</sup> Federal Emergency Management Agency. *FEMA's Risk Mapping, Assessment, and Planning (Risk MAP): Fiscal Year 2011 Report to Congress*. Federal Emergency Management Agency, 2011.

A more effective approach is needed. One that engages community stakeholders; moves away from problem-based planning (that so often misses informal systems, which characterize social, cultural and natural capital of a community) to asset-based appreciative inquiry planning; identifies and assesses all risk to all assets that are necessary for each communities' human well-being; incorporates community goals and planning in the risk assessment process; includes capability and opportunity analyses; and helps address the need for inclusion of risk assessment and information into other community planning processes. The Federal Emergency Management Agency understands much of this and funded the development and testing of an asset-based approach (referred to in this thesis as the "Workshop Model") to help improve their Risk MAP process.

This thesis expands on the Workshop Model in the following ways: (1) it formalizes the approach by creating an expanded asset-based appreciative inquiry risk assessment model (referred to in this thesis as the "ABAIRA Model"); (2) further clarifies key concepts, including risk, resilience and human well-being (HWB); (3) expands the scope to include eight major areas; (4) adds a risk prioritization matrix; and (5) compares the ABAIRA Model to Risk MAP. The Workshop Model and its underlying concepts of resilience, risk, risk assessment, capital, human well-being and appreciative inquiry were used as the foundation for the ABAIRA Model.

There are eight main areas for improvement to the Risk MAP process that are addressed in this thesis. These include: (1) defining community resilience; (2) a risk assessment process that focuses on what really matters to a community, most importantly their human well-being; (3) effective community engagement; (4) incorporating community goals and plans into the risk assessment process; (5) identifying assets beyond just built capital, by including natural and social capital; (6) assessment of community capability; (7) identification and assessment of

mitigation, risk reduction and resilience opportunity; and (8) incorporating risk assessment and information into other community planning processes.

## **1.1 Research Questions**

### **Research Question**

How can an asset-based appreciative inquiry risk assessment model improve FEMA's Risk MAP process to help communities become more resilient?

### **Sub-questions**

- What is risk?
- What is resilience?
- What is risk assessment?
- What is human well-being?
- What is the Risk MAP process?
- What is the ABAIRA Model?

## **1.2 Hypothesis**

The ABAIRA Model will provide an approach with which risk assessment processes can be improved to help communities become more resilient. At the very least it will further the much needed discussion that should lead to an improved FEMA Risk MAP process approach and a better understanding of community risk and resilience.

## **2 Literature Review**

Many of the concepts discussed within this analysis are complex and have competing definitions. It is therefore important to provide some detailed explanations and context. The discussion begins with risk in the context of hazards and threats. It moves to resilience, then to risk assessment. From there, human well-being is discussed, along with the necessary goods and services that support it and the different types of capital (assets) that provide these goods and services. Then onto asset-based risk assessment and appreciative inquiry, and finally, the process of integrating risk assessment into other types of planning.

### **2.1 Defining Risk**

Understanding, managing, and reducing risk is fundamental for building community resilience. Risk as defined by The United Nations Office for Disaster Risk Reduction (UNISDR), is “The combination of the probability of an event and its negative consequences.”<sup>6</sup> The negative consequences that are most often listed in regard to disaster risk are losses to lives, property, assets and services. This view of disaster risk is limited. It discounts the opportunities that come with change that both causes and is caused by events.

Conventional disaster and hazard mitigation planning views the mitigation-preparation-response-recovery sequence in linear terms, dependent on an ability to predict events and their

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<sup>6</sup> UNISDR The United Nations Office for Disaster Risk Reduction Website; “Terminology.” <http://www.unisdr.org/we/inform/terminology>. (accessed July 28, 2014).

impacts, largely in order to preserve or restore pre-event conditions.<sup>7</sup> Such planning is typically driven by a vulnerability analysis.

The process assumes that resilience is achieved by mitigating all vulnerabilities, which is expensive, if not impossible and unsustainable given our limited resources. Restoring things back to the way they were before a disruption is also practically impossible and often socio-ecologically undesirable. This has been recognized by recent efforts to incorporate sustainability into community disaster recovery goals.<sup>8,9</sup> Threats should instead be seen as uninvited but potentially important agents of change, and resilience should be viewed as the capacity to adapt to change, rather than to bounce back from it.<sup>10</sup> The capacity to adapt is being able to respond to a disruption by adjusting to a new normal, and to build back better, where better is defined according to community cultural and social values and principles of resilience.<sup>11,12</sup> The capacity to adapt often times is only revealed after a disruption, but it could and should be developed in the course of a community's ongoing development.

In this analysis, risk is defined as threats to human well-being and consequently community resilience. Opportunities are defined as positive risk or the chance that resilience will improve,

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<sup>7</sup> Beatley, T. *Planning for Coastal Resilience: Best Practices for Calamitous Times*. Washington, DC: Island Press, 2009. 6-8.

<sup>8</sup> Paton, D., and D. M. Johnston, eds. *Disaster Resilience: An Integrated Approach*. Springfield, IL: Charles C. Thomas, 2006. 7 and 8.

<sup>9</sup> Smith, G. P., and D. Wenger. "Sustainable Disaster Recovery: Operationalizing an Existing Agenda." In H. â. Rodríguez, E. L. Quarantelli and R. R. Dynes, eds. *Handbook of Disaster Research*, 234-257. New York: Springer, 2007.

<sup>10</sup> Norris, F., S. Stevens, B. Pfefferbaum, K. Wyche, and R. Pfefferbaum. "Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness." *American Journal of Community Psychology* 41, no.1 (2008): 127-150.

<sup>11</sup> Chan, K. M. A., A. D. Guerry, P. Balvanera, S. Klain, T. Satterfield, X. Basurto and U. Woodside. "Where Are Cultural and Social in Ecosystem Services?: A Framework for Constructive Engagement." *BioScience* 62, no. 8 (2012): 744-756.

<sup>12</sup> Millennium Ecosystem Assessment. *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press, 2005.

i.e. through mitigation.<sup>13</sup> Capability is defined as the community's capacity for threat warning, preparedness, response and recovery. Risk as used in this analysis:

1. Incorporates ecosystem services thinking into the process. Risk assessment goes beyond merely focusing on built capital to include a consideration of social and natural capital; and
2. Considers the reduction of a community's ability to adapt to a change and self-organize.

This change in emphasis can be illustrated through two very different approaches to reducing risk. A traditional approach to risk reduction would include a coastal flood prone community where all structures are built above the level of flooding. Here the community has focused on protecting built capital. A different approach is where a community adopts the necessary legal tools whereby the development rights of structures destroyed by flooding could be transferred to high ground development sites. This second community might have secured an acceptance for this approach by involving a wide range of community stakeholders. Resilience in this case focuses on natural capital (high ground), social capital (networks) and their ability to adapt to a changing coastline. Should sea level rise and storm severity increase, causing the shoreline to retreat, our second community may be the more resilient especially if the government and property owners in our first example were heavily indebted and had exhausted their financial resources in paying the costs of elevation and had few reserves to rebuild.

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<sup>13</sup> Freitag, B., S. M. Bolton, F. Westerlund, and J. L. S. Clark. *Floodplain Management: A New Approach for a New Era*. Washington, DC: Island Press, 2009.

## 2.2 Defining Resilience

Resilience is a concept with many different definitions and approaches. The Department of Homeland Security (DHS) defines resilience within PPD-21 as, “the ability to prepare for and adapt to changing conditions, and withstand and recover rapidly from disruptions.”<sup>14</sup> Some examples of resilience measures DHS gives include: “developing a business continuity plan, having a generator for back-up power, and using building materials that are more durable.”<sup>15</sup>

This analysis goes beyond the DHS definition of resilience by ascribing to the resilience science definition and approach, viewed within the context of the Panarchy model. The Panarchy model is a concept from the science of ecology that explains the evolving nature of complex adaptive systems. It is the hierarchical structure in which natural (i.e. forests, wetlands, lakes etc.) and human systems (i.e. structures of governance, settlements, and cultures) are interlinked in never-ending adaptive cycles of growth, accumulation, restructuring, and renewal (see Appendix A for a more detailed explanation of Panarchy).<sup>16</sup>

Resilience is defined within this analysis as the capacity of a community to absorb change from an event and adapt so as to retain the ability to provide goods and services necessary for human well-being (HWB). This means the ability of an individual or community to adapt or transform in response to disturbances —rather than just “bouncing back,” undergoing undesirable change, or collapsing. Important to this definition is that what is resilient to one may

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<sup>14</sup> DHS.gov Department of Homeland Security Official Website; “What Is Security and Resilience?” <http://www.dhs.gov/what-security-and-resilience>. (accessed July 28, 2014).

<sup>15</sup> Ibid.

<sup>16</sup> Holling, C. S. “Understanding the Complexity of Economic, Ecological, and Social Systems.” *Ecosystems* 4, no. 5 (2001): 390–405. 392.

not be resilient to others. One's resilience may actually depend on another's collapse. Any change may bring benefits to some, hardships to others.

“Self-organizing mechanisms in different systems allow them to absorb internal and external disturbances, but if thresholds are exceeded, systems will be attracted to an alternative state which may lead to undesirable conditions and reduced function.”<sup>17</sup> Reversing this change may be very expensive or even impossible.<sup>18</sup>

A system state is a set of variables that can “change and create either stabilizing feedbacks that keep the system in a particular state (e.g., a clear lake) or amplifying feedbacks that push the system toward a new configuration and system state (e.g., a murky lake).”<sup>19</sup> Disturbances are natural or man-made pressures that influence the ability of a system to continue its functions. Forest fires, heavy rainfall, earthquakes, and economic bubbles are all examples of disturbances.<sup>20</sup>

The concept of resilience shifts the focus from growth and efficiency to adaptation and flexibility. The aim of community resilience is for the community to be able to adapt in order to keep the system within a “state” that will continue to provide the goods and services necessary for HWB.<sup>21</sup> This “state” is different for every community, because each community not only has its own priorities and conditions, but also different assets that it depends upon for HWB and feels

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<sup>17</sup> Alberti, M. Russo, M and K. Tenneson. *Snohomish Basin 2060 Scenarios: Adapting to an Uncertain Future: Decision Support for Long Term Provision of Ecosystem Services in the Snohomish Basin, WA*. Seattle, WA: Urban Ecology Research Laboratory, University of Washington, 2013. 48.

<sup>18</sup> Ibid. 48.

<sup>19</sup> Resilience Alliance. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0*. Resilience Alliance, 2010. 6.

<sup>20</sup> Alberti, M. Russo, M and K. Tenneson. *Snohomish Basin 2060 Scenarios: Adapting to an Uncertain Future: Decision Support for Long Term Provision of Ecosystem Services in the Snohomish Basin, WA*. Seattle, WA: Urban Ecology Research Laboratory, University of Washington, 2013. 48.

<sup>21</sup> Ibid. 48.

are important. An example is Neah Bay, WA. The Makah Tribe's community identity is so closely connected with its place at Neah Bay that the community cannot consider adaptive strategies for resilience that other communities (e.g. Redmond, WA) might be able to consider, such as relocating to a different area post-disaster. The Makah community also depends heavily upon natural capital (e.g. fishing and timber). Whereas, the Redmond community is not as tied to its location and it depends heavily upon flexible social capital (e.g. its work force and businesses). This means much of the Redmond community could consider relocating.<sup>22</sup>

Resilience theory leans on certain assumptions:<sup>23</sup>

- Change is natural and an essential element of systems. When we try to reduce or eliminate change we actually reduce the systems' resilience (ability to withstand disturbances).
- Diversity is essential for resilience due to providing opportunities for adaptation to change. No strategy or condition is ever 'optimal.'
- Uncertainty: "While we may be able to reduce the uncertainty around future events and conditions of complex systems by expanding empirical studies and improving predictive models, we will never have complete knowledge. We therefore need approaches to decision making that are effective across multiple future conditions (i.e. robust strategies) and that improve our adaptive capacity and opportunities for self-organization."<sup>24</sup>
- Systems are linked culturally, politically, socially, economically, ecologically, and technologically.
- There are three related dimensions to resilience: specified resilience, general resilience, and transformability.
- Working with resilience involves both adapting and transforming.<sup>25</sup>

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<sup>22</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 36.

<sup>23</sup> Alberti, M. Russo, M and K. Tenneson. *Snohomish Basin 2060 Scenarios: Adapting to an Uncertain Future: Decision Support for Long Term Provision of Ecosystem Services in the Snohomish Basin, WA*. Seattle, WA: Urban Ecology Research Laboratory, University of Washington, 2013. 48.

<sup>24</sup> Ibid. 49.

<sup>25</sup> Walker, Brian H., and David Salt. *Resilience Practice: Building Capacity to Absorb Disturbance and Maintain Function*. Washington, DC: Island Press, 2012. 68.

Resilience as a process addresses:<sup>26</sup>

1. *Specified resilience* – the capacity to absorb a particular kind of change.
2. *General resilience* – the capacity to absorb changes of all kinds, including novel, unforeseen ones.
3. *Transformability* – the capacity to create a fundamentally new system when conditions make the existing system untenable.

Resilience science identifies five factors that define resilience:

1. *Remembering* – this occurs when the potential accumulated and stored in the larger, slow levels, influence reorganization. A fire burns a forest but seed stocks remain allowing for the forest to regenerate.
2. *Revolt* – this occurs when fast, small events overwhelm recovery, which can be positive or negative. We have destroyed countless forests in order to build houses and plant orchards. Our resiliency depended on the lack of resiliency of a forest. Or for example, a burnt forest attempting to reestablish itself may be overtaken by more resilient competitors such as Scotch Broom or Himalayan Blackberry, preventing the establishment of the pre-change ecology.
3. *Feedbacks* – can amplify change in a system or have a stabilizing effect. Resilient communities have self-organizing feedback mechanisms. Think sunlight reflecting off of white snow minimizing warming and melting, thus generating a stabilizing feedback on the snowpack, or dirty snow absorbing the heat from sunlight, leading to further melting, thus causing an amplifying feedback effect on the snowpack.<sup>27</sup> Or for example, a flood damages a home in Snoqualmie, Washington. Most homes are elevated and the owner sees a lifestyle and market advantage of elevating the home above future flood levels even without the incentives of the National Flood Insurance Program. However, along the east coast of a New Jersey barrier island, using limited resources to elevate your home may create a destructive feedback if the grounds wash away from under your home and you have exhausted your financial resources.
4. *Threshold / Tipping Point* – a point at which a relatively small change in external conditions causes a rapid change. Change is seldom linear. A one-degree change in temperature can melt a protective ice shelf, removing a vital buffer for an Alaskan community.

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<sup>26</sup> Walker, Brian H., and David Salt. *Resilience Practice: Building Capacity to Absorb Disturbance and Maintain Function*. Washington, DC: Island Press, 2012. 68-101.

<sup>27</sup> Resilience Alliance. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0*. Resilience Alliance, 2010. 6.

5. *Transformability* – the capacity to create a fundamentally new system when conditions make the existing system untenable – where organizations are capable of exploiting new opportunities. We pretty much destroyed the economies of Japan and Germany during WWII. That was one of our war objectives, but in the process we destroyed old built capital including antiquated machinery and helped modernize both countries’ industrial sectors.

Another approach to resilience thinking is City Resilience (for more details see Appendix B),

which includes the following: <sup>28</sup>

- *Robustness*: strength, or the ability of elements, systems, and other units of analysis to withstand a given level of stress or demand without suffering degradation or loss of function;
- *Redundancy*: the extent to which elements, systems, or other units of analysis exist that are substitutable, i.e., capable of satisfying functional requirements in the event of disruption, degradation, or loss of functionality;
- *Resourcefulness*: the capacity to identify problems, establish priorities, and mobilize resources when conditions exist that threaten to disrupt some element, system, or other unit of analysis.
- *Rapidity*: the capacity to meet priorities and achieve goals in a timely manner.

*“Communities can be viewed as a set of interrelated systems that share a common vision and the overall resilience of communities may be viewed in much the same way as the overall health of the human body. Communities depend on a number of interrelated systems for [human well-being]. The relative ‘health’ of community systems will determine how well a community can withstand disruptive events. If a community has weakened infrastructure, like a human body with a compromised immune system, it will not withstand trauma as well as one in good health. [Also,] investment in community resilience before a disaster occurs may help a community reduce or avoid monumental recovery and restoration costs after the event has taken place.”<sup>29</sup>*

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<sup>28</sup> Bruneau, Michel, and Andrei Reinhorn. “Exploring the Concept of Seismic Resilience for Acute Care Facilities.” *Earthquake Spectra* 23, no.1 (2007): 41-62. 3.

<sup>29</sup> Resilience Alliance. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0.* Resilience Alliance, 2010. 15.

On a final note, just as no strategy or condition is ever ‘optimal’, resilience is not a task or process that can be considered “completed.” There is no perfect end state or condition. Therefore, building community resilience means (in the traditional emergency management definition), “building strong communities that contain adequate essential public and private services including schools, transportation, health care, utilities, roads and bridges, public safety and businesses”<sup>30</sup> -- or, in the definition used in this project, resilience is building the capacity of a community to absorb change (disturbances) and reorganize so as to retain essentially the same state (function, structure, identity, and feedbacks) that will continue to deliver desired goods and services for HWB.

### **2.3 Risk Assessment**

A key component of managing risk is to understand it and therefore determine what levels of risk are acceptable. To do this, risk must be assessed. According to UNISDR, risk assessment is, “A methodology to determine the nature and extent of risk by analyzing potential hazards [threats] and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.”<sup>31</sup> This includes weighing the costs and benefits of mitigating and reducing risk. By considering these elements and going through this process, communities can better understand how to best manage and plan for their risk.

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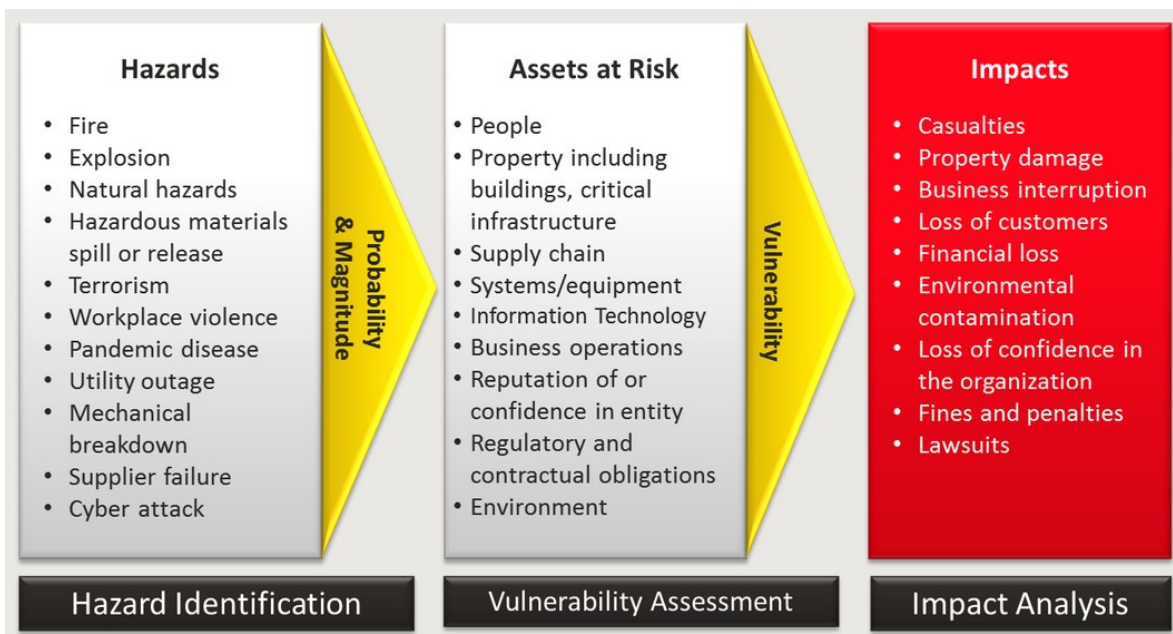
<sup>30</sup> Resilience Alliance. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0.* Resilience Alliance, 2010. 15.

<sup>31</sup> UNISDR The United Nations Office for Disaster Risk Reduction Website; “Terminology.” <http://www.unisdr.org/we/inform/terminology>. (accessed July 28, 2014).

The Department of Homeland Security defines the following terms:<sup>32</sup>

- *Threat* – natural or manmade occurrence, individual, entity, or action that has or indicates the potential to harm life, information, operations, the environment, and/or property.
- *Vulnerability* – physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard.
- *Consequence* – effect of an event, incident, or occurrence.

**Figure 1. Standard Risk Assessment Process**<sup>33</sup>



A common way of assessing and therefore prioritizing risk is shown in Figure 1. First, identify the threats (hazards). Second, conduct an inventory of assets that are deemed important. Third, conduct a vulnerability analysis to figure out which assets are vulnerable to the threats (hazards) previously identified. Fourth, do an impact analysis to understand consequences. The

<sup>32</sup> Department of Homeland Security. *National Infrastructure Protection Plan*. Department of Homeland Security, 2013. 17.

<sup>33</sup> Ready.gov FEMA Ready Campaign Website; “Risk Assessment.” <http://www.ready.gov/risk-assessment>. (accessed July 28, 2014).

final step is to determine risk priorities. This is typically done by multiplying Threat (Hazard) x Vulnerability x Consequence. Usually some kind of risk assessment matrix is created. This includes the threats (hazards), showing probability and impact severity (see Table 1 below).<sup>34</sup>

**Table 1. Common Risk Assessment Matrix** <sup>35</sup>

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	Extremely High				
	Critical		High			
	Moderate		Medium			
	Negligible				Low	

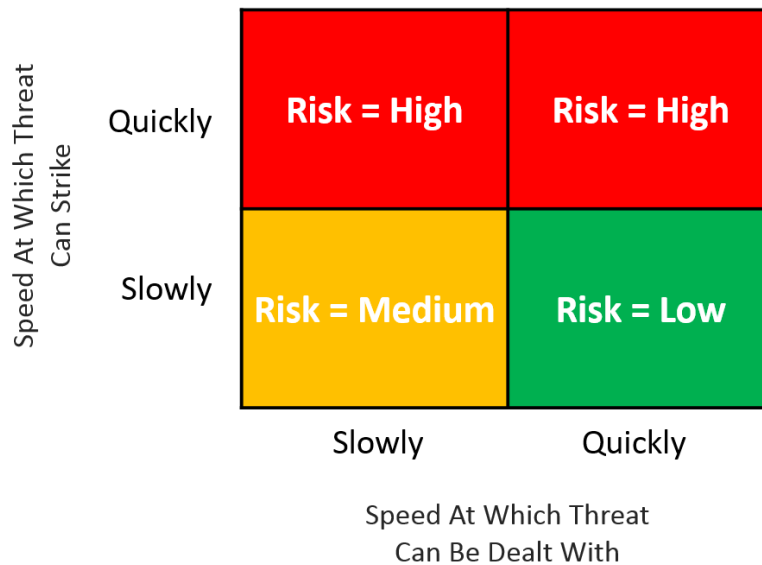
Unfortunately, most standard risk assessment matrices are two-dimensional models. They show the probability of occurrence and the severity of impact (consequence), but do not allow for consideration of time and capability.<sup>36</sup> Certain threats (hazards) give little or no time for warning. For instance earthquakes, which can cause a tsunami. Present day understanding and technology does not allow us to adequately predict earthquakes and thus send out warning alerts. We can however send out short-notice tsunami warnings if a system is in place to do so.

<sup>34</sup> DrTomOConnor.com Website of T. O'Connor; "Mitigation and Preparedness;" *MegaLinks in Criminal Justice*. Last modified January 19, 2014. <http://www.drtoconnor.com/3430/3430lect06.htm>. (accessed July 28, 2014).

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.

**Figure 2. Risk Assessment Matrix (Time)** <sup>37</sup>



In order to address this problem, a different kind of risk matrix thinking is needed (see Figure 2). One that includes consideration of how quickly a threat can strike (warning time) and how quickly it can be dealt with (responded to and recovered from). <sup>38</sup> This allows for a more in-depth assessment of risk.

### **2.3.1 Threat and Hazard Identification and Risk Assessment (THIRA)**

Another, newer approach to risk assessment is called Threat and Hazard Identification and Risk Assessment (THIRA). The THIRA process builds upon standard risk assessment processes in two important ways. First, it incorporates the whole community into the planning process.

<sup>37</sup> DrTomOConnor.com Website of T. O'Connor; "Mitigation and Preparedness;" *MegaLinks in Criminal Justice*. Last modified January 19, 2014. <http://www.drtoconnor.com/3430/3430lect06.htm>. (accessed July 28, 2014).

<sup>38</sup> Ibid.

Second, it helps communities “identify capability targets and resource requirements necessary to address anticipated and unanticipated risks.”<sup>39</sup>

The process consists of four steps (see Figure 3). Step one and two are basically the same as threat (hazard) identification. Step three prompts communities to set their core capability requirements (which originate from the National Preparedness Goal). Each core capability falls within the FEMA mission areas: prevention, protection, mitigation, response and recovery. The whole goal is to take the assessed risk information and set capability goals on how to deal with these risks. An example of a core capability is “Public Information and Warning.” Step four involves communities estimating what resources they need to achieve the capability targets they set in step three. This includes the use of community assets and mutual aid, while also considering preparedness and mitigation opportunities.<sup>40</sup>

**Figure 3. THIRA Process**<sup>41</sup>



<sup>39</sup> Department of Homeland Security. *CPG 201: Threat and Hazard Identification and Risk Assessment Guide—Second Edition*. Department of Homeland Security, 2013. 1.

<sup>40</sup> Ibid. 1 and 2.

<sup>41</sup> Ibid. 2.

### 2.3.2 Risk and Resilience

Approaches to resilience require preparing for the unexpected, whereas risk assessment typically proceeds from the premise that hazards are identifiable and predictable. Current risk based approaches are unsatisfactory, even with known hazards. They emphasize risk probabilities that may be unknowable. Community systems exist within dynamic and unpredictable environments and estimates of risk probabilities are notoriously unreliable. Take for example, the estimating of the joint probability and synergy of two or more major events happening at the same time or back to back. Or look at cascading failures.<sup>42</sup>

As such, it is inadequate and not helpful to think of community resilience as achieving some static state of being. It should be approached as an ongoing adaptive process -- not something that a system achieves or has, but a characteristic of the way it behaves. Ecological systems when restored do not revert back to their original states like a rubber band returning to its original shape after being stretched and neither do community systems after an event. Conditions always change, even when we don't realize it.<sup>43</sup>

Engineering approaches to infrastructure resilience “often represent incremental adaptations of what has historically been understood as risk [assessment].”<sup>44</sup> Table 2 shows a comparison between risk management and resilience in regard to engineered systems.

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<sup>42</sup> Park, J., T. P. Seager, P. S. C. Rao, M. Convertino, and I. Linkov. “Integrating Risk and Resilience Approaches to Catastrophe Management in Engineering Systems.” *Risk Analysis* 33, no. 3 (2013): 356–367. 359.

<sup>43</sup> Ibid. 359.

<sup>44</sup> Ibid. 359 and 360.

**Table 2. Comparison of Risk Management and Resilience Perspectives** <sup>45</sup>

	<b>Risk Management</b>	<b>Resilience</b>
<b>Design Principles</b>	Preservation of status quo; minimize risk of failures	Adaptation to changing conditions without permanent loss of function; acknowledgement of unknown hazards; intentional failure may be allowed at subsystem level to reduce possibility of permanent loss of function in larger system
<b>Design Objectives</b>	Minimization of probability of failure, albeit with rare catastrophic consequences and long recovery times	Minimization of consequences of failure, albeit with more frequent failures and rapid recovery times
<b>Design Strategies</b>	Armoring, strengthening, oversizing, resistance, redundancy and isolation	Diversity, adaptability, cohesion, flexibility, renewability, regrowth, innovation and transformation
<b>Relation to Sustainability</b>	Security and longevity	Recovery, renewal and innovation
<b>Mechanisms of Coordinating Response</b>	Centralized, hierarchical decision structures coordinate efforts according to response plans	Decentralized, autonomous agents respond to local conditions
<b>Modes of Analysis</b>	Quantitative (probability-based) and semi-quantitative (scenario-based) analysis of identified hazards in context of utility theory (i.e. costs and benefits)	Possible consequence analysis of involving scenarios with unidentified causes

A good comparison that highlights the difference between current thinking and resilience thinking is between fail-safe and safe-to-fail systems. <sup>46</sup> A good example of this is levee systems. The traditional fail-safe design aims at efficiency, constancy, and predictability. The levees are often times overbuilt and reinforced to increase resistance against rising flood risks. They don't take into account the unpredictability of changes in precipitation, land use and climate, and the systems effect on flood magnitude and frequency. All of which increase flood risk. In a safe-to-fail system, controlled modes of failure have been anticipated and designed for, which allows for change and unpredictability. An example of this is moving levees back and creating buffer areas

<sup>45</sup> Park, J., T. P. Seager, P. S. C. Rao, M. Convertino, and I. Linkov. "Integrating Risk and Resilience Approaches to Catastrophe Management in Engineering Systems." *Risk Analysis* 33, no. 3 (2013): 356–36. 361.

<sup>46</sup> *Ibid.* 363.

that are designed to be flooded when waters rise above the levees. This can mean the difference between a minor event and a catastrophic one. So, paradoxically, the traditional levee systems that were intended to reduce the risk from flooding, have actually increased these risks, while at the same time giving a sense of false security. This shows the value of integrating resilience thinking, which can help a complex engineered system better persist even when risk estimation is unreliable.<sup>47</sup>

Because complex systems are interdependent, adverse impacts from one system failing often times spills into other systems. This means that community systems should take into account not only unexpected direct risks, but also unexpected consequences that could cascade through other connected systems. Thus it is vital that an adequate representation of stakeholders be included in the risk assessment process.<sup>48</sup>

In order to assess risk we must understand what people value. Typically, when conducting risk assessment, the mapping of what is considered valuable and important to the broader community is not explicitly stated and debated amongst the majority of stakeholders. Instead there is an assumption that all stakeholders implicitly agree on community assets that are vulnerable. Stakeholders however often have different opinions on what is important, which often results in the pursuit of irreconcilable goals.<sup>49</sup>

A study using focus groups was done in South Africa, investigating if it is possible for a wide range of community stakeholders to construct a common holistic description of what is

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<sup>47</sup> Park, J., T. P. Seager, P. S. C. Rao, M. Convertino, and I. Linkov. "Integrating Risk and Resilience Approaches to Catastrophe Management in Engineering Systems." *Risk Analysis* 33, no. 3 (2013): 356–36. 363.

<sup>48</sup> Ibid. 365.

<sup>49</sup> Becker, Per and Henrik Tehler. "Constructing a Common Holistic Description of What is Valuable and Important to Protect: A Possible Requisite for Disaster Risk Management." *International Journal of Disaster Risk Reduction* 6 (2013): 18–27. 19 and 20.

valuable and important to protect. The study results showed that this approach can establish common objectives for disaster risk assessment and increase engagement of stakeholders that otherwise wouldn't be part of this process. Thus showing that this process is a vital step towards a more resilient society.

The questions asked were as follows:<sup>50</sup>

- What is valuable and important to protect?
- Why is it valuable?
- Which other elements are (or might be) valuable in securing/replacing that valuable element?

The main elements turned out to be human life, health and well-being. As a result they came up with “a complex system of critical functions, flows and infrastructure supplying the basic necessities to secure human life, health and wellbeing, i.e. water, food, shelter, sanitation, health care, education and livelihood.”<sup>51</sup> Consequently, risk assessment could be used to gather a quality of life baseline before an event and compare it post-event. This process could be used to measure community resilience by looking at pre-event service capacity compared to post-event.<sup>52</sup>

In order to become more resilient, communities must consciously define the quality of life (human well-being) they want. This can only be achieved through full participation of

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<sup>50</sup> Becker, Per and Henrik Tehler. “Constructing a Common Holistic Description of What is Valuable and Important to Protect: A Possible Requisite for Disaster Risk Management.” *International Journal of Disaster Risk Reduction* 6 (2013): 18–27. 21.

<sup>51</sup> Ibid. 26.

<sup>52</sup> Bruneau, Michel, and Andrei Reinhorn. “Exploring the Concept of Seismic Resilience for Acute Care Facilities.” *Earthquake Spectra* 23, no.1 (2007): 41-62. 4.

community stakeholders. The participatory process itself is often times as important as the outcome.<sup>53</sup>

## 2.4 Human Well-Being

There are many definitions of HWB (quality of life). HWB is experiential, what people value being and doing. Most would agree though that it includes the following: basic material needs for a good life; health; personal security; good social relations; and the experience of freedom. These five components together, provide the conditions for physical, social, psychological, and spiritual fulfillment.<sup>54</sup>

One definition of a good quality of life includes, among other factors, “access to income, education, health care, housing, employment, legal rights and exposure to crime, pollution, disease, disaster and other risks.”<sup>55</sup> And, according to the Rockefeller City Resilience Framework, a healthy and resilient community includes the following aspects, “good health; knowledge and education; reliable services and robust infrastructure; diverse livelihood opportunities; healthy ecosystems; the ability to organize and make decisions; and access to external assistance.”<sup>56</sup>

For the purposes of this analysis, the Millennium Ecosystem Services typology and definitions for HWB will be used.

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<sup>53</sup> Mileti, Dennis S. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington DC: Joseph Henry Press, 1999. 5-6.

<sup>54</sup> Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: A Framework for Assessment*. Washington, DC: Island Press, 2003. 73-4.

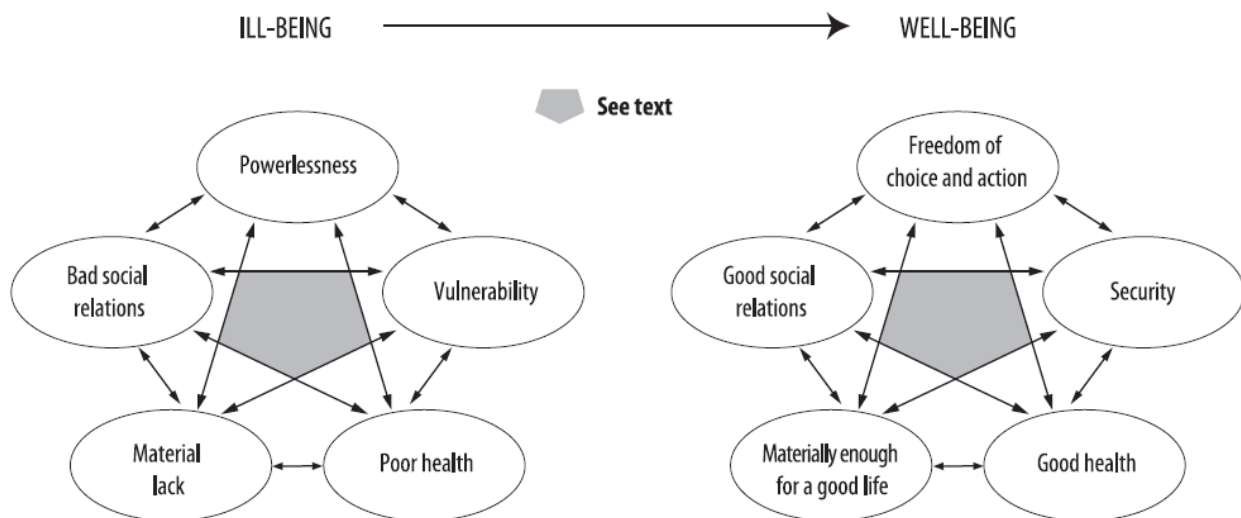
<sup>55</sup> Mileti, Dennis S. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington DC: Joseph Henry Press, 1999. 5-6.

<sup>56</sup> Arup. *City Resilience Framework: Resilience Index*. The Rockefeller Foundation, 2014.

1. *Basic Material for a Good Life* – secure and adequate livelihoods, income and assets, enough food and water at all times, furniture, clothing, and access to goods
  - a. Access (availability and security) to resources to sustain livelihood – Indicators
    - i. Basic sustenance: water, food, clothes, sanitation, electricity, fuel/gas stations, roads/bridges, private/public transportation systems, grocery stores/farmers’ markets, credit, shops; schools, colleges, daycares; play/sports areas; cell-phone, internet etc.
    - ii. Employment: sufficient income, stable employment (employed greater than 6 months), sufficient employed persons (working more than 35 hours per week)
2. *Health* – access to medical care, feeling well, and having a healthy physical environment
  - a. Special needs population – Indicators
    - i. Elderly and children; Linguistic communities; Infirm; Living alone; Food and Nutrition (FNS) and Medicaid recipients
  - b. Healthy environment – Indicators
    - i. Mobility; Hospitals, pharmacies, clinics etc.; Nutrition – Indicators (obesity); Expected longevity at birth; Disability-adjusted life years; and Exposure to toxins – exceedance of guideline limits
3. *Security* – secure access to natural and other resources, safety of person and possessions, shelter, and living in a predictable and controllable environment with security from natural and human-made disasters
  - a. Shelter – Indicators
    - i. Shelter (number of homeless, occupancy of permanent shelters, vacancy rate); and People in adequate housing
  - b. Exposure to risk (floods, drought, winter storms) – Indicators
    - i. Risk of death, injury, or property loss through natural hazards; and Hazard mitigation planning
  - c. Crime – Indicators
    - i. Police and fire stations; and Violent crime rate

4. *Good Social Relations* – social cohesion, mutual respect, good gender and family relations, and the ability to help others and provide for children
  - a. Ability to communally solve problems – Indicators
    - i. Residents serving on municipal boards and committees; and Community Emergency Response Teams (CERT)
  - b. Sense of belonging – Indicators
    - i. Registered neighborhood organizations – map your neighborhood; Community gathering places – community centers; and Community faith-based organizations
  
5. *Freedoms and Choice* – having control over what happens and being able to achieve what a person values doing or being
  - a. Participation in decision making – Indicators
    - i. Level of education; Gender/racial/ethnic/sexual orientation bias; Level of corruption; Fairness of elections; and Registered voters

**Figure 4. Human Ill-being vs. Well-being**<sup>57</sup>



<sup>57</sup> Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: A Framework for Assessment*. Washington, DC: Island Press, 2003. 75.

The five components of HWB reinforce each other, both positively and negatively. When a change occurs in one this often brings about changes in the others (see Figure 4). There are negative and positive interactions.<sup>58</sup>

On the ill-being side, the arrows “represent negative directions of causality: for example, poor people are vulnerable to sickness, which in turn makes them poorer; bad social relations make people vulnerable to shocks, which in turn deepens material poverty and so on; and all of these contribute to powerlessness.” On the side of HWB, having enough appropriate goods and services facilitates good health, “enabling a better livelihood, while good social relations can provide security against stresses and shocks. In turn, security is likely to increase material well-being and so on. All of these enhance freedom of choice and action.”<sup>59</sup>

A very important condition for HWB is the capability to adapt so that during times of dynamic change. This can lead to conflicts, necessitating trade-offs between the HWB of different individuals, groups and organizations. An example is when built capital is accumulated at a cost of natural capital or cultural or spiritual values. This also has a generational dimension concerning the HWB of others in the future.<sup>60</sup>

As a final note, when it comes to HWB, those who live in comfortable, urban environments often take ecosystem services for granted. They assume that HWB derives from being a savvy consumer, making good lifestyle choices and having access to good health care services. “But this ignores the role of the natural environment: of the array of ecosystem services that allow

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<sup>58</sup> Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: A Framework for Assessment*. Washington, DC: Island Press, 2003. 75.

<sup>59</sup> Ibid. 75.

<sup>60</sup> Ibid. 75.

people to enjoy good health, social organization, economic activity, a built environment and life itself.”<sup>61</sup>

## 2.5 Goods and Services

Goods and services are products of human efforts and natural systems. We use them to sustain and enhance our human well-being. Goods are items you can see and touch, such as: water, food, clothing, medicine, tools, your house, fuel etc. Services are provided by people, entities or nature, such as: water filtration, photosynthesis, electricity, public transportation, law and order, city planning, daycare etc. These are not discrete categories. Think of them as a continuum with pure service on the one end and pure goods on the other. Most goods and services fall between these two extremes. For example, although some utilities actually deliver physical goods and services; like water utilities which deliver and often treat water — utilities are usually considered services.

One type of services we want to focus on especially is ecosystem services. These are some of the benefits that people obtain from natural capital. An ecosystem is a complex system of plants, animals and micro-organism communities – and usually people – and the nonliving environment interacting as a functional unit.<sup>62</sup> Ecosystems are the planet's life-support systems

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<sup>61</sup> World Health Organization. *Ecosystems and Human Well-Being: Health Synthesis*. World Health Organization, 2005. 12.

<sup>62</sup> Ash, Neville et al, eds. *Ecosystems and Human Well-being: A Manual for Assessment Practitioners*. Washington, DC: Island Press, 2010. xi.

for all forms of life, including humans. Our needs for food, water, clean air, shelter and relative climatic constancy etc. are fundamental and unalterable and thus indispensable to HWB.<sup>63</sup>

Ecosystem services include the following:

- *Provisioning* services, such as providing food, water, timber and fiber;
- *Regulating* services, such as the regulation of climate, floods, disease, wastes and water quality;
- *Cultural* services, such as offering recreational, aesthetic, and spiritual benefits; and
- *Supporting* services, such as soil formation, photosynthesis, and nutrient cycling.<sup>64</sup>

## 2.6 Capital

Communities rely on goods and services provided by built, natural, and human and social capital in differing degrees and at different times. Capital typologies differ. Traditionally, economists define capital as any non-financial asset that is used to produce goods and services. Ecological economists and accounting regimes, such as the triple bottom line, have broadened the definition to include natural and human-social capital.<sup>65</sup> Some find value in isolating intellectual capital or financial capital, as well as their interrelation and valuation, however there appears to be a general consensus with the following classification:<sup>66, 67</sup>

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<sup>63</sup> World Health Organization. *Ecosystems and Human Well-Being: Health Synthesis*. World Health Organization, 2005. 12.

<sup>64</sup> Ash, Neville et al, eds. *Ecosystems and Human Well-being: A Manual for Assessment Practitioners*. Washington, DC: Island Press, 2010. xi.

<sup>65</sup> Daly, Herman E, and Joshua Farley. *Ecological Economics: Principles and Applications*. Washington, DC: Island Press, 2011. 17.

<sup>66</sup> Green, G. P., and A. Haines. *Asset Building & Community Development (3rd ed.)*. Thousand Oaks, CA: Sage, 2012.

<sup>67</sup> Stokols, D., R. P. Lejano, and J. Hipp. "Enhancing the Resilience of Human-Environment Systems: a Social Ecological Perspective." *Ecology and Society* 18, no.1 (2013): Article 7.

1. *Built Capital*: Things built by humans. Examples include bridges, buildings, dams and machinery.
2. *Natural Capital*: Natural capital typically refers to stock that yields a flow of natural services and tangible natural resources. Examples include forests, wetlands, mangroves, soil, sand dunes, agriculture and fossil fuels. The Millennium Ecosystems Assessment includes cultural services as natural capital.
3. *Human Capital and Social Capital*: These are often combined. Human capital refers to abilities of individuals. Social capital as abilities of groups of individuals. This includes networks of human relationships, mutual trust and skills.

The goods and services provided for by one capital are often interchangeable with other capital. If un-secured furniture falls during an earthquake, you drop, cover and hold, preferably under a secure object. In other words, if the built capital you depend on is vulnerable (unsecured furniture), you rely on human and social capital (your ability to know what to do and being physically able to drop, cover and hold). If you are unable to learn or are physically handicapped, you are more dependent on your surrounding environment -- If you are an Olympic athlete, less so.

Communities are not unlike the above example. Communities rely on services provided by built, natural, and human and social capital in differing degrees and at different times. Resilient communities exploit their advantages in adapting to extreme events.

The asset-based appreciative inquiry risk assessment approach captures and makes use of a community's unique abilities to adapt to dramatic changes including earthquakes, floods and climate change. While most communities would rely on all three types of capital to varying degree, some may rely more on a strong built environment. Others may rely on their

community's ability to mobilize and organize their citizenry to share assets, while others might rely on their natural resources.

Below are three examples of the varying importance of different types of capital to different communities in Washington State.<sup>68</sup>

*Built Capital:* The City of Everett, Washington is the home of a major Boeing airplane manufacturing plant. It represents the main industry for the City and both are dependent on the survival of its built capital, the physical plant, for providing goods and services – airplanes and jobs. If the physical plant is destroyed by an earthquake, the Boeing Company may very well decide not rebuild and relocate to another state. In the process it would relocate all social and human capital.

*Social Capital:* Redmond, Washington is the headquarters for Microsoft Corporation. The built capital that houses most workers, the Microsoft campus, is important, but workers are not as dependent on the physical campus to provide services, as are those that work for the Boeing Company. If an earthquake destroyed the campus, employees could work off campus, while the campus is re-built. This is the company's contingency plan. Unlike the Boeing Company, there is less of a threat that Microsoft Corporation would relocate.

*Natural Capital:* The Makah Tribe is located on the Washington State coast. Their economy and cultural identity is tied to this Coast. Should a near tsunami destroy their community, the Tribe could not relocate. Homes and governmental services, built capital, could be rebuilt only if the coastal environment survives -- if land were available. On the other hand, this same reliance on immediate natural environment affords the community a degree of local self-sufficiency which may help it survive a disaster in the short and medium term, assuming the coastal environment survives in some form.

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<sup>68</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014.

## 2.7 Asset-Based Risk Assessment

*“If you are looking for a way to begin work towards organizing local people to take an active role in the place where they live, it is a good idea to start with what you know. If you don’t know the place where you live, how will you know how to take advantage of all there is to offer? How will you know how to build a strong, active community without the foundation of assets that are already right there?”*<sup>69</sup>

“An important beginning point involves mapping the assets of the community — the skills and talents of local residents, as well as the capabilities available or possible through local organizations and institutions.”<sup>70</sup> “It shows all the interconnections among assets; these interconnections reveal ways to access the assets. How you get to the assets and use them, and the people involved in the getting and using, all these are also assets. Assets—the relations among them and access to use them—these are the grounds on which communities are built.”<sup>71</sup>

An asset-based approach is very different from the commonly used needs-based or vulnerability-based approach to community development or risk assessment. It identifies the community’s positive aspects and looks at ways to empower the community. Community assets are identified by stakeholders within the community. This includes resources (capital) that would otherwise be ignored, unrealized or dismissed, such as social and natural capital. This glass is half-full approach does not deny the real problems or vulnerabilities, it simply focuses efforts on

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<sup>69</sup> Dorfman, Diane. *Mapping Community Assets Workbook*. Portland, OR: Northwest Regional Educational Laboratory, 1998. iii.

<sup>70</sup> Beaulieu, Lionel J. *Mapping the Assets of Your Community: A Key Component for Building Local Capacity*. Mississippi State: Southern Rural Development Center, 2002. 2.

<sup>71</sup> Dorfman, Diane. *Mapping Community Assets Workbook*. Portland, OR: Northwest Regional Educational Laboratory, 1998. iii.

identifying how community stakeholders and assets contribute and can continue to contribute to community human well-being.<sup>72</sup>

In a needs-based (vulnerability) approach to risk assessment, well-intentioned efforts by government, universities and NGOs are focused on analyzing community problems (vulnerabilities) and identifying solutions to meet the needs (address the vulnerabilities) of a community. This process however is typically very one-sided and casts a negative view upon the community, by simply viewing it as a collection of needs and a recipient of assistance (focusing on the vulnerabilities), rather than as part of the solution. By only focusing on the negative problems and vulnerabilities, community assets and capabilities are often overlooked. This compromises the community, rather than empowering its members to self-identify community priorities and take charge of their lives and of the community. It can also lead to communities overly relying upon government and NGO assistance and expertise, rather than looking internally for solutions and support. This can lead to weakening of vital local social ties and networks and consequently the weakening of the community's resilience.<sup>73</sup>

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<sup>72</sup> Mathie, Alison, and Gord Cunningham. *From Clients to Citizens: Asset-Based Community Development as a Strategy for Community Driven Development*. Antigonish, Nova Scotia, Canada: Coady International Institute, 2002. 5.

<sup>73</sup> Ibid. 4.

**Table 3. Contrasting the "Needs" vs. "Assets" Approach to Community Enhancement** <sup>74</sup>

<b>Needs</b>	<b>Assets</b>
Focuses on deficiencies	Focuses on effectiveness
Results in fragmentation of responses to local needs	Builds interdependencies
Makes people consumers of services; builds dependence	Identifies ways that people can give of their talents
Residents have little voice in deciding how to address local concerns	Seeks to empower people

“Asset mapping begins with the philosophy that all local residents, regardless of age, gender, race, ethnic background, place of residence, or other characteristics, can play an effective role in addressing important local matters.”<sup>75</sup> Local people and organizations are encouraged to explore how providers of goods and services that are necessary for their human well-being are interrelated, and to respond to issues regarding risk to these providers in a coordinated, collaborative fashion.

A broadly representative group of community stakeholders is gathered to identify and map community assets and capacities that are necessary for human well-being. Assets listed are not limited to those within the community. This same group then creates a shared vision for

<sup>74</sup> Beaulieu, Lionel J. *Mapping the Assets of Your Community: A Key Component for Building Local Capacity*. Mississippi State: Southern Rural Development Center, 2002. 4.

<sup>75</sup> Ibid. 4.

community resilience that incorporates already established community goals, which leads to collaborative community action.<sup>76</sup>

This approach is community-driven and similarly to the ABCD approach, focuses on active participation and empowerment through community engagement. It also makes use of appreciative inquiry, which promotes positive change in communities by focusing on what is working well. Participants draw upon their memories of what they like about their community, especially in regard to human well-being. Instead of focusing on the problems and what is vulnerable and internalizing these negative ideas, the idea is to create and reinforce a positive shared meaning within the community that will enhance the community's capacity to maintain and improve the well-being or quality of life of all its stakeholders.<sup>77</sup>

“Just as plants grow towards their energy source, so do communities and organizations move towards what gives them life and energy. Reality is socially constructed and language is a vehicle for reinforcing shared meaning attributed to that reality. To the extent that memory and the construction of everyday reality offer hope and meaning, people tend to move in that direction. Parents and teachers are familiar with this principle; research demonstrates extensively that children's performance is shaped by teachers' and parents' expectations more than it is by childrens' innate ability.”<sup>78</sup>

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<sup>76</sup> Mathie, Alison, and Gord Cunningham. *From Clients to Citizens: Asset-Based Community Development as a Strategy for Community Driven Development*. Antigonish, Nova Scotia, Canada: Coady International Institute, 2002. 5.

<sup>77</sup> Ibid. 7.

<sup>78</sup> Ibid. 7.

## 2.8 Appreciative Inquiry

A theme driving our approach was inspired by a strength-based approach based on the Appreciative Inquiry model (AI). Some researchers believe that excessive focus on dysfunctions can actually cause these dysfunctions to become worse or fail to become better. By contrast, AI assumes that when all members of an organization are motivated to understand and value the most favorable features of its culture, it can make rapid improvements.

Strength-based methods are used in the creation of organizational development strategy and implementation of organizational effectiveness tactics.

Appreciative Inquiry is organized around the following principles:<sup>79</sup>

- Appreciate “Best of what is”
- Imagine “What might be”
- Design “What should be”
- Create “What will be”

The process being compared begins with participants profiling the unique attributes of their respective communities using Human Well-being categories, and not by cataloging community dysfunctions or vulnerabilities. Questions are then asked that lead from its strengths not weaknesses.

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<sup>79</sup> Bushe, G.R. “The Appreciative Inquiry Model.” In Kessler, E. (ed.) *The Encyclopedia of Management Theory*. Sage Publications, 2013.

## 2.9 Integrating Risk Assessment into Community Planning

Integrating risk reduction into community planning is vital for making communities more resilient. There are a number of ways to do this. One way to combine them is to include asset-based appreciative inquiry risk identification and assessment (an approach that defines risks as threats to assets and is not vulnerability driven) throughout the planning process. This allows for the consideration of risk in all community planning, which helps communities tap into their potential for reducing risk. Community workshops encourage community stakeholders to identify needs and potential solutions, and can reinforce stakeholder relationships, institutional frameworks and partnerships to address risk reduction and resilience in a holistic manner. Other potential benefits include assessing how development contributes to human well-being (quality of life), especially regarding vulnerable populations within the community; developing good information on risk and communicating risk information widely.<sup>80</sup>

Another way is to integrate hazard mitigation into other types of planning. Some progress has been made towards this through the mandating of mitigation elements in comprehensive plans, and through incorporation of best practices and techniques of mitigation in zoning codes, subdivision codes and other instruments.<sup>81,82</sup> However, there is still a need to enable greater stakeholder participation in creative discussions around even better mitigation practices, and to relate such practices to communities' overall development policies and unique environmental

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<sup>80</sup> Valdes, Helena Molin, and Patricia Holly Purcell. "Guidance on Resilience in Urban Planning", *International Journal of Disaster Resilience in the Built Environment* 4, no. 1 (2013): 1. 1.

<sup>81</sup> Federal Emergency Management Agency. *Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials*. Washington, DC: Federal Emergency Management Agency, 2013.

<sup>82</sup> Schwab, J. C., ed. *Hazard Mitigation: Integrating Best Practices into Planning*. Chicago, IL: American Planning Association, Planning Advisory Service Report No. 560, 2010.

and socio-economic conditions, especially given the ever-changing nature of the hazards themselves.

Yet another way is to integrate risk assessment, such as climate change adaptation, into an agency's asset management system. This is a convenient and targeted approach due to the fact that these processes include "developing inventories of assets and taking a risk-based approach to factors that affect asset conditions."<sup>83</sup> Asset management systems offer a streamlined framework for incorporating risk adaptation into budgets, capital plans and rehabilitation cycles. Risk adaptation can also be "integrated into transportation planning processes, environmental review, project development, and performance measurement."<sup>84</sup>

## **2.10 Workshop Model**

The Workshop Model was designed and tested to help improve the Federal Emergency Management Agency (FEMA)'s Risk MAP process. It focused on three main areas: (1) refining the definitions of resilience and risk; (2) developing the community workshop model itself; and (3) improving community engagement.

The Workshop Model was tested by conducting community workshops in three Washington State communities: Redmond, Everett and Neah Bay. The main goal of the community exercises is to highlight the specifics of local assets that can promote HWB and adaptive capacities. The Workshop Model's approach prompts for links or comparisons between community risk; existing providers of the goods and services necessary for community HWB;

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<sup>83</sup> Federal Transit Administration. *Flooded Bus Barns and Buckled Rails: Public Transportation and Climate Change Adaptation*. Washington, DC: FTA Office of Budget and Policy, 2011. 51.

<sup>84</sup> *Ibid.* 51.

community goals; and existing and potential mitigation and adaptation strategies. The approach also involves a parsing of assets into categories of built, natural, and social (and, more specifically, social networks) capital.

The approach first asks participants to list the sources of HWB (quality of life) in their community. What do they like about their community? What makes their community unique? Only then was the threat introduced for discussion on how the community might prepare for it, respond to it, recover and rebuild. Unlike most risk assessment efforts, the protocol does not begin with presentations of exposure and vulnerability. This approach might be compared, for example, with the “Roadmap for Adapting to Coastal Risk”,<sup>85</sup> which has participants develop a profile of the local population (societal), the built environment (infrastructure) and important natural resources (ecosystem); however, the NOAA approach begins by describing a hazard scenario in detail first, and seeks primarily to identify vulnerabilities as well as strengths, in the context of that specific hazard scenario.<sup>86</sup>

The 5E Instructional Method was used to frame the three round workshop process. The 5E method encourages active dialog along with a progression of thought where subsequent ideas build on previous ones through five stages of learning -- Engage, Explore, Explain, Elaborate, and Evaluate. Engage means piquing students’ curiosity, determining their current understanding and encouraging them to compare their ideas with others. Explore means interacting with the material and ideas through group discussion, framing the questions, and comparing and sharing ideas. Explain means understanding concepts and ideas, using terminology, recording the process

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<sup>85</sup> NOAA Coastal Services Center. *Digital Coast: Roadmap for Adapting to Coastal Risk*. 2012.

<sup>86</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014.

and revising ideas based upon comparisons of previous thinking. Elaborate means connecting ideas, solving problems, applying knowledge to new situations, deepening understanding of concepts and processes and communicating these understandings with others. Evaluate means demonstrating understanding by applying it to evaluate other projects, as well as assessing progress through comparison of current understanding with prior knowledge, which leads to probing even further into the concept.<sup>87</sup>

The community workshops consist of three rounds of discussion lasting roughly 3 hours. Responses are recorded on a prepared template (See Appendix C). Community maps are provided for spatial reference, and participants are encouraged to make notes on the maps. The lead facilitator describes the purpose and process of the community workshop after introduction by a local official.

In order to focus the discussion, participants are divided into groups that correspond to Millennium Ecosystem Assessment (MA) categories of goods and services for HWB, including: *basic material for a good life; health; security; and good social relations.*<sup>88</sup>

Below are how each of the four categories are defined:<sup>89</sup>

1. *Basic Material for a Good Life* – secure and adequate livelihoods, income and assets, enough food and water at all times, furniture, fuel, clothing, and access to goods
2. *Health* – access to medical care, feeling well, and having a healthy physical environment
3. *Security* – safety of person and possessions, shelter, and living in a predictable and controllable environment with security from natural and human-made disasters

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<sup>87</sup> “Inquiry, the Learning Cycle, & the 5E Instructional Model.” In *The Guidelines for Lesson Planning*. Electronic Journal of Science Education.

<sup>88</sup> Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: A Framework for Assessment*. Washington, DC: Island Press, 2003. 73-4.

<sup>89</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 10.

4. *Good Social Relations* – social cohesion, mutual respect, good gender and family relations, and the ability to help others and provide for children

A facilitator from the project team is assigned to each group to prompt them for ideas focused on the group's assigned MA category of goods and services. A note taker is also at each table.

The first round (pre-disruption) begins with a brief presentation of the community's overall socio-economic and spatial profile, including information gathered primarily from comprehensive planning and mitigation plan documents. Participants are asked to think about what they like about their community and what makes their community unique.<sup>90</sup>

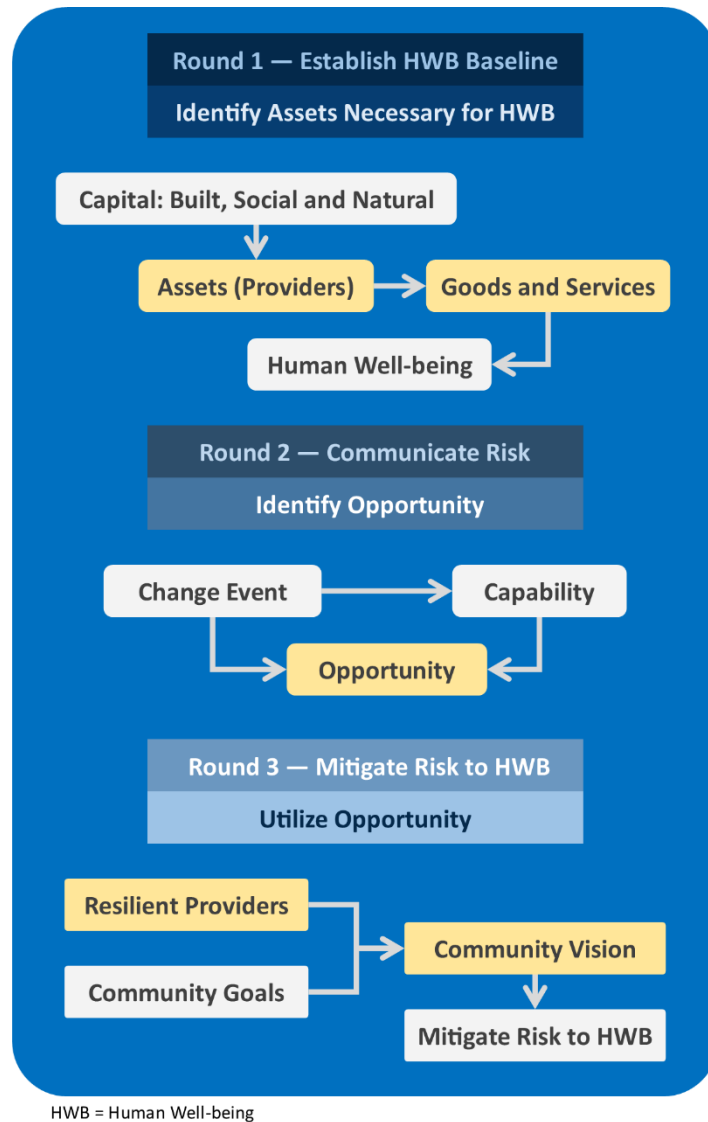
Unlike most risk assessment efforts, the approach used does not begin with presentations of exposure and vulnerability. Participants then characterize their community in terms of the goods and services that constitute their HWB, and the assets (providers) that provided those goods and services. Providers are specific to the community or its surroundings and can be located on a map, though they may also include spatially dispersed or mobile organizations or networks. At the end of the round participants in each group circle the top three most important themes or providers and a spokesperson from each group presents highlights of their discussion to the room.<sup>91</sup>

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<sup>90</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 11.

<sup>91</sup> *Ibid.* 12.

**Figure 5. Community Workshop**



The second round (immediately post-disruption) begins with the introduction of a change event (threat). Described are general types of impact experienced by different neighborhoods (areas) across the city based on their building stock, infrastructure, demographics, accessibility, topography and environmental conditions. The presentation does not describe site-specific impacts, except for the probabilities of disruption to key services and facilities such as highways, hospitals and fire and police stations. A brief description of the community's emergency

capability is also included. Participants then discuss how, during the week or so following the earthquake, they would obtain (i.e. through what providers) the goods and services they identified during Round One.<sup>92</sup>

The third round begins with an introduction to the concept of creating a new community vision that 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 human well-being. The lead facilitator presents generalized publicly vetted community goals and objectives, as laid out in the comprehensive plan, hazard mitigation plan, and/or other key policy documents. Participants are encouraged to consider the implicit values and explicit goals and strategies reflected in these documents, and to think of new strategies that might occur to them based on the previous rounds of discussion. Participants then review the providers of HWB that they listed in the earlier rounds, and ways to (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.<sup>93</sup>

Finally, at the end of Round Three, the groups rotate to another table according to a World Café-like procedure, in order to add perspectives from different HWB categories to each table's findings. Team members from each table rotate clockwise to the next table (minus the team reporter who remains at the original table) where they are briefed by that table's team reporter and then give input. Every 10 minutes teams rotate to the next table and repeat the activity until

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<sup>92</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 11.

<sup>93</sup> *Ibid.* 12.

all teams have had a chance to comment on all tables. The community workshop concludes with each table reporting back to the full room, and then each participant filling out individual forms evaluating the community workshop itself.<sup>94</sup> For more information on the workshop agenda see Appendix D.

### 2.10.1 Feedback from Community Workshop Participants

During the testing of the Workshop Model, feedback was gathered from participants at the end of each community workshop on what worked and what didn't. Participants were also asked for suggestions on how to improve the process. This worked out well. As shown in Table 4, feedback from the Workshop Model was very positive. Using a Likert Scale of 1 (“no”) to 5 (“yes”), the total response averages for each community was above 4.5 (see Appendix E for a copy of the evaluation sheet that was used).

**Table 4. Workshop Participant Response Averages - Likert Scale of 1 (“no”) to 5 (“yes”)<sup>95</sup>**

Evaluation Questions	Redmond*	Everett†	Neah Bay††
1. Were directions easy to follow?	4.19	4.27	4.80
2. Did you see value in the community workshop?	4.86	4.77	5.00
3. Were the right participants involved?	4.48	4.59	4.20
4. Was the play worth your time?	4.86	4.55	4.80
5. Total Average	4.60	4.55	4.70

\* 21 evaluations out of 21 total participants

† 22 evaluations out of 32 total participants

†† 5 evaluations out of 10 total participants

<sup>94</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 12.

<sup>95</sup> Ibid. 35.

## 2.11 Gaps in Literature

What was missing is a comprehensive, holistic community resilience framework that combines the physical aspects of communities (built and natural capital) with the less tangible aspects associated with human well-being and social capital; that is relevant in the context of economic, physical, natural and social disruption; and that applies at the community scale rather than to individual systems within a community.<sup>96</sup> However, Arup is currently developing a city resilience framework for the Rockefeller Foundation that covers some of this. It would be worth looking at this framework once it is complete.

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<sup>96</sup> Arup. *City Resilience Framework: Resilience Index*. The Rockefeller Foundation, 2014. 4.

### **3 Methodology**

Communities are facing ever-increasing risk and there is a growing awareness among risk professionals (analysts, emergency managers, planners etc.) that the tools and processes for assessing risk and helping communities become resilient are somewhat inadequate. A more effective approach is needed. One that engages community stakeholders; moves away from problem-based planning (that so often misses informal systems, which characterize social, cultural and natural capital of a community) to asset-based appreciative inquiry planning; identifies and assesses all risk to all assets that are necessary for each communities' human well-being; incorporates community goals and planning; includes capability and opportunity analyses; and helps address the need for inclusion of risk assessment and information into other community planning processes.

The Federal Emergency Management Agency is aware of many of these issues and consequently funded the development and testing of the Workshop Model to help improve their Risk MAP process. The main areas of concern were community engagement and resilience. Thus to enhance these pieces of the Risk MAP process the Workshop Model focused on the following:

1. Refining the definitions of resilience and related concepts;
2. Developing a community workshop model; and
3. Achieving effective community buy-in (which leads to action).

Using soft-systems methodology (SSM), the ABAIRA Model is compared to FEMA's Risk MAP process. Data was gathered on risk, community resilience, human well-being, the Workshop Model and the FEMA Risk MAP process. This data, along with information on risk

assessment, resilience science, human well-being, asset-based risk assessment and appreciative inquiry, was used to do the following:

- (1) Compare Concepts
  - a. Resilience
  - b. Risk assessment
- (2) Compare Processes
  - a. Goals
  - b. Steps
- (3) Provide Suggestions for Improvement to the Risk MAP Process

### **Research Question**

How can an asset-based appreciative inquiry risk assessment model improve FEMA's Risk MAP process to help communities become more resilient?

### **3.1 System Analysis using Soft-Systems Methodology (SSM)**

During the analysis process, the ABAIRA Model and the FEMA Risk MAP process are explained in detail. The ABAIRA model is compared to FEMA's Risk MAP process using a classic seven-step SSM approach and CATWOE. CATWOE analysis helps bring clarity to systems that have multiple ways of viewing them. This allows for a greater understanding of the ABAIRA Model, Risk MAP and the approaches being compared. It gives important context to

concepts and factors being considered that will give readers a richer picture of the problems being addressed and the solutions being offered.<sup>97</sup>

The classic SSM approach is a seven stage process comprising:<sup>98</sup>

- (1) entering the problem situation,
- (2) expressing the problem situation,
- (3) formulating root definitions of relevant systems,
- (4) building conceptual models of Human Activity Systems,
- (5) comparing the models with the real world,
- (6) defining changes that are desirable and feasible, and
- (7) taking action to improve the real world situation

The SSM approach being used also includes CATWOE.<sup>99</sup>

- **C stands for customers.** Those who would be the victims or beneficiaries of this system, e.g., clients.
- **A stands for actors.** Those who would perform the activities of this system, e.g., agents.
- **T stands for transformation process.** The input that is transferred into the output by this system, e.g., the core of the purposeful activity.
- **W stands for *weltanschauung*.** The image of this world that makes this system meaningful, e.g., world view.
- **O stands for owner.** Those who could abolish or stop this activity, e.g., ownership.
- **E stands for environmental constraints.** The external constraints that this system takes as a given, e.g., environmental impositions.

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<sup>97</sup> Gregory, F. H. "Cause, Effect, Efficiency & Soft Systems Models" Warwick Business School Research Paper No. 42 (ISSN 0265-5976) January 1992. 3.

<sup>98</sup> Ibid. 3.

<sup>99</sup> Rosenhead, Jonathan, and John Mingers, *Rational Analysis for a Problematic World Revisited 2nd Edition*. Chichester, England: Wiley and Sons, 2001. 75.

## **3.2 Root Definitions**

Below are the root definitions of the two systems being compared, FEMA's Risk MAP process and the ABAIRA Model. The ABAIRA system, while similar in many fundamental ways to the Risk MAP system, has some major differences. The ABAIRA system includes community stakeholders as actors in the process by gathering their input on community assets and risk reduction opportunities. It assesses community capability and opportunity (prevention, mitigation and resilience enhancement); improves community resilience by supporting human well-being; sets risk priorities based upon impacts to human well-being instead of mainly focusing on vulnerability; and includes ecosystems as customers.

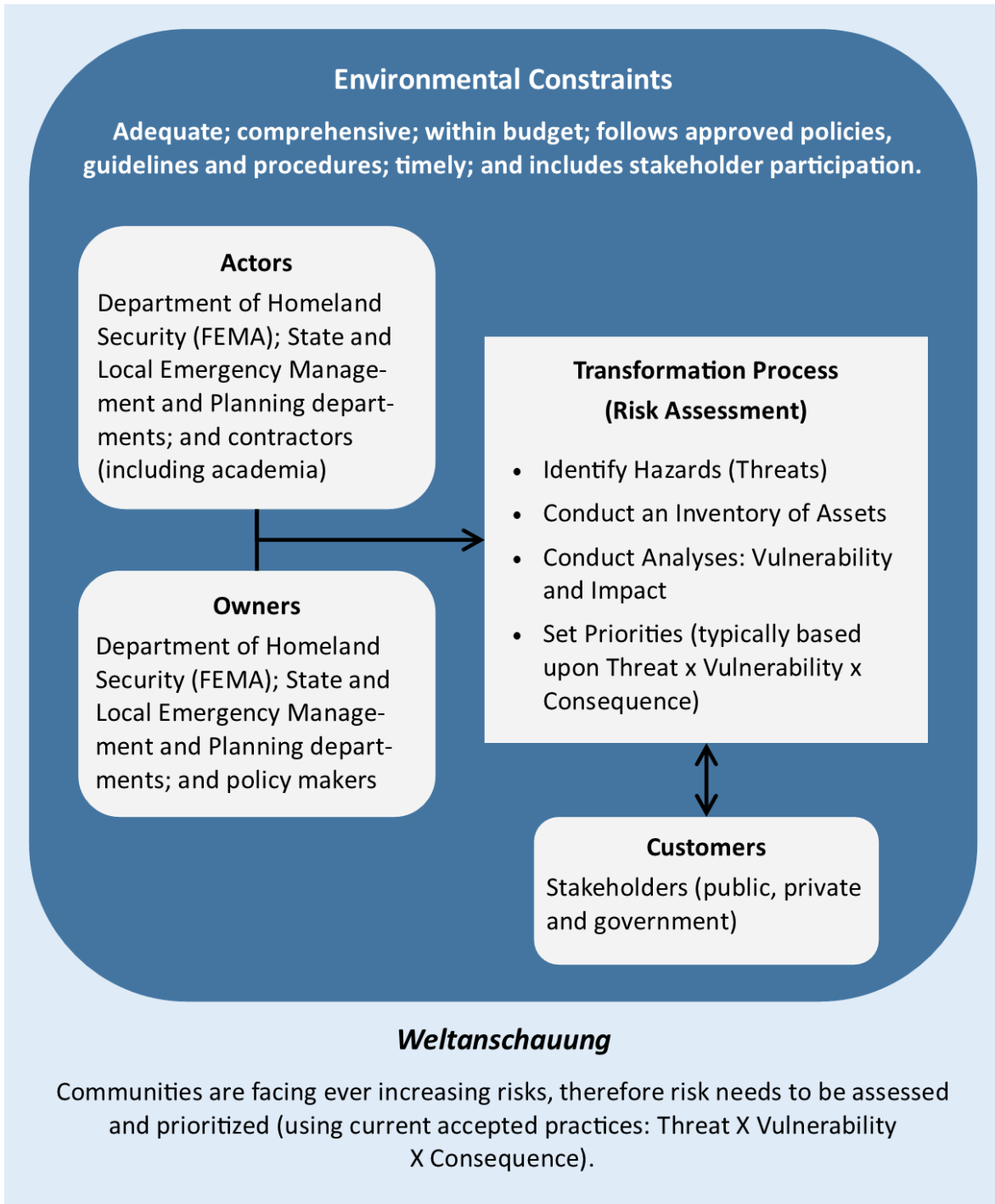
### **FEMA Risk MAP System**

This is a system, organized by DHS, various state and local agencies and contractors (including academia), which assesses risk to communities and provides adequate, timely and comprehensive risk information to stakeholders (public, private and government) that is used to make decisions on how to mitigate and reduce their flood and earthquake risk.

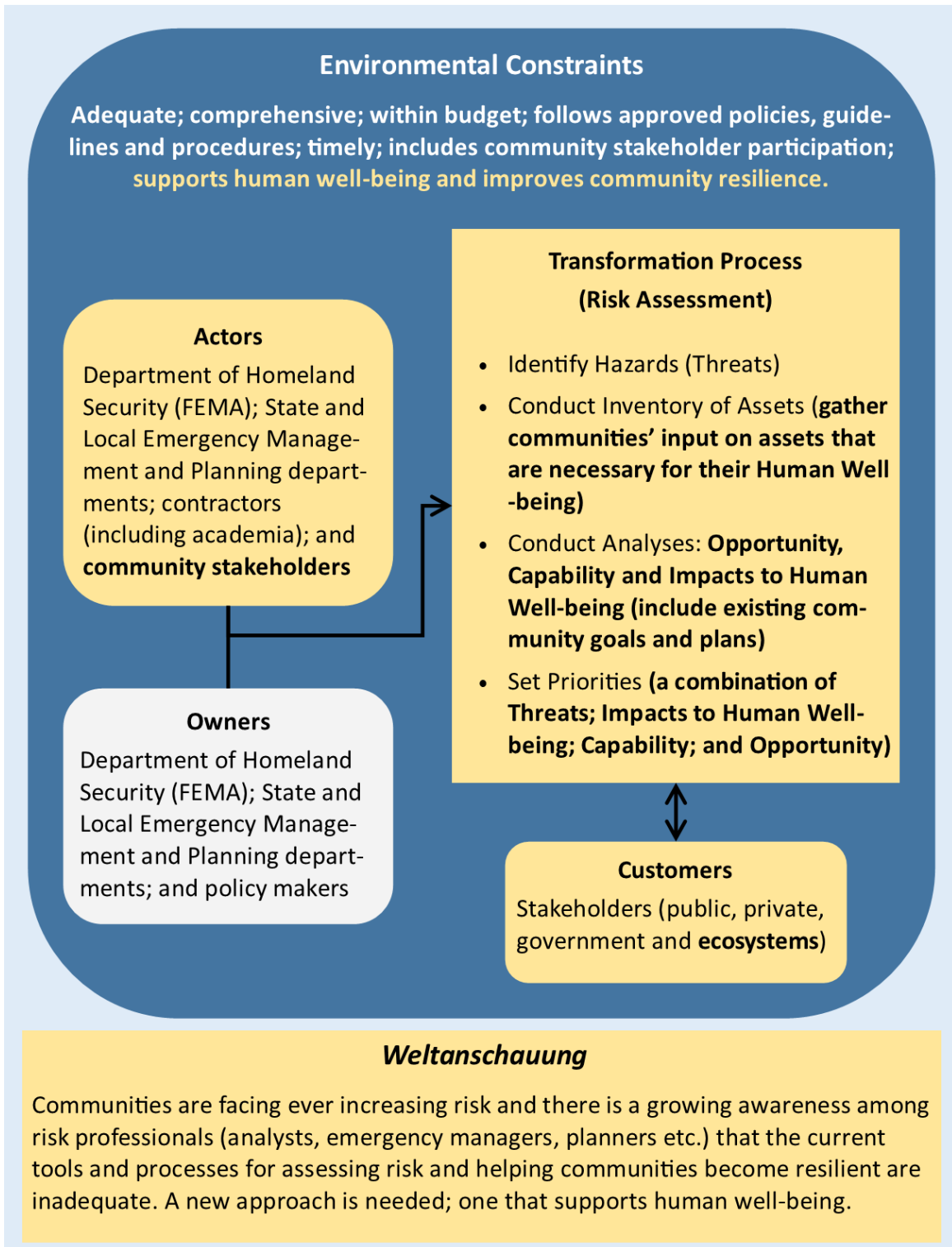
### **ABAIRA System**

This is a system, organized by DHS, various state and local agencies, contractors (including academia) and community stakeholders, which assesses community risk, capability and opportunity; and provides adequate, timely and comprehensive risk information to stakeholders (public, private and government) that is used to make decisions on how to reduce their risk to human well-being and improve resilience.

**Figure 6. FEMA Risk Assessment System**



**Figure 7. ABAIRA System**



### 3.3 Risk Mapping, Assessing and Planning (MAP)

The Federal Emergency Management Administration (FEMA) Risk Mapping, Assessing and Planning (Risk MAP) process is a tool developed and used by FEMA to help enable communities to better identify, assess, communicate and ultimately mitigate risk to life and property. Through collaboration with State, Local, and Tribal entities, this process helps communities identify, assess, communicate and mitigate risk (mainly involving flooding and earthquakes). It also enhances maps (mainly flood maps); provides risk information (in the form of reports) to help communities enhance their mitigation plans; and guides and encourages them to communicate risk to their constituents.<sup>100</sup>

This can help communities become “more resilient and better able to withstand the impacts of disaster.”<sup>101</sup> Risk MAP supports the following FEMA Administrator’s Priorities: (1) to strengthen the nation’s resilience to disasters; and (2) to foster a national community-oriented approach to emergency management that strengthens local institutions, assets, and social networks to build sustainable and resilient communities.<sup>102</sup>

The Risk MAP Process uses the standard Department of Homeland Security (DHS) risk assessment method (Threat x Vulnerability x Consequence):<sup>103</sup>

- *Threat* – natural or manmade occurrence, individual, entity, or action that has or indicates the potential to harm life, information, operations, the environment, and/or property.

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<sup>100</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 36.

<sup>101</sup> Federal Emergency Management Agency. *FEMA’s Risk Mapping, Assessment, and Planning (Risk MAP): Fiscal Year 2011 Report to Congress*. Federal Emergency Management Agency, 2011.

<sup>102</sup> Ibid.

<sup>103</sup> Department of Homeland Security. *National Infrastructure Protection Plan*. Department of Homeland Security, 2013. 17.

- *Vulnerability* – physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard.
- *Consequence* – effect of an event, incident, or occurrence.

**Figure 8. Risk MAP Process** <sup>104</sup>



<sup>104</sup> Federal Emergency Management Agency. *Risk MAP Process*. PowerPoint Slideshow. Federal Emergency Management Agency, 2012.

### 3.3.1 Risk MAP Steps<sup>105, 106</sup>

The Risk MAP process consists of four major steps. Step one is identifying risk (mainly focused on flooding and earthquakes) and mapping it. This starts with the selecting of a watershed for Discovery. Discovery involves gathering information on hazards and hazard mitigation activities within the watershed area in order to determine which areas require mapping, risk assessment and or mitigation planning assistance. Project areas are then selected based on whether the risk to the area warrants mitigation action. Step two is assessing risk. This involves conducting Scoping meetings with project area stakeholders to review the scope of the project. Risk identification (mainly flooding and earthquakes) is continued in project areas on a more local scale. A detailed risk assessment is then conducted. Step three is communicating risk. Risk is discussed with the communities that fall within the project areas. A meeting is conducted with community officials to review the Risk MAP reports that are being developed for the communities. These reports contain information on risk and mitigation. A watershed-wide resilience meeting is then held with community officials and other key stakeholders to identify and prioritize mitigation action. The Flood Insurance Rate Maps (FIRMs) are issued for the project areas. Finally, step four is mitigating risk. The communities within the project areas then take the information that FEMA has provided and use it to mitigate and reduce their risk.

#### 1. **Identify Risk** - *through mapping risk data*

- a. Select a watershed for Discovery;
- b. gather information about local hazards and hazard risks;

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<sup>105</sup> RiskMAP6.com FEMA Region 6 – Mitigation Division Website; <http://www.riskmap6.com/>. (accessed July 28, 2014).

<sup>106</sup> STARR. *Jefferson and Clallam Counties Discovery Report*. Federal Emergency Management Agency, 2013. 3.

- c. review mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities;
  - d. support communities within the watershed or county to develop a vision for its future;
  - e. collect information from communities about their hazard history, development plans, daily operations, and hazard management activities;
  - f. use all information gathered to determine which areas of the watershed require mapping, risk assessment, or mitigation planning assistance through a Risk MAP project;
  - g. map the data;
  - h. decide whether or not the risk warrants mitigation action; and
  - i. select the project area.
2. **Assess Risk** - *by assessing present and future risks*
  - a. Conduct Scoping meetings with project area stakeholders to review the scope of the project; and
  - b. identify and assess risk in project area.
3. **Communicate Risk** - *leads to planning for risk*
  - a. Discuss risks with communities;
  - b. conduct meeting with community officials to review Risk MAP products;
  - c. conduct a watershed-wide resilience meeting with community officials and other key stakeholders to identify and prioritize mitigation action; and
  - d. issue Flood Insurance Rate Maps (FIRMs).
4. **Mitigate Risk** - *leads to transferring and reducing risk*

### **3.3.2 Risk MAP Products**

There are three major products that are given to each community during the Risk MAP process. The first is the Discovery report. It describes the area and lists the following: what needs are being addressed; past hazards; areas of concern; and current and potential mitigation projects.<sup>107</sup> The second is the Risk report. It provides information on local flood and earthquake risk, as well as general information on hazard mitigation.<sup>108</sup> The third deliverable is the Flood Insurance Rate Map (FIRM), which is the official map of the community on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community.

### **3.4 ABAIRA Model**

The ABAIRA Model is an asset-based appreciative inquiry risk assessment approach that assesses community risk, capability and opportunity; and provides adequate, timely and comprehensive risk and resilience information to community stakeholders. This information is then used to make decisions on how to reduce and manage risk to HWB and improve community resilience. Resilience is defined within the ABAIRA Model as the capacity of a community to absorb change from an event and adapt so as to retain the ability to provide goods and services necessary for HWB.

The ABAIRA Model's approach emphasizes inclusive community stakeholder engagement; moves away from problem-based planning (that so often misses informal systems,

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<sup>107</sup> STARR. *Jefferson and Clallam Counties Discovery Report*. Federal Emergency Management Agency, 2013. 4

<sup>108</sup> Federal Emergency Management Agency. *Teton Watershed Risk Report*. Federal Emergency Management Agency, 2012.

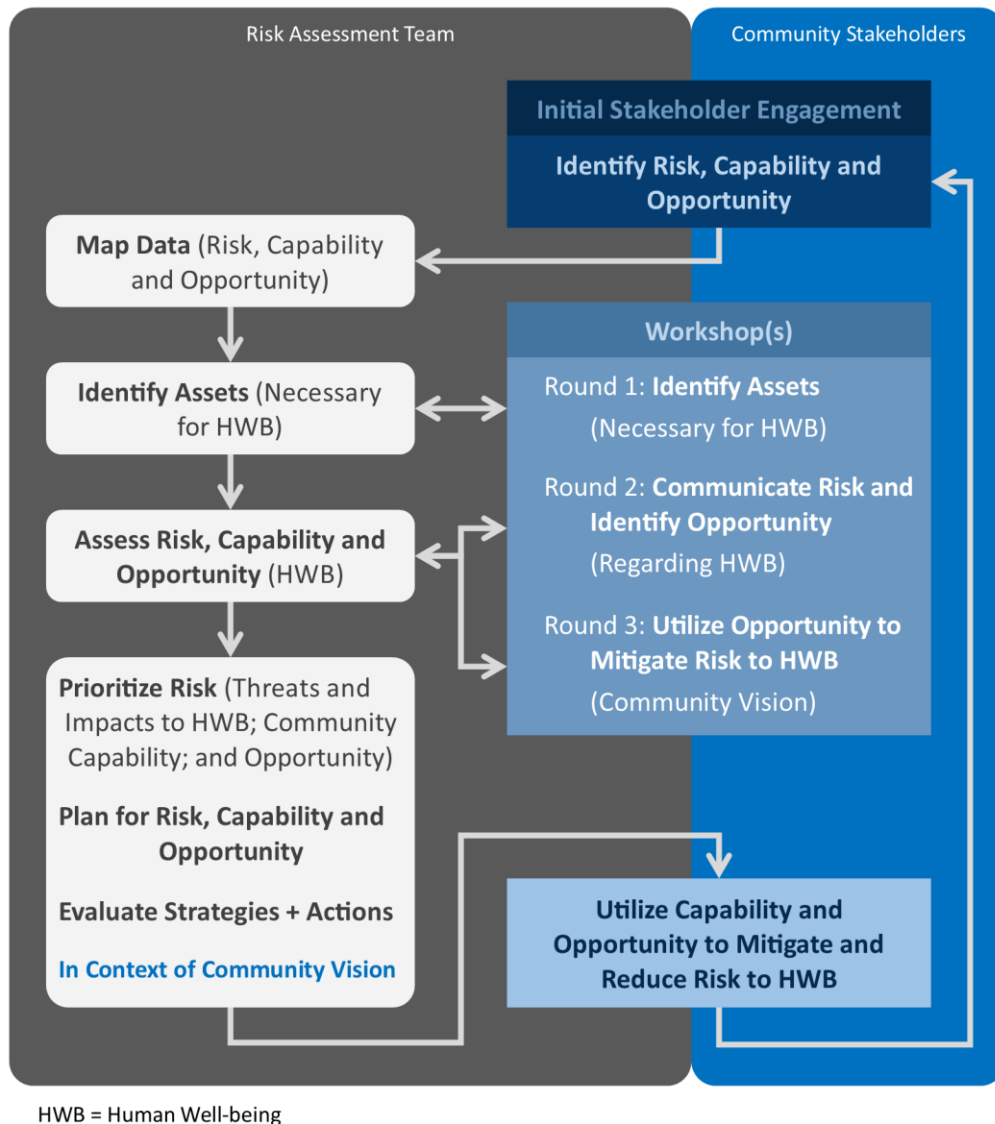
which characterize social, cultural and natural capital of a community) to asset-based appreciative inquiry planning; identifies and assesses all risk to all assets that are necessary for each communities' human well-being; incorporates community goals and planning in the risk assessment process; includes capability and opportunity analyses; introduces a risk prioritization matrix that emphasizes impacts to HWB, community capability and opportunity for risk reduction and resilience enhancement; and helps address the need for inclusion of risk assessment and information into other community planning processes.

The ABAIRA Model includes the community workshop template from the Workshop Model as described earlier in section 2.10 of this thesis. The main goal of the community workshops is to highlight the specifics of local assets that can promote HWB and adaptive capacities. They do this by prompting for links or comparisons between community risk; existing providers of the goods and services necessary for community HWB; community goals; and existing and potential mitigation and adaptation strategies.

The ABAIRA Model follows the 5e structural method, with each phase building upon the previous one(s). Phases one and two correspond to the “Engage” and “Explore” stages. This includes initial community stakeholder engagement, where risk, capability and opportunity are identified; mapping the data; and the first community workshop, where assets are identified. Phase three addresses the “Explain” and “Elaborate” stages. This includes preliminary assessment of community risk, capability and opportunity; the communication of this data and information to the community; and the second community workshop. Phase four corresponds to the “Elaborate” and “Evaluate” stages. This includes prioritizing and planning for risk, capability

and opportunity; utilizing opportunity to mitigate risk and enhance community resilience; and evaluating and contextualizing these risk reduction opportunities and strategies.<sup>109</sup>

**Figure 9. ABAIRA Model**



<sup>109</sup> "Inquiry, the Learning Cycle, & the 5E Instructional Model." In *The Guidelines for Lesson Planning*. Electronic Journal of Science Education.

### 3.4.1 ABAIRA Model Steps<sup>110</sup>

The ABAIRA Model includes ten major steps, which are categorized based upon responsibility. Steps one, three, five, six and ten involve both the risk assessment team and community stakeholders. Their success depends upon significant participation from and engagement with the communities. This includes community meetings and workshops, and other forms of outreach to community officials and stakeholders (as inclusive as feasibly possible). Steps two, four, seven, eight and nine are primarily conducted by the risk assessment team.

Step one is identifying community risk, capability and opportunity. It begins with identifying the areas and communities to be studied. All available data and information is then gathered on threats (this includes hazards), community capability (including preparedness, warning, response and recovery) and opportunity for reducing risk (existing hazard mitigation plans and activities; and community plans and goals). This includes initial community stakeholder engagement in order to gather local input on hazards, threats, capability and opportunity. This leads into step two, which is mapping the data and information. This includes developing a threat scenario (most catastrophic probable threat) for each community that will be presented during the community workshops.

Step three is identifying assets that provide the goods and services necessary for each community's HWB. This starts off with the first community workshop (round 1 of the Workshop Model), where input on assets that provide the goods and services necessary for HWB is

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<sup>110</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 38-41.

gathered from community stakeholders. The risk assessment team then conducts research on each community to identify any critical assets that were missed during the workshop(s).

Step four is the preliminary assessment of community risk, capability and opportunity in regard to HWB for each community. All of the data and information that has been gathered up to this point is analyzed. This leads to step five, which is communicating risk, capability and opportunity to community stakeholders. This is done initially through the second community workshop (round 2 of the Workshop Model), where the threat scenario is presented and discussed.

Step six is utilizing opportunity to mitigate risk to HWB and enhance resilience. This begins with the third community workshop (round 3 of the Workshop Model), where participants are asked to identify resilient assets and envision a more resilient community. This leads to step seven, which is prioritizing risk to HWB. This involves using the newly developed risk prioritization matrix (see Table 5). Step eight is planning for community risk, capability and opportunity in regard to HWB, which includes assessing existing community plans.

Step nine is evaluating and contextualizing risk reduction and resilience enhancement strategies and action. These strategies and actions are developed, refined and operationalized with the focus being on HWB in the context of each community's vision of resilience. This step, along with the information, reports and assistance provided to each community, should lead to step ten, which is utilizing capability and opportunity to prevent and mitigate risk to HWB and enhance community resilience.

## **1. Identify Risk, Capability and Opportunity (Initial Stakeholder Meetings)**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Identify the areas and communities to be studied
- Suggest stakeholders (as inclusive as possible)
- Identify risks of concern (using all available current data)
  - Includes climate change and terrorism (threats to and from transportation related assets)
- Gather information on community capability (preparedness, warning, response and recovery)
- Identify opportunity for prevention, mitigation and resilience; and future directions as presented in vetted plans, such as: comprehensive plans; land use plans, and public works documents

## **2. Map Risk, Capability and Opportunity Data**

The following steps are to be completed by the risk assessment team:

- Map collected data
- Identify the most probable catastrophic risks
- Create a database on the capability of each community that is as comprehensive and accurate as feasibly possible
- Identify the most probable beneficial opportunities
- Hypothesize relationships between the highest probable threats, capability of each community and most probable beneficial opportunities (to present to each community)
- Develop threat scenario(s) that would be most appropriate for each community
- Prepare for round 1 of the community workshop

### **3. Identify Assets**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Conduct round 1 of the community workshop
  - Give an overview of the community transportation infrastructure (including critical infrastructure that is interconnected to it)
  - Introduce concepts
  - Identify transportation infrastructure assets (providers) of the goods and services necessary for each community's human well-being
- Identify critical assets that were overlooked during the workshops
- Map the assets

### **4. Assess Risk, Capability and Opportunity regarding HWB**

The following steps are to be completed by the risk assessment team:

- Preliminary assessment of risk to HWB
- Assess community capability
- Preliminary assessment of community opportunity
- Prepare for round 2 of the community workshop

### **5. Communicate Risk and Identify Opportunity regarding HWB**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Discuss risks, capabilities and opportunities with communities
- Conduct round 2 of the community workshop
  - Introduce concepts
  - Introduce scenario(s)
  - Describe community capability

- Identify providers of goods and services necessary for HWB that would be available directly after an event
- Prepare for round 3 of the community workshop

## **6. Utilize Opportunity to Mitigate Risk to HWB within context of Community Vision**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Conduct round 3 of the community workshop (resilience meeting)
  - Provide stakeholders with enough information to understand the nexus between risks, capabilities and opportunities (what the community could likely become)
  - Identify resilient providers
  - Identify prevention, mitigation and resilience enhancement solutions that advance a preferred vision of the community

## **7. Prioritize Risk regarding HWB**

The following steps are to be completed by the risk assessment team:

- Assess community opportunity
- Assess and prioritize risk to HWB (see Figure 12 for more detail)
  - Threats
  - Impacts to HWB
  - Capability
  - Opportunity

## **8. Plan for Risk, Capability and Opportunity regarding HWB**

The following steps are to be completed by the risk assessment team:

- Assess community plans

- Plan for risk, capability and opportunity

## **9. Evaluate and Contextualize Strategies**

The following steps are to be completed by the risk assessment team:

- Develop and refine mitigation, risk reduction and resilience enhancement strategies and actions (include those expressed in round 3 of the community workshop)

## **10. Utilize Capability and Opportunity to Prevent and Mitigate Risk to HWB; and Enhance Infrastructure Resilience**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Operationalize prevention, mitigation and resilience enhancement strategies
- Provide information and assistance to community stakeholders on prevention, mitigation and resilience strategies and planning

### **3.4.2 Risk Prioritization**

The standard way of prioritizing risk is multiplying Threat (Hazard) x Vulnerability x Consequence. This risk prioritization matrix moves away from this standard in three key ways: (1) de-emphasizing vulnerability; (2) focusing on impacts to HWB as the consequence; and (3) including capability and opportunity components. De-emphasizing vulnerability fits into the ABAIRA approach of focusing on assets necessary for HWB and positive aspects of the community. With so little resources available, communities can't fix, protect and or mitigate every vulnerable asset. Therefore it makes sense to narrow consequences down to the impacts to HWB. This focuses the priorities on what really matters. Finally, including capability and

opportunity components makes sense because they affect risk. The more capability a community has to deal with risk and the more opportunity it has to reduce risk, the more resilient it becomes.

**Table 5. Risk Prioritization Matrix**

1	2	3	4	5	6	7	8	9	10	11	12	13
Hazard (Threat)	Scenario (Location, timing, magnitude)	Probability (L, M, H)	Vulnerable Assets (Providers)	Impacts to Human Well-being				Capability		Opportunity		Risk Rating (Overall)
				Health	Material	Security	Social Relations	Preparedness and Warning	Response and Recovery	Prevention and Mitigation	Community Resilience	

L = Low  
M = Medium  
H = High  
C = Catastrophic

**Columns**

**1 - Hazard (Threat):** Compile a list of hazards (threats) to the community.

**2 - Scenario:** Consider worst-case scenarios. Be sure to include specifics, such as: location, time and magnitude.

**3 - Probability:** Estimate the probability that the scenarios will occur (the sample worksheet uses “H” for high, “M” for medium and “L” for low).

**4 - Vulnerable Assets (Providers):** Compile a list of assets (providers of goods and services necessary for human well-being) identified by community stakeholders and the risk assessment team that are vulnerable to the hazard scenario.

**5 to 8 - Impacts to Human Well-being:** Analyze the potential impact of the hazard scenario on human well-being. Rate impacts “L” for low, “M” for medium, “H” for high and “C” for catastrophic.

- **Health:** Access to medical care, feeling well, and having a healthy physical environment
- **Basic Material for a Good Life:** Secure and adequate livelihoods, income and assets, enough food and water at all times, furniture, fuel, clothing, and access to goods
- **Security:** Safety of person and possessions, shelter, and living in a predictable and controllable environment with security from natural and human-made disasters
- **Good Social Relations:** Social cohesion, mutual respect, good gender and family relations, and the ability to help others and provide for children

**9 and 10 - Capability:** Analyze the capabilities of the community.

- **Preparedness and Warning:** List preparedness and warning capability.
- **Response and Recovery:** List response and recovery capability.

**11 and 12 - Opportunity:** Analyze the opportunities of the community.

- **Prevention and Mitigation:** List opportunities for prevention and mitigation.
- **Community Resilience:** List opportunities for enhancing community resilience.

**13 - Risk Rating:** The “Overall Risk Rating” can be any number of combinations of columns 3 through 13. It’s up to each risk assessment team to make those decisions.

## **4 Results and Analysis**

### **4.1 Comparison of Concepts**

The two concepts used in both processes that could best be compared and are the most relevant for this study are resilience and risk assessment. The Department of Homeland Security (DHS), including FEMA, is moving towards a holistic risk assessment approach that includes resilience and the ABAIRA Model focuses on resilience. It is therefore important to understand how each process approaches resilience and risk assessment.

#### **Resilience**

Both processes include adaptation as part of their definition of resilience. The DHS definition includes preparing for, being able to withstand and recovering from disruptions. Whereas the ABAIRA Model mentions being able to absorb change (disruption), which is very similar. The key difference is retaining the ability to provide goods and services necessary for HWB. The DHS definition does not mention what assets should be doing the withstanding and what should be recovered. With current recovery practices this means building back to what things were pre-disruption, without regard to HWB and opportunities to enhance resilience by building better. While protecting and recovering critical built capital remains an important aspect of resilience, protecting everything that is vulnerable and recovering it to the state it was pre-disruption is not an achievable objective, nor a resilient one. This approach is the opposite of adaptation.

**Table 6. Comparison of Resilience Definitions**

<b>Definitions of Resilience</b>	
<b>FEMA</b>	DHS defines resilience within PPD-21 as, “the ability to prepare for and adapt to changing conditions, and withstand and recover rapidly from disruptions.” <sup>111</sup> Some examples of resilience measures DHS gives include: “developing a business continuity plan, having a generator for back-up power, and using building materials that are more durable.” <sup>112</sup> It is assumed within this analysis that FEMA also has adopted this definition.
<b>ABAIRA Model</b>	Resilience is defined within the ABAIRA Model as the capacity of a community to absorb change from an event and adapt so as to retain the ability to provide goods and services necessary for human well-being (HWB).

**Risk Assessment**

The only similarities between the FEMA risk assessment process and the ABAIRA Model are the inclusion of threats and consequence. The ABAIRA Model however defines threats as including all threats and hazards, not just flooding and earthquakes. The ABAIRA Model also defines consequence as impacts to HWB, which includes assets that fall within natural, social and built capital.

The main obvious difference is that unlike the FEMA process, the ABAIRA Model does not focus on vulnerability. It instead uses an appreciative inquiry approach to develop a pre-event baseline of what assets community stakeholders value most. The ABAIRA Model then combines the following: threats, impacts to HWB, community capability and community

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<sup>111</sup> DHS.gov Department of Homeland Security Official Website; “What Is Security and Resilience?” <http://www.dhs.gov/what-security-and-resilience>. (accessed July 28, 2014).

<sup>112</sup> Ibid.

opportunity. This should contribute to an increased breadth of risk reduction and resilience enhancement strategies.

**Table 7. Comparison of Risk Assessment Approaches**

<b>Risk Assessment</b>	
<b>FEMA</b>	The Risk MAP Process uses the standard DHS risk assessment method (Threat x Vulnerability x Consequence). <sup>113</sup> The risks that are mainly focused on are flood and earthquake.
<b>ABAIRA Model</b>	The ABAIRA Model assesses all risk to all assets that provide the goods and services necessary for the communities' human well-being, which includes assets that fall within natural, social and built capital. It uses an appreciative inquiry approach to develop a solid pre-event baseline built off of what community stakeholders appreciate about their community and depend upon for human well-being. Community capability and opportunity are then assessed. By combining: threats; impacts to human well-being; community capability; and opportunity, this contributes to an increased breadth of mitigation, risk reduction and resilience enhancement strategies.

#### 4.2 Comparison of Processes

The goals and steps are the heart of any process. They dictate what gets done and how. The goals and steps in FEMA Risk MAP process and the ABAIRA Model have similarities, but also differ significantly.

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<sup>113</sup> Department of Homeland Security. *National Infrastructure Protection Plan*. Department of Homeland Security, 2013. 17.

## Goals

FEMA’s goal is to mitigate risk to life and property. FEMA also supports fostering a community-oriented approach to strengthening the nation’s resilience through building resilient communities, which is a step in the right direction. The ABAIRA Model goal is also to help communities become more resilient. However, instead of focusing on just people and property, it includes all assets by moving away from a vulnerability approach to an asset-based appreciative inquiry one.

**Table 8. Comparison of Goals**

<b>Goals</b>	
<b>FEMA</b>	To help enable communities to better identify, assess, communicate and ultimately mitigate risk to life and property. <sup>114</sup> Risk MAP supports the following FEMA Administrator’s Priorities: (1) to strengthen the nation’s resilience to disasters; and (2) to foster a national community-oriented approach to emergency management that strengthens local institutions, assets, and social networks to build sustainable and resilient communities. <sup>115</sup>
<b>ABAIRA Model</b>	Help communities become more resilient by: engaging community stakeholders; moving away from problem-based planning (that so often misses informal systems, which characterize social, cultural and natural capital of a community) to asset-based appreciative inquiry planning; identifying and assessing all risk to all assets that are necessary for each communities’ human well-being; incorporating community goals and planning; including capability and opportunity analyses; and helping address the need for inclusion of risk assessment and information into other community planning processes.

<sup>114</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 36.

<sup>115</sup> Federal Emergency Management Agency. *FEMA’s Risk Mapping, Assessment, and Planning (Risk MAP): Fiscal Year 2011 Report to Congress*. Federal Emergency Management Agency, 2011.

## Steps

Due to the ABAIRA Model being based off of the Workshop Model, which was developed to improve the Risk MAP process, many of the main steps are very similar. The comparison is therefore divided into two sections. The first section shows the steps that are similar. The second section highlights the differences, specifically the modifications and additional steps contained within the ABAIRA Model.

The fundamental steps in the Risk MAP process are similar in many ways to the same steps within the ABAIRA Model. These include identifying, assessing, communicating and mitigating risk. There are however some major differences. The most obvious difference is the movement away from a vulnerability approach to one that focuses on opportunity, capability and HWB. This includes: identifying and assessing capability, opportunity and risk to HWB to find relationships between them; conducting the three community workshops; planning for risk, capability and opportunity; and developing, refining and operationalizing mitigation, risk reduction and resilience enhancement strategies.

**Table 9. Comparison of Process Steps**

<b>Steps</b>	
<b>Similarities</b>	<ol style="list-style-type: none"><li>1. Gather information about local hazards and hazard risks</li><li>2. Review mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities</li><li>3. Support communities to develop a vision for its future</li><li>4. Collect information from communities about their hazard history, development plans, daily operations, and hazard management activities</li></ol>

	<ol style="list-style-type: none"> <li>5. Use all information gathered to determine which areas require mapping, risk assessment, or mitigation planning assistance through a Risk MAP project</li> <li>6. Map the data</li> <li>7. Decide whether or not the risk warrants mitigation action</li> <li>8. Select the project area</li> <li>9. Conduct Scoping meetings with project area stakeholders to review the scope of the project</li> <li>10. Identify and assess risk in project area</li> <li>11. Discuss risks with communities</li> <li>12. Conduct meetings with community officials to review Risk MAP products</li> <li>13. Conduct a resilience meeting with community officials and other key stakeholders to identify and prioritize mitigation action</li> <li>14. Mitigate Risk</li> </ol>
<p style="text-align: center;"><b>Differences</b></p>	<p>The ABAIRA Model contains the following modifications and additional steps:</p> <ol style="list-style-type: none"> <li>1. Suggest a more inclusive threshold of stakeholders (including vulnerable populations)</li> <li>2. Gather information on community capability (preparedness, warning, response and recovery)</li> <li>3. Identify opportunity for prevention, mitigation and resilience; and future directions as presented in vetted plans, such as: comprehensive plans; land use plans and public works documents</li> <li>4. Identify the most probable catastrophic risks</li> <li>5. Create a database on the capability of each community that is as comprehensive and accurate as feasibly possible</li> <li>6. Identify the most probable beneficial opportunities</li> <li>7. Hypothesize relationships between the highest probable threats, capability of each community and most probable beneficial opportunities (to present to each community)</li> <li>8. Develop threat scenario(s) that would be most appropriate for each community</li> <li>9. Conduct round 1 of the Workshop Model to identify assets (providers) of the goods and services necessary for each community's human well-being</li> <li>10. Assess community capability</li> <li>11. Discuss risks, capabilities and opportunities with communities</li> </ol>

	<ol style="list-style-type: none"> <li>12. Conduct round 2 of the Workshop Model to identify providers of goods and services necessary for HWB that would be available directly after an event</li> <li>13. Conduct round 3 of the Workshop Model (resilience meeting) <ol style="list-style-type: none"> <li>a. Provide stakeholders with enough information to understand the nexus between risks, capabilities and opportunities (what the community could likely become)</li> <li>b. Identify resilient providers</li> <li>c. Identify mitigation, risk reduction and resilience enhancement solutions that advance a preferred vision of the community</li> </ol> </li> <li>14. Assess community opportunity</li> <li>15. Assess and prioritize risk to HWB</li> <li>16. Assess community plans</li> <li>17. Plan for risk, capability and opportunity</li> <li>18. Develop, refine and operationalize mitigation, risk reduction and resilience enhancement strategies (include those expressed in round 3 of the community workshop)</li> <li>19. Operationalize prevention, mitigation and resilience enhancement strategies</li> <li>20. Provide information and assistance to community stakeholders on mitigation, risk reduction and resilience strategies and planning</li> </ol>
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### 4.3 Suggestions for Improvement to the Risk MAP Process

Based upon the comparison results, there are several modifications that could be incorporated into the Risk MAP process to improve it. All of these suggested modifications support refining FEMA’s approach to risk and resilience:

1. Place greater emphasis on all risk to all assets that provide the goods and services necessary for the communities’ human well-being. This includes assets that fall within natural and social capital. Rather than restricting risk assessment discussions to vulnerable built capital.

2. Develop tools to identify opportunities for mitigating and reducing risk and improving community resilience that include natural and social capital.
3. Move away from the DHS risk assessment method (Threat x Vulnerability x Consequence) to an appreciative inquiry approach that assesses all risk to all assets that provide the goods and services necessary for the communities' human well-being. Develop a solid pre-event baseline built off of what community stakeholders appreciate about their community and depend upon for human well-being: and assess community capability and opportunity. By combining: impacts to human well-being; community capability; and opportunity, this contributes to an increased breadth of mitigation, risk reduction and resilience enhancement strategies. Using an appreciative inquiry approach will also increase productivity and enjoyment of the community workshops. Thus increased community engagement (see Table 4 for participant feedback results from the Workshop Model that support this).
4. Gather information on community capability (preparedness, warning, response and recovery) and create a database on the capability of each community that is as comprehensive and accurate as feasibly possible
5. Better incorporate community goals and planning into the risk assessment process.
6. Address community resilience, not as a static goal or the ability to bounce back, but as a process enabling communities to self-organize following a critical change event. This helps in characterizing the community and assessing the value and contribution of all available assets (natural, social and built), as well as helping participants to take ownership of the solutions they developed.
7. Provide information and assistance to community stakeholders on mitigation, risk reduction and resilience strategies and planning

Based upon the comparison results, there are several additions and modifications that could be incorporated into the Risk MAP products. It is important to note that the ABAIRA Model does not contain any major products or deliverables, such as flood maps or reports. This is so

that when it's being compared to other processes, the steps, concepts and approach can be incorporated into the existing products and deliverables.

The Discovery report could include a list of capabilities and a list of current and potential opportunities. This would help inform communities on where they are currently at in regard to capability and opportunity. The Risk report could include the following:

1. Community Vision
2. Information on all risk to HWB (not just flood and earthquake risk)
3. Information on capability
4. Information and strategies on mitigation, risk reduction and resilience
5. Guide for incorporating risk assessment and information into local planning processes
  - a. Explain the need for inclusion of risk assessment and information into other community planning processes
  - b. Provide examples of best practices
  - c. List relevant resources

#### **4.4 Limitations and Constraints**

The development and testing of the Workshop Model, which provided the foundation for the ABAIRA Model, was on a limited budget, tailored for three communities and constrained by mainly focusing on refining a resilience definition and concepts, developing a community workshop model and improving effective community engagement. In all three communities, the project team had previously worked with local emergency management officials on hazard mitigation planning. The Workshop Model was framed as action research, intended to assist the communities with on-going planning as well as yield useful findings for broader FEMA policy and academic understanding. Local officials advertised the workshop to their existing networks

of stakeholders in hazard mitigation planning. Participants were therefore not any more representative of the entire community than these stakeholder networks already are, especially in the larger and more diverse cities of Redmond and Everett. The objective of the workshops was therefore to test the new format for discussion among people who for the most part are already familiar with emergency and disaster planning. This of course limited the perspectives and probable 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 human well-being (quality of life) in the context of hazard mitigation planning.<sup>116</sup>

More testing using the expanded ABAIRA Model will need to be done in order to truly test the full breadth of the approach that is being suggested in this analysis. The testing will need to go beyond just a few community workshops. Also the Risk MAP process is very complex and seems to differ slightly for each of the ten FEMA regions. There are no overall Risk MAP framework documents or reports that lay out the steps, concepts and approaches in a concise, comprehensive manner. This made it difficult to do concept and step-by-step process comparisons. Participant feedback data for Risk MAP Discovery and Scoping meetings, such as: whether directions are easy to follow; did the participants you see value in the community exercise; were the right participants (community stakeholders) involved; and was the Risk MAP process worth their time, was also not available. That is why it's missing from the analysis

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<sup>116</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 7 and 8.

## **5 Discussion**

The comparison results show how an asset-based appreciative inquiry risk assessment approach could improve FEMA's Risk MAP process to better help communities become resilient in the face of ever-changing risk. This approach has the potential to significantly change the way risk is mapped, assessed and planned for, which helps strengthen our nation's resilience.

All eight main problem areas are addressed by the ABAIRA Model. These include: (1) defining community resilience; (2) a risk assessment process that focuses on what really matters to a community, most importantly their human well-being; (3) effective community engagement; (4) incorporating community goals and plans into the risk assessment process; (5) identifying assets beyond just built capital, by including natural and social capital; (6) assessment of community capability; (7) identification and assessment of mitigation, risk reduction and resilience opportunity; and (8) incorporating risk assessment and information into other community planning processes.

### **5.1 Findings**

#### **5.1.1 Defining Community Resilience**

The standard risk assessment process assumes that resilience is achieved by mitigating all vulnerabilities, which is expensive, if not impossible and unsustainable given our limited resources. Restoring things back to the way they were before a disruption is also practically impossible and often socio-ecologically undesirable. This has been recognized by recent efforts

to incorporate sustainability into community disaster recovery goals.<sup>117,118</sup> Threats should instead be seen as uninvited but potentially important agents of change, and resilience should be viewed as the capacity to adapt to change, rather than to bounce back from it.<sup>119</sup> The capacity to adapt is being able to respond to a disruption by adjusting to a new normal, and to build back better, where better is defined according to community cultural and social values and principles of resilience.<sup>120,121</sup> The capacity to adapt often times is only revealed after a disruption, but it could and should be developed in the course of a community's ongoing development.

Approaches to resilience require preparing for the unexpected, whereas risk assessment typically proceeds from the premise that hazards are identifiable and predictable. Current risk based approaches are unsatisfactory, even with known hazards. They emphasize risk probabilities that may be unknowable. Community systems exist within dynamic and unpredictable environments and estimates of risk probabilities are notoriously unreliable. Take for example, the estimating of the joint probability and synergy of two or more major events happening at the same time or back to back. Or look at cascading failures.<sup>122</sup>

As such, it is inadequate and not helpful to think of community resilience as achieving some static state of being. It should be approached as an ongoing adaptive process. Not

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<sup>117</sup> Paton, D., and D. M. Johnston, eds. *Disaster Resilience: An Integrated Approach*. Springfield, IL: Charles C. Thomas, 2006. 7 and 8.

<sup>118</sup> Smith, G. P., and D. Wenger. "Sustainable Disaster Recovery: Operationalizing an Existing Agenda." In H. â. Rodríguez, E. L. Quarantelli and R. R. Dynes, eds. *Handbook of Disaster Research*, 234-257. New York: Springer, 2007.

<sup>119</sup> Norris, F., S. Stevens, B. Pfefferbaum, K. Wyche, and R. Pfefferbaum. "Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness." *American Journal of Community Psychology* 41, no.1 (2008): 127-150.

<sup>120</sup> Chan, K. M. A., A. D. Guerry, P. Balvanera, S. Klain, T. Satterfield, X. Basurto and U. Woodside. "Where Are Cultural and Social in Ecosystem Services?: A Framework for Constructive Engagement." *BioScience* 62, no. 8 (2012): 744-756.

<sup>121</sup> Millennium Ecosystem Assessment. *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press, 2005.

<sup>122</sup> Park, J., T. P. Seager, P. S. C. Rao, M. Convertino, and I. Linkov. "Integrating Risk and Resilience Approaches to Catastrophe Management in Engineering Systems." *Risk Analysis* 33, no. 3 (2013): 356-367. 359.

something that a system achieves or has, but a characteristic of the way it behaves. Ecological systems when restored do not revert back to their original states like a rubber band returning to its original shape after being stretched and neither do community systems after an event.

Conditions always change. Even when we don't realize it. <sup>123</sup>

### **5.1.2 Assessing Risk to What Really Matters**

The Risk MAP process could better help communities become more resilient by moving away from a standard vulnerability approach to an asset-based appreciative inquiry one. Instead of just focusing on what could potentially break, focus on what really matters.

An asset-based approach is very different from the commonly used needs-based or vulnerability based approach to risk assessment. It identifies the community's positive aspects and looks at ways to empower the community. Community assets are identified by stakeholders within the community. This includes resources (capital) that would otherwise be ignored, unrealized or dismissed, such as social and natural capital. This glass is half-full approach does not deny the real problems or vulnerabilities, it simply focuses efforts on identifying how community stakeholders and assets contribute and can continue to contribute to community human well-being. <sup>124</sup>

In a needs-based (vulnerability) approach to risk assessment, well-intentioned efforts by government, universities and NGOs are focused on analyzing community problems

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<sup>123</sup> Park, J., T. P. Seager, P. S. C. Rao, M. Convertino, and I. Linkov. "Integrating Risk and Resilience Approaches to Catastrophe Management in Engineering Systems." *Risk Analysis* 33, no. 3 (2013): 356–367. 359.

<sup>124</sup> Mathie, Alison, and Gord Cunningham. *From Clients to Citizens: Asset-Based Community Development as a Strategy for Community Driven Development*. Antigonish, Nova Scotia, Canada: Coady International Institute, 2002. 5.

(vulnerabilities) and identifying solutions to meet the needs (address the vulnerabilities) of a community. This process however is typically very one-sided and casts a negative view upon the community, by simply viewing it as a recipient of assistance (focusing on the vulnerabilities), rather than part of the solution. By only focusing on the negative problems and vulnerabilities, community assets and capabilities are often overlooked. This compromises the community, rather than empowering it to self-identify community priorities and take charge of their lives and of the community. It can also lead to communities overly relying upon government and NGO assistance and expertise, rather than looking internally for solutions and support. This can lead to weakening of vital local social ties and networks and consequently the weakening of the community's resilience.<sup>125</sup>

Typically, when conducting risk assessment, the mapping of what is considered valuable and important to the broader community is not explicitly stated and debated amongst the majority of stakeholders (especially vulnerable stakeholders who are most likely to be impacted). Instead there is an assumption that all stakeholders implicitly agree on community assets that are most important and most vulnerable. Stakeholders however often have different opinions on what is important, which often results in the pursuit of irreconcilable goals.<sup>126</sup>

A study using focus groups was done in South Africa, investigating if it is possible for a wide range of community stakeholders to construct a common holistic description of what is valuable and important to protect. The study results showed that this approach can establish

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<sup>125</sup> Mathie, Alison, and Gord Cunningham. *From Clients to Citizens: Asset-Based Community Development as a Strategy for Community Driven Development*. Antigonish, Nova Scotia, Canada: Coady International Institute, 2002. 4.

<sup>126</sup> Becker, Per and Henrik Tehler. "Constructing a Common Holistic Description of What is Valuable and Important to Protect: A Possible Requisite for Disaster Risk Management." *International Journal of Disaster Risk Reduction* 6 (2013): 18–27. 19 and 20.

common objectives for disaster risk assessment and increase engagement of stakeholders that otherwise wouldn't be part of this process. Thus showing that this process is a vital step towards a more resilient society.

The questions asked were as follows: <sup>127</sup>

- What is valuable and important to protect?
- Why is it valuable?
- Which other elements are valuable in securing that valuable element?

The main elements turned out to be human life, health and well-being. As a result they came up with “a complex system of critical functions, flows and infrastructure supplying the basic necessities to secure human life, health and wellbeing, i.e. water, food, shelter, sanitation, health care, education and livelihood.” <sup>128</sup>

The results from the testing of the Workshop Model, which is used as the foundation for the ABAIRA Model, were very similar to the study done in South Africa, in that participants constructed both a common holistic description of what is valuable (for their human well-being) and common objectives for disaster risk assessment. The questions asked during the workshops were similar as well.

This suggests that the Risk MAP process would benefit from beginning with questions of HWB and allowing those to drive discussion of community values. These values can be

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<sup>127</sup> Becker, Per and Henrik Tehler. “Constructing a Common Holistic Description of What is Valuable and Important to Protect: A Possible Requisite for Disaster Risk Management.” *International Journal of Disaster Risk Reduction* 6 (2013): 18–27. 21.

<sup>128</sup> Ibid. 26.

expressed as the providers of HWB goods and services, prompted by questions in an appreciative inquiry mode:

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

This approach requires FEMA to move away from the standard risk assessment method (Threat x Vulnerability x Consequence) to an appreciative inquiry approach. One that assesses all risk to all assets that provide the goods and services necessary for the communities' human well-being.

By starting the community workshops with a broad definition and inventory of assets for everyday quality of life, and then returning to a summary of the community's goals and plans after discussing the change event scenario, the ABAIRA Model shows it is relatively easy for participants to link mitigation, preparedness and recovery capacity with ideas for enhanced well-being 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. Consequently, risk assessment could be used to gather a human well-being baseline before an event and compare it post-event. This process could be used to measure community resilience by looking at pre-event service capacity compared to post-event.<sup>129</sup> Using an appreciative inquiry approach will also increase productivity and enjoyment of the community workshops. Thus increased community engagement (see Table 4

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<sup>129</sup> Bruneau, Michel, and Andrei Reinhorn. "Exploring the Concept of Seismic Resilience for Acute Care Facilities." *Earthquake Spectra* 23, no.1 (2007): 41-62. 4.

for participant feedback results from the Workshop Model that support this). The participatory process itself is often times as important as the outcome.<sup>130</sup>

### **5.1.3 Effective Community Engagement**

It is widely understood and accepted that in order to get communities to mitigate and reduce their risks, they must first understand and accept what those risks are. They then need to understand how they can mitigate and reduce those risks. Finally, they need the appropriate skills, tools and resources to take action. All of this requires effective community stakeholder effective engagement. Communities must feel empowered by the process or else they will ignore and or reject it, along with the tools and information.

The ABAIRA Model showed that an effective way of engaging community stakeholders is to obtain their input on how the process can be tailored to work best for their community in regard to helping them make their community more resilient. Part of obtaining input is eliciting feedback from workshop participants on what worked and what didn't and to give suggestions on how to improve the process. During the testing of the Workshop Model, each community (Redmond, Everett and Neah Bay) was asked for their input and workshop participants were given the opportunity to give feedback on the process. This worked out well. As shown in Table 4, feedback from the Workshop Model was very positive. Using a Likert Scale of 1 ("no") to 5 ("yes"), the total response averages for each community was above 4.5 (see Appendix E for a copy of the evaluation sheet that was used).

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<sup>130</sup> Mileti, Dennis S. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington DC: Joseph Henry Press, 1999. 5-6.

“Asset mapping begins with the philosophy that all local residents, regardless of age, gender, race, ethnic background, place of residence, or other characteristics, can play an effective role in addressing important local matters.”<sup>131</sup> Unfortunately community processes, including FEMA’s Risk MAP process are not usually very inclusive. They tend to leave out the most vulnerable stakeholders. This is not only a big mistake because it’s these stakeholders who tend to be the most impacted by change events, but it also limits the understanding of what’s important to the community, and thus limits the opportunity to mitigate and reduce the community’s risk.

As anyone who has held a community meeting or workshop can tell you, it is very difficult to first identify an inclusive representative set of stakeholders, second reach out to them in a timely manner, and finally get them to show up to the meeting or workshop. While the group of stakeholders that participated in the testing of the Workshop Model were not as inclusive as we would have liked, they were representative enough to get useful results showing the value of the approach (see Appendix F for a summary of the workshop results). During the Risk MAP process this should not be as much of a problem, given that the time and resource allocations are much greater than what was allotted for the testing of the Workshop Model.

The concepts, information and tools should also be structured, packaged and presented in a user-friendly way. This can help engage and empower these very stakeholders who are the most vulnerable and thus least familiar with the process. This also makes it easier for communities to make use of them, especially if they don’t have available personnel with the necessary training and technical expertise. For details on how the workshops were structured see Appendix D.

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<sup>131</sup> Beaulieu, Lionel J. *Mapping the Assets of Your Community: A Key Component for Building Local Capacity*. Mississippi State: Southern Rural Development Center, 2002. 4.

#### 5.1.4 Incorporating Community Goals and Plans

In order for the information and tools to be effective and appropriate for the community's needs, they should include relevant accurate information regarding the community. This means incorporating existing community plans, data and goals beyond just the mitigation plans and flood hazard data. Examples include: comprehensive plans; current and future land-use changes (in and around the community); economic development goals; ecosystem services and land use values; and climate change data. This also helps make the information and tools more relevant and thus more likely to be used by community stakeholders.

Also, in order to fully understand the risk to a community, the current and future plans and environmental changes must be taken into consideration. According to the National Academy of Sciences (NAS), while DHS's risk analysis models for natural hazards appear well suited to near-term decisions, they should evolve to "support longer term risk management and policy decisions."<sup>132</sup> Improvements should be made to take into account the consequences of "long-term systemic uncertainties, such as those arising from effects of climate change; incorporate diverse perceptions of risk impacts; and support decision making at local and regional levels."<sup>133</sup> As an example, the Risk MAP process could "develop and disseminate maps that show flood hazards under future conditions such as increased impervious area upstream and potential effects of climate change."<sup>134</sup>

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<sup>132</sup> National Academy of Sciences. *Review of the Department of Homeland Security's Approach to Risk Analysis*. National Academy of Sciences, 2010.

<sup>133</sup> Ibid.

<sup>134</sup> American Planning Association. *Hazard Mitigation: Draft Policy Guide*. American Planning Association, 2014.

### 5.1.5 Including Natural and Social Capital (Assets)

Communities rely on goods and services for their well-being, which are provided by built, natural, and social capital (assets) in differing degrees and at different times. Risk assessment and management should go beyond merely focusing on built capital to include a consideration of social and natural capital. All of our critical institutions and assets are or depend upon the natural environment, including ecosystem services; our human capital; and our social systems. Natural and social capital are equally if not more important for the long-term resilience of our communities, which is why opportunities for mitigating and reducing risk and improving community resilience must include natural and social capital.

According to the American Planning Association (APA), “Communities that integrate environmental considerations with hazard mitigation planning will be successful in effective planning for both objectives.”<sup>135</sup> The NAS also mentions that “the full range of consequences of natural hazard events includes effects that lie outside current evaluations, such as loss of potable water, housing, and other basic services; diverse effects on communities; impacts on social trust; psychological effects of disasters; distributional inequities; and differential social vulnerability.”<sup>136</sup> And, “as risk assessment of natural hazards moves forward over the longer term, incorporating social dimensions into risk assessment and risk management will have to be a major priority in building a more complete and robust base of knowledge to inform decisions.”<sup>137</sup>

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<sup>135</sup> American Planning Association. *Hazard Mitigation: Draft Policy Guide*. American Planning Association, 2014.

<sup>136</sup> National Academy of Sciences. *Review of the Department of Homeland Security's Approach to Risk Analysis*. National Academy of Sciences, 2010.

<sup>137</sup> Ibid.

This change in emphasis can be illustrated through two very different approaches to reducing risk. A traditional approach to risk reduction would include a coastal flood prone community where all structures are built above the level of flooding. Here the community has focused on protecting built capital. A different approach is where a community adopts the necessary legal tools whereby the development rights of structures destroyed by flooding could be transferred to high ground development sites. This second community might have secured an acceptance for this approach by involving a wide range of community stakeholders. Resilience in this case focuses on natural capital (high ground), social capital (networks) and their ability to adapt to a changing coastline. Should sea level rise and storm severity increase, causing the shoreline to retreat, our second community may be the more resilient. Especially if the government and property owners in our first example were heavily indebted and had exhausted their financial resources in paying the costs of elevation and had few reserves to rebuild. Thus the resilient community would have protected their quality of life, allowing them to continue to live and function as a community.

#### **5.1.6 Identifying and Assessing Capability**

In order to fully assess a community's risk to human well-being, we must understand what its capabilities are. This includes gathering information on: community preparedness; capacity to warn the community about imminent events; a community's ability to respond to an event; and how well a community can recover from the impacts of an event. All of these factors affect how much and in what ways a community is impacted by change events. This should affect how risk is understood and prioritized.

Assessing the capability of communities and then communicating this information to community stakeholders will help them to understand what is working and what needs to be improved. This will help them with their risk planning and developing or updating risk related documents, such as the Threat and Hazard Identification and Risk Assessment (THIRA). One way to do this is to create a database that is accessible to the community. Another way is to include this information in the Discovery and Risk reports. Some information may need to be restricted due to security and safety issues.

### **5.1.7 Identifying and Assessing Opportunity**

In order for communities to become more resilient, they need to identify, assess and take advantage of opportunities for mitigation, risk reduction and resilience enhancement. Change events don't just bring negative impacts, they can also bring opportunities. These need to be recognized and understood in order to be taken advantage of and utilized.

The Risk MAP process can help communities identify, assess and utilize their opportunities by: identifying the most probable beneficial opportunities; hypothesizing relationships between the highest probable risks, capability of each community and most probable beneficial opportunities; providing community stakeholders with enough information to understand the nexus between risks, capabilities and opportunities (what the community could likely become); and providing information and assistance to community stakeholders on mitigation, risk reduction and resilience strategies and planning. One suggestion is to include information and strategies on current and potential opportunities in the Discovery and Risk reports.

### 5.1.8 Incorporating Risk into Other Community Planning Processes

According to the APA, communities want to rebuild back to the way things were pre-event, without taking into consideration a repeat of the disaster or the effects of long-term trends (such as beach erosion).<sup>138</sup> The Risk MAP process should guide communities to rebuild for the future, not the present, and thus in a more resilient manner. In order for communities to fully utilize their opportunity and thus mitigate and reduce risk, as well as enhance their resilience, they should incorporate risk information and assessment components into other planning processes.

There are a number of ways the Risk MAP process can be improved to help communities achieve this. First, the process could be used to reassess land-use plans, zoning ordinances, and other codes for areas of identified risk and to develop strategies to mitigate those risks.<sup>139</sup> Second, it could be used to assist communities with integrating their Hazard Mitigation Action Plans into comprehensive plans, by timing the process to coincide with the updating of those plans. Third, promote community risk and resilience planning in a holistic way, by encouraging community stakeholders to create a community vision. One that best helps the community recover from a change event over the long term, puts the community in better position should another change event occur, and meets the community's goals for an even better quality of life. Include this community vision in the Risk report. Fourth, include a guide on incorporating risk assessment and information into local planning processes in the Risk report. This guide should explain the need for inclusion of risk assessment and information into other community planning processes, provide examples of best practices and list relevant resources.

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<sup>138</sup> American Planning Association. *Hazard Mitigation: Draft Policy Guide*. American Planning Association, 2014.

<sup>139</sup> Ibid.

## 5.2 Proposed Risk MAP Process

The proposed Risk MAP process incorporates the suggested improvements. It includes eight major steps, which are categorized based upon responsibility. Steps one, two, three and four involve both the risk assessment team and community stakeholders. Their success depends upon significant participation from and engagement with the communities. This includes community meetings and workshops, and other forms of outreach to community officials and stakeholders (as inclusive as feasibly possible). Steps A, B, C and D are primarily conducted by the risk assessment team.

Step one is identifying community risk, capability and opportunity. It begins with identifying the areas and communities to be studied. All available data and information is then gathered on threats (this includes hazards), community capability (including preparedness, warning, response and recovery) and opportunity (existing hazard mitigation plans and activities; and community plans and goals). During this step, initial community meetings (similar to the Discovery and Scoping meetings in the Risk MAP process) will be conducted, with an inclusive representation of stakeholders to gather local input on hazards, threats, capability and opportunity. This leads into step A, which is mapping the data and information. This includes developing a threat scenario (most catastrophic probable threat) for each community that will be presented during the community workshops.

Step two is identifying assets that provide the goods and services necessary for each community's HWB. This starts off with the first community workshop (round 1 of the Workshop Model), where input on assets that provide the goods and services necessary for HWB is

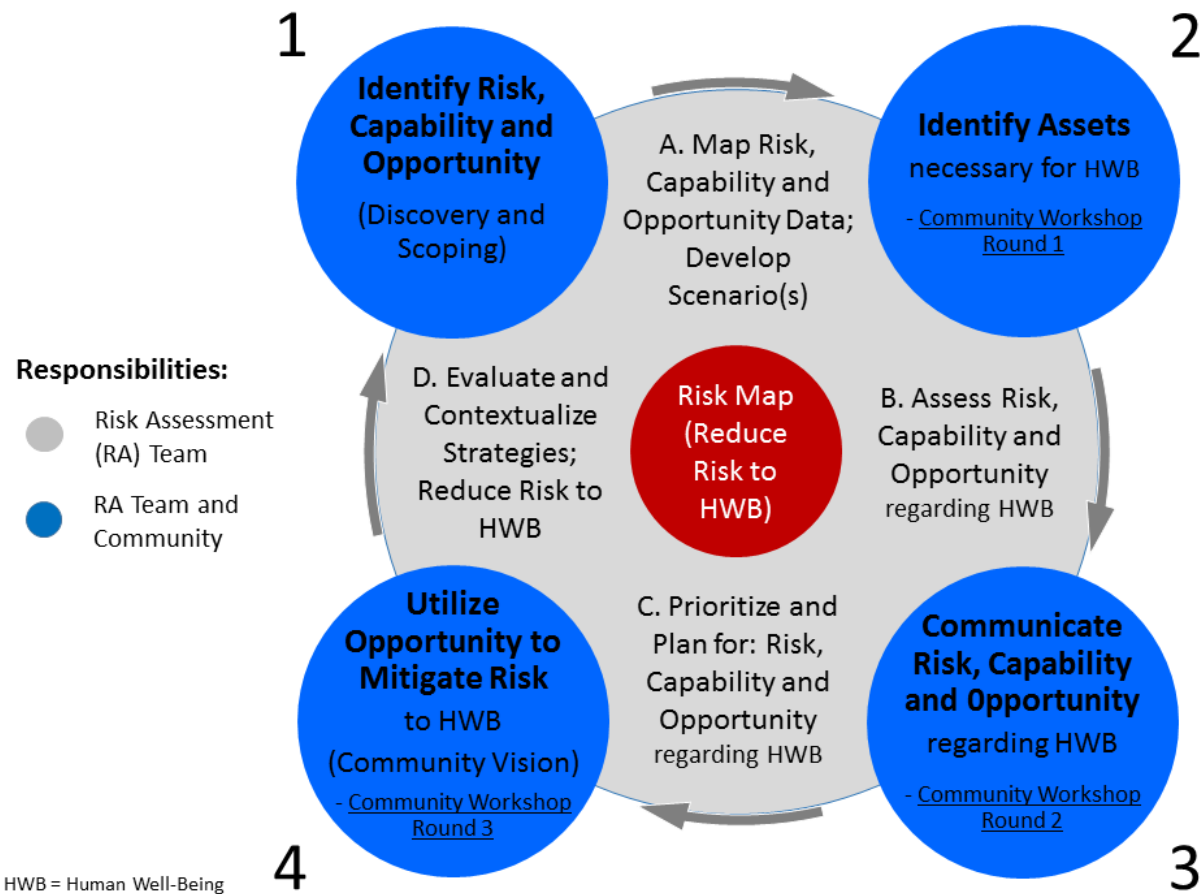
gathered from community stakeholders. The risk assessment team then conducts research on each community to identify any critical assets that were missed during the workshop(s).

Step B is the preliminary assessment of community risk, capability and opportunity in regard to HWB for each community. All of the data and information that has been gathered up to this point is analyzed. This leads to step three, which is communicating risk, capability and opportunity to the communities. This is done initially through the second community workshop (round 2 of the Workshop Model), where the threat scenario is presented and discussed.

Step C is prioritizing and planning for community risk, capability and opportunity in regard to HWB. This involves using the risk prioritization matrix (see Table 5), as well as incorporating risk assessment, capability and opportunity into community planning. This step would be done conjointly with step four, which is utilizing opportunity to mitigate risk and enhance resilience. This begins with the third community workshop (round 3 of the Workshop Model), where participants are asked to identify resilient assets and envision a more resilient community. Finally, step D is evaluating and contextualizing risk reduction and resilience enhancement strategies and action. These strategies and actions are developed, refined and operationalized with the focus being on HWB in the context of each community's vision of resilience. This step, along with the information, reports and assistance provided to each community, should lead to community risk reduction and resilience enhancement action.

The proposed Risk MAP process with the suggested improvements incorporated into it could look like Figure 10.

**Figure 10. Proposed Risk MAP Process**



### 5.2.1 Proposed Risk MAP Steps

#### 1. Identify Risk, Capability and Opportunity (Discovery and Scoping)

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Discovery phase (similar to Risk MAP)
- Identify the communities to be studied
- Suggest stakeholders (as inclusive as possible)
- Identify risks of concern (using all available current data)

- Gather information on community capability (preparedness, warning, response and recovery)
- Identify opportunity for prevention, mitigation and resilience; and future directions as presented in vetted plans, such as: comprehensive plans; land use plans, public works documents, Community Rating System (CRS) documents and 510 plans
- Use all information gathered to determine which communities require mapping, risk assessment, and or mitigation planning assistance through a Risk MAP project
- Scoping phase (similar to Risk MAP)

### **A. Map Risk, Capability and Opportunity Data; and Develop Scenario(s)**

The following steps are to be completed by the risk assessment team:

- Map collected data
- Create a database on the capability of each community that is as comprehensive and accurate as feasibly possible
- Identify the most probable beneficial opportunities
- Hypothesize relationships between the highest probable risks, capability of each community and most probable beneficial opportunities (to present to each community)
- Identify the most probable catastrophic threats
- Develop threat scenario(s) that would be most appropriate for each community
- Prepare for round 1 of the community workshop

### **2. Identify Assets necessary for HWB – Community Workshop Round 1**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Conduct round 1 of the Workshop Model
  - Briefly describe the community
  - Introduce concepts

- Identify assets (providers) of the goods and services necessary for each community's human well-being; and map them
- Identify any critical assets that were overlooked during the workshops

## **B. Assess Risk, Capability and Opportunity regarding HWB**

The following steps are to be completed by the risk assessment team:

- Preliminary assessment of risk to HWB
- Assess community capability
- Preliminary assessment of community opportunity
- Prepare for round 2 of the community workshop

## **3. Communicate Risk, Capability and Opportunity regarding HWB – Community Workshop Round 2**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Discuss risks, capabilities and opportunities with communities
- Conduct round 2 of the Workshop Model
  - Introduce concepts
  - Introduce scenario(s)
  - Describe community capability
  - Identify providers of goods and services necessary for HWB that would be available directly after an event

## **C. Prioritize and Plan for: Risk, Capability and Opportunity regarding HWB**

The following steps are to be completed by the risk assessment team:

- Assess and prioritize risk to HWB
- Assess community plans
- Preliminary planning for risk, capability and opportunity

- Prepare for round 3 of the community workshop

#### **4. Utilize Opportunity to Mitigate Risk to HWB within context of Community Vision – Community Workshop Round 3**

The following steps are to be completed by the risk assessment team in collaboration with community stakeholders:

- Conduct round 3 of the Workshop Model (resilience meeting)
  - Provide stakeholders with enough information to understand the nexus between risks, capabilities and opportunities (what the community could likely become)
  - Identify resilient providers
  - Identify mitigation, risk reduction and resilience enhancement solutions that advance a preferred vision of the community

#### **D. Evaluate and Contextualize Strategies; Reduce Risk to HWB**

The following steps are to be completed by the risk assessment team:

- Develop, refine and operationalize mitigation, risk reduction and resilience enhancement strategies and actions (include those expressed in round 3 of the community workshop)
- Provide information and assistance to community stakeholders on mitigation, risk reduction and resilience strategies and planning (amendments to the flood insurance maps and community rating system documents, including hazards mitigation plans, comprehensive land use plans, public works capital improvement plans, etc.)

#### **5.2.2 Proposed Risk MAP Products**

These products expand upon the current Risk MAP Discovery and Scoping reports. The Discovery report includes a list of capabilities and opportunities. The Scoping report includes

information on all risk (not just flood and earthquake), capability, strategies for resilience and a guide for incorporating risk assessment and information into local planning processes. The FIRMS could include 500 year flood risk.

### **1. Discovery Report**

- a. Descriptions of area
- b. List of needs to be addressed with Risk MAP projects
- c. List of past hazards
- d. List of areas of concern
- e. List of capabilities
- f. List of current and potential opportunities

### **2. Risk Report**

- a. Community Vision
- b. Information on risk to HWB
- c. Information on capability
- d. Information and strategies on mitigation, risk reduction and resilience
- e. Guide for incorporating risk assessment and information into local planning processes
  - i. Explain the need for inclusion of risk assessment and information into other community planning processes
  - ii. Provide examples of best practices
  - iii. List relevant resources

### **3. Flood Insurance Rate Maps (FIRMS)**

- a. The official map of a community on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community.

### 5.3 Limitations

The Workshop Model, which is the foundation for the ABAIRA Model, was only partially tested due to conducting just three community workshops. The Workshop Model was also mainly limited to focusing on: (1) refining the definitions of resilience and risk; (2) developing the community workshop model itself; and (3) improving community engagement. Thus it didn't address the Risk MAP process as a whole, nor did it "formally" address all of the problem areas that the ABAIRA Model addresses. These additional problem areas include: a holistic risk assessment process that focuses on what really matters to a community, most importantly their human well-being; incorporating community goals and plans into the risk assessment process; identifying assets beyond just built capital, by including natural and social capital; assessment of community capability; identification and assessment of mitigation, risk reduction and resilience opportunity; and incorporating risk assessment and information into other community planning processes. This limited the depth of testing as well as suggestions for improvement.

### 5.4 Further Research

There are a number of opportunities for moving this research forward. First, the ABAIRA Model could be compared to other risk assessment and management approaches to see what lessons could be learned. As an example see my master's capstone *Helping Communities Become More Resilient Through the Use of Asset-Based Risk Assessment for Transportation Systems*.<sup>140</sup> Second, the capability assessment and risk prioritization components could be further

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<sup>140</sup> Dixon, Maximilian. "Helping Communities Become More Resilient Through the Use of Asset-Based Risk Assessment for Transportation Systems." Master's capstone, University of Washington, 2014.

researched and refined. Third, the ABAIRA Model could be fully tested in at least one community to see what works, what doesn't and what could be improved. This could be done using a format similar to how the Workshop Model was tested. Fourth, the ABAIRA Model could be developed into a full risk management process. One way of doing this is by incorporating a measurement component similar to the DHS Risk Management Framework. This includes: developing risk reduction and resilience enhancement performance metrics; comparing results against established HWB baselines; and tracking progress against established community priorities.

## 6 Conclusion

The world is changing rapidly. Communities are facing greater and more complex risks, i.e. climate change, cyber vulnerabilities and terrorism. Infrastructure systems are becoming more complex and expensive to build and maintain. In 2013 the American Society of Civil Engineers (ASCE) gave US infrastructure a D grade. The tools, processes and approaches we use today to assess and manage risk are outdated and inadequate. In order for our nation to become resilient, our communities must become resilient by better managing risk.

With the increased emphasis by DHS and others on a whole community approach to risk assessment and resilience, there is huge potential for developing a more effect approach. One that focuses on helping communities adapt to ever changing risks, by: (1) redefining resilience; (2) assessing risk to what really matters to a community, most importantly their human well-being; (3) effectively engaging communities to obtain their buy-in and support; (4) incorporating community goals and plans; (5) identifying assets beyond just built capital, by including natural and social capital; (6) identifying and assessing community capability; (7) identifying and assessing community opportunity for mitigation, risk reduction and resilience enhancement; and (8) incorporating risk assessment and information into other community planning processes.

The Risk MAP process and products are great for traditional hazard mitigation planning. The Risk MAP process could and should however be much, much more. By incorporating the suggestions discussed in this analysis and switching to an asset-based appreciative risk assessment approach, FEMA's Risk MAP process could be improved to better help communities become resilient in the face of ever changing risks, which helps strengthen our nation's resilience.

Asset-based appreciative inquiry risk assessment is a leap in the right direction. It has the potential to significantly improve the way risk is mapped, assessed and planned for. This approach is community-driven and similarly to the ABCD approach, focuses on active participation and empowerment through community engagement. It also makes use of appreciative inquiry, which promotes positive change in communities by focusing on what is working well. Participants draw upon their memories of what they like about their community, especially in regard to human well-being. “Just as plants grow towards their energy source, so do communities and organizations move towards what gives them life and energy.”<sup>141</sup> Instead of focusing on the problems and what is vulnerable and internalizing these negative ideas, this approach creates and reinforces a positive shared meaning within the community that will enhance the community’s capacity to maintain and improve the well-being of all its stakeholders.<sup>142</sup> And thus become more resilient.

This change in emphasis can be illustrated through two very different approaches to reducing risk. A traditional approach to risk reduction would include a coastal flood prone community where all structures are built above the level of flooding. Here the community has focused on protecting built capital. A different approach is where a community adopts the necessary legal tools whereby the development rights of structures destroyed by flooding could be transferred to high ground development sites. This second community might have secured an acceptance for this approach by involving a wide range of community stakeholders. Resilience in this case focuses on natural capital (high ground), social capital (networks) and their ability to adapt to a changing coastline. Should sea level rise and storm severity increase, causing the

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<sup>141</sup> Mathie, Alison, and Gord Cunningham. *From Clients to Citizens: Asset-Based Community Development as a Strategy for Community Driven Development*. Antigonish, Nova Scotia, Canada: Coady International Institute, 2002. 7.

<sup>142</sup> Ibid. 7.

shoreline to retreat, our second community may be the more resilient. Especially if the government and property owners in our first example were heavily indebted and had exhausted their financial resources in paying the costs of elevation and had few reserves to rebuild. Thus the resilient community would have protected their quality of life (human well-being), allowing them to continue to live and function as a community.

On a final note, integrating risk reduction into community planning is also vital for making communities more resilient. There are a number of ways to do this. One way to combine them is to include asset-based appreciative inquiry risk assessment throughout the planning process. This allows for the consideration of risk in all community planning, which helps communities tap into their potential for reducing risk. Community workshops encourage community stakeholders to identify needs and potential solutions, and can reinforce stakeholder relationships, institutional frameworks and partnerships to address risk reduction and resilience in a holistic manner. Other potential benefits include assessing how development contributes to human well-being (especially regarding vulnerable populations within the community), developing good information on risk, and communicating risk information widely.<sup>143</sup>

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<sup>143</sup> Valdes, Helena Molin, and Patricia Holly Purcell. "Guidance on Resilience in Urban Planning", *International Journal of Disaster Resilience in the Built Environment* 4, no. 1 (2013): 1. 1.

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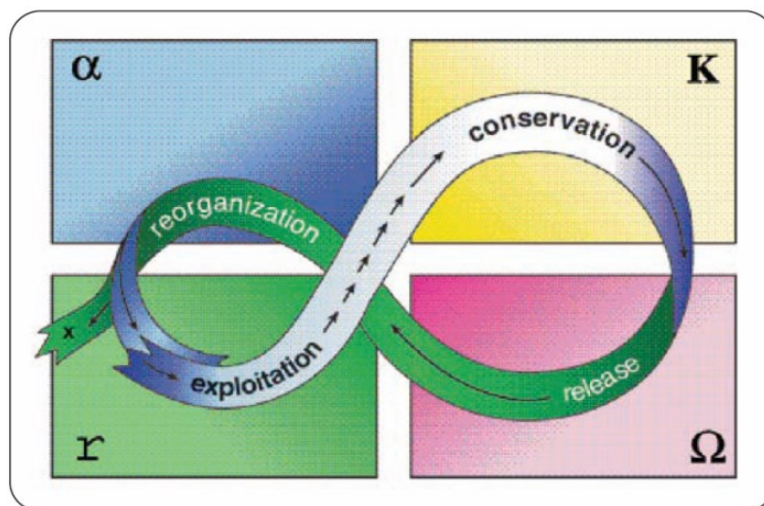
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## 7 Appendices

### 7.1 Appendix A. Panarchy

The Panarchy model is a concept that explains the evolving nature of complex adaptive systems. It is the hierarchical structure in which natural (i.e. forests, wetlands, lakes etc.) and human systems (i.e. structures of governance, settlements, and cultures) are interlinked in never-ending adaptive cycles of growth, accumulation, restructuring, and renewal. “These transformational cycles take place in nested sets at scales ranging from a leaf to the biosphere over periods from days to geologic epochs, and from the scales of a family to a sociopolitical region over periods from years to centuries.”<sup>144</sup> By trying to understand these cycles and their scales, we should be able to evaluate their contribution to community resilience and to identify the points at which a system is capable of accepting positive change and the points where it is vulnerable.<sup>145</sup>

**Figure 11. Panarchy Model** <sup>146</sup>



<sup>144</sup> Holling, C. S. “Understanding the Complexity of Economic, Ecological, and Social Systems.” *Ecosystems* 4, no. 5 (2001): 390–405. 392.

<sup>145</sup> Ibid. 392.

<sup>146</sup> Ibid. 392.

Social-ecological systems cycle through four phases: rapid growth ( $r$ ), conservation of resources ( $K$ ), release of resources ( $\Omega$ ), and reorganization ( $\alpha$ ). This is called the adaptive cycle. It describes how systems change over time. An example is forest fire regimes. They begin with the rapid growth of colonizing plants ( $r$ ), move to conservation of nutrient resources and maintenance of structure in mature forests ( $K$ ), then release nutrient resources through fire ( $\Omega$ ), and finally go through forest renewal via the soil seed bank ( $\alpha$ ).<sup>147</sup>

The adaptive cycle has two major transitions. The first phase, from exploitation to conservation, or  $r$  to  $K$ , involves growth and stability. It is the slow accumulation and transformation of resources, which is quite slow. The second phase, from release to reorganization, or  $\Omega$  to  $\alpha$ , which is shorter and often quite rapid, involves change and variety. It is there organization that creates opportunities for innovation and renewal.<sup>148</sup>

During the first phase from exploitation to conservation, connectedness and stability increase and natural, built, and human-social capital is accumulated. For example, in a forest, nutrients and biomass resources become more and more tightly bound within the dominant vegetation, preventing other competitors from utilizing them. The potential for other uses of the natural capital is high, but it is controlled by the dominant species and current processes of the forest. The system becomes rigid and thus is vulnerable to drivers of change, such as wind, fire, disease, insect outbreak, and drought. The capital accumulated and sequestered in the vegetation and soil are then suddenly released and the tight control is lost.<sup>149</sup>

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<sup>147</sup> Resilience Alliance. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0.* Resilience Alliance, 2010. 7.

<sup>148</sup> Holling, C. S. "Understanding the Complexity of Economic, Ecological, and Social Systems." *Ecosystems* 4, no. 5 (2001): 390–405. 393-6.

<sup>149</sup> *Ibid.* 393-6.

Other examples involve human-social capital. Corporations such as IBM, AT&T, or General Motors become rigid to the point of crisis and then have to restructure. The Soviet Union suffered a sudden collapse for similar reasons. In these cases agents of change were stakeholder revolts, public-interest attacks through the legal system, or more extreme societal revolts.<sup>150</sup>

In summary, there are four key elements that characterize an adaptive cycle:

1. Capital increases incrementally in conjunction with increased efficiency, which leads to increased rigidity. This is the phase from  $r$  to  $K$  in Figure 11.
2. As capital increases, slow changes gradually expose an increasing vulnerability (decreased resilience) to drivers of change, such as fire, insect outbreak, competitors, or opposition groups. This leads to release, which moves abruptly into a back loop from  $K$  to  $\Omega$ .
3. When uncertainty is high, potential is great, and controls are weak, innovation tends to flourish, so that new and unexpected combinations can form. This is the phase of reorganization ( $\Omega$  to  $a$ ).
4. Those innovations are then tested ( $a$  to  $r$ ). Many fail, but some survive and adapt. This leads the cycle back to the phase of growth from  $r$  to  $K$ .<sup>151</sup>

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<sup>150</sup> Holling, C. S. "Understanding the Complexity of Economic, Ecological, and Social Systems." *Ecosystems* 4, no. 5 (2001): 390–405. 393-6.

<sup>151</sup> *Ibid.* 393-6.

Figure 12. Panarchy Model with Nested Cycles <sup>152</sup>

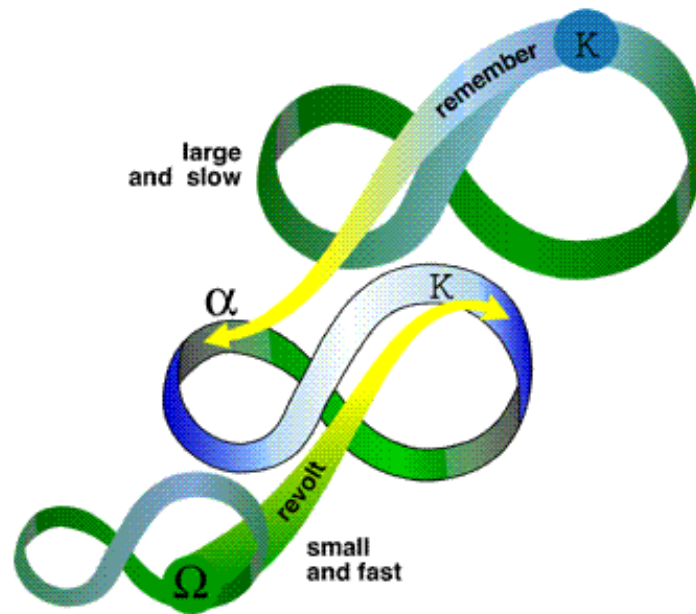


Figure 12 introduces three important concepts to the adaptive cycle. The first is nested sets of adaptive cycles (which turn it into the Panarchy model). The larger cycle is slower and typically acts to stabilize the smaller faster cycles, thus maintaining system integrity (for a time at least). These fast nested cycles can allow for inventing, experimenting and testing within the slower more stable cycles, thus improving long-term resilience. This is done through the second important concept, revolt, which occurs when fast, small events overwhelm large, slow ones. Revolt however can also lead to weakening long-term community resilience (i.e. hotels come in right after a tsunami and buy up land on the beach which was previously village housing). The third is remembering. This occurs when the potential accumulated and stored in the larger, slow

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<sup>152</sup> Holling, C. S. "Understanding the Complexity of Economic, Ecological, and Social Systems." *Ecosystems* 4, no. 5 (2001): 390–405. 396.

levels, influence reorganization (i.e. beneficial capital that survived the disaster). The interaction between cycles combines creative learning with conserving and continuity.<sup>153</sup>

There are three important factors that influence the adaptive cycle and the future state of systems:

- i. The inherent potential or “capital” of a system that is available for change. This determines the range of what alternative options are possible for the future.
- ii. The internal controllability or connectedness of a system, which measures how flexible or rigid such controls are over variables and processes. This determines the degree to which a system can control its own destiny, especially against the whims of external variables.
- iii. The adaptive capacity or “resilience” of a system. This determines how vulnerable a system is to unexpected or unpredictable changes.

These three factors—inherent potential (capital), controllability, and adaptive capacity (resilience)—apply to all scales, whether at the cell or an ecosystem, the individual or a community. In regard to community development and ecosystem management, they are the factors that shape the responses of ecosystems, agencies, and people to crises.<sup>154</sup>

*“This process [the adaptive cycle] can serve to clarify the meaning of ‘sustainable development’. Sustainability is the capacity to create, test, and maintain adaptive capability. Development is the process of creating, testing, and maintaining opportunity. The phrase that combines the two, ‘sustainable development,’ therefore refers to the goal of fostering adaptive capabilities while simultaneously creating opportunities. It is therefore not an oxymoron but a term that describes a logical partnership.”<sup>155</sup>*

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<sup>153</sup> Holling, C. S. “Understanding the Complexity of Economic, Ecological, and Social Systems.” *Ecosystems* 4, no. 5 (2001): 390–405. 398.

<sup>154</sup> *Ibid.* 393–4.

<sup>155</sup> *Ibid.* 399.

## 7.2 Appendix B. The Rockefeller City Resilience Framework

This approach, “moves away from traditional disaster risk management, which is founded on risk assessments that relate to specific hazards. Instead, it accepts the possibility that a wide range of disruptive events – both stresses and shocks – may occur but are not necessarily predictable. Resilience focuses on enhancing the performance of a system in the face of multiple hazards, rather than preventing or mitigating the loss of assets due to specific events.”<sup>156</sup>

In this framework there are 12 indicators, which fall into the following four categories: “the health and wellbeing of individuals (people); urban systems and services (place); economy and society (organization); and, finally, leadership and strategy (knowledge).”<sup>157</sup> These indicators are performance indicators. “They describe the outcome of actions to build resilience, not the actions themselves. This acknowledges that resilience results from individual and collective action at various levels, delivered by multiple stakeholders ranging from households to municipal government.”<sup>158</sup>

### Qualities of Resilient Systems<sup>159</sup>

#### Reflective

They have mechanisms to continuously evolve, and will modify standards or norms based on emerging evidence, rather than seeking permanent solutions based on the status quo.

#### Robust

Robust systems include well-conceived, constructed and managed physical assets, so that they can withstand the impacts of hazard events without significant damage or loss of function.

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<sup>156</sup> Arup. *City Resilience Framework: Resilience Index*. The Rockefeller Foundation, 2014. 3.

<sup>157</sup> Ibid. 8.

<sup>158</sup> Ibid. 8.

<sup>159</sup> Ibid. 5.

## Redundant

Redundancy refers to spare capacity purposely created within systems so that they can accommodate disruption, extreme pressures or surges in demand. It includes diversity: the presence of multiple ways to achieve a given need or fulfil a particular function.

## Flexible

Flexibility implies that systems can change, evolve and adapt in response to changing circumstances. This may favor decentralized and modular approaches to infrastructure or ecosystem management.

## Resourceful

Resourcefulness implies that people and institutions are able to rapidly find different ways to achieve their goals or meet their needs during a shock or when under stress.

## Inclusive

Inclusion emphasizes the need for broad consultation and engagement of communities, including the most vulnerable groups. Addressing the shocks or stresses faced by one sector, location, or community in isolation of others is an anathema to the notion of resilience. An inclusive approach contributes to a sense of shared ownership or a joint vision to build city resilience.

## Integrated

Integration and alignment between city systems promotes consistency in decision-making and ensures that all investments are mutually supportive to a common outcome. Integration is evident within and between resilient systems, and across different scales of their operation.

## Indicators of Resilient Systems <sup>160</sup>

### 1. Minimal human vulnerability

This relates to the extent to which everyone's basic needs are met.

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<sup>160</sup> Arup. *City Resilience Framework: Resilience Index*. The Rockefeller Foundation, 2014. 8.

## 2. Diverse livelihoods and employment

This is facilitated by access to finance, ability to accrue savings, skills training, business support, and social welfare.

## 3. Adequate safeguards to human life and health

This relies on integrated health facilities and services, and responsive emergency services.

## 4. Collective identity and mutual support

This is observed as active community engagement, strong social networks and social integration.

## 5. Social stability and security

This includes law enforcement, crime prevention, justice, and emergency management.

## 6. Availability of financial resources and contingency funds

This is observed in sound management of city finances, diverse revenue streams, and the ability to attract business investment, allocate capital, and build emergency funds.

## 7. Reduced physical exposure and vulnerability

This relies on environmental stewardship, appropriate infrastructure, effective land use planning and enforcement of planning regulations.

## 8. Continuity of critical services

This results from diversity of provision, redundancy, active management and maintenance of ecosystems and infrastructure, and contingency planning.

## 9. Reliable communications and mobility

This is enabled by diverse and affordable multi-modal transport systems and information and communication technology (ICT) networks, and contingency planning.

## 10. Effective leadership and management

This relates to government, business and civil society and is recognizable in trusted individuals, multi-stakeholder consultation, and evidence-based decision-making.

## 11. Empowered stakeholders

This is underpinned by education for all, and relies on access to up-to-date information and knowledge to enable people and organizations to take appropriate action.

## 12. Integrated development planning

This is indicated by the presence of a vision, an integrated development strategy, and plans that are regularly reviewed and updated by cross-departmental groups.



## 7.4 Appendix D. Community Workshop Agenda

- Have participants sign in and create a name tag
- Arrange participants into three tables of 5-7 members each:
  - Basic Material for a Good Life
  - Health
  - Security
  - Good Social Relations
- Welcome: by community official (5 minutes)
- Introductions/statement of purpose/community overview: (15 minutes)
- Round 1 Introduction: (5 minutes)
  - Explain Goods and Services and Providers
  - Describe tools: Risk Assessment Sheet and Map
  - Describe Round 1
- Round 1: (40 minutes total)
  - **Each table conducts an ice breaker where everyone says their name and why they are there (5 minutes).**
  - **Each table will select a team leader who will summarize and present at the end of team discussions**
  - 1. Facilitator asks: **Think about what defines your community? What goods and services and providers of these contribute to your quality of life? (25 minutes)**
    - Give examples of goods and services
    - Record goods and services in column 1.
    - Record providers in column 2.
      - Feel free to draw lines connecting goods and services to providers.
    - Have the team leader place dots next to what they will talk about.

- 2. **Team leader from each table will summarize and present. (10 minutes)**
  
- Break: (10 minutes)
  - **Facilitator highlights the providers using the appropriate colors. (10 minutes)**
    - a. **Built by Humans = Leave As Is**
    - b. **Built by Nature = Highlight in Green**
    - c. **Social Networks = Highlight in Purple**
    - d. **Control is Outside of Community = Red Check**
  
- Introduce the scenario (hazard and impacts): (5 minutes)
  - Redmond – Seattle Fault EQ (7.2)
  - Everett – South Whidbey Island Fault EQ (7.4)
  - Neah Bay – Cascadia Subduction Zone EQ (9.0) and Tsunami
  
- Round 2 Introduction: (3 minutes)
  
- Round 2: (25 minutes total)
  1. Facilitator will ask: **Immediately following the earthquake -- What / Who provides the goods and services you listed in round 1? (15 minutes)**
    - Record providers in column 3.
    - Have the team leader place dots next to what they will talk about.
  
  2. **Team leader from each table will summarize and present. (10 minutes)**
  
- Stretch Break: (10 minutes)
  - **Facilitator highlights the providers using the appropriate colors. (10 minutes)**
    - a. **Built by Humans = Leave As Is**
    - b. **Built by Nature = Highlight in Green**
    - c. **Social Networks = Highlight in Purple**
  
- Round 3 Introduction: (5 minutes)
  
- Round 3: (55 minutes total)
  1. Facilitator will ask: **Following a Disaster – For each of the goods and services that are needed for quality of life from column 1, identify the providers from**

**columns 2 and 3 that would do ALL of the following: (a) best help the community recover 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. (15 minutes)**

- Record in column 4.
- If you think of any providers that do not yet exist, list them in column 5, the "Parking Lot".

**2. Break into World Café where each team rotates clockwise (except for the team leader) every 10 minutes until all teams have participated at all tables (20 minutes)**

- Have the team leader place dots next to what they will talk about.

**3. Team leader from each table will summarize and present. (10 minutes)**

- Evaluations: Pass them out

## 7.5 Appendix E. Community Workshop Evaluation Form

Name: \_\_\_\_\_

Exercise Evaluation						
Check 1 - 5	No		Undecided		Yes	Comments
	1	2	3	4	5	
1	Were directions easy to follow?					
2	Did you see value in the exercise?					
3	Were the right participants involved?					
4	Was the play worth your time?					
5	Any suggestions?					

7.6 Appendix F. Summary of Community Workshop Model Results <sup>161</sup>

Item	Redmond	Everett	Neah Bay
<b>Reliance on Institutions for basic materials vital for HWB</b>	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 upon the traditional providers (built capital) and take the opportunity to go back to traditional ways of living with the land; including hunting and gathering, and traditional ways of education;
<b>Reliance on family, friends and neighbors</b>	post-disruption, would rely upon immediate neighbors, family and friends, neighborhood-based organizations, the less formal networks that support them, and decentralized infrastructure;		the community has a tighter and better organized informal social structure that allow for communication, improvisation and flexibility;
<b>Reliance on social networks</b>	post-disruption, would rely very little upon traditional providers (built capital) and overwhelmingly upon social networks (social capital) for goods and services;		post-disruption, would rely more upon social networks (social capital) for goods and services and very little upon traditional providers (built capital);
<b>Multifunctional facilities</b>	the multifunctional adaptability of some institutional facilities enhanced their importance post-disruption;		the tribe already moved some of their critical multifunctional facilities above the tsunami inundation zone and have plans to move other critical buildings and services in coming years;
<b>Change in institutional roles</b>	institutions 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.;		there was Implicit concurrence but changes in institutional roles was not mentioned directly;

<sup>161</sup> Institute for Hazards Mitigation Planning and Research, University of Washington. *Whole Community Resilience: An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption - Final Report*. Federal Emergency Management Agency, 2014. 33.

<b>Redundancy / Relocation of services</b>	a clear need 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 areas;	distributed system redundancy by locating goods and services in more accessible areas post-event, and increased self-sufficiency and diversification of facilities and services through the creation or strengthening of neighborhood centers outside of high risk areas;	already relocated some of their critical buildings and services above the tsunami inundation zone and have plans to move other critical buildings and services in coming years;
<b>Alternative routes</b>	need safer alternate transportation routes that increase connections between the hilly areas;	need for safe alternative routes and links to surrounding areas to mitigate post-distruption isolation and consequently longer recovery times;	need safer alternate transportation routes, due to having only one way in and one way out; e.g. improving existing logging roads;
<b>Walkability</b>	neighborhood centers should be walkable from most residences, via trails and walkways that improve accessibility;	neighborhood centers should be walkable from most residences;	community does regular tsunami drills, thus a need for walkable access;
<b>Need for community nodes / centers</b>	new neighborhood centers should include branch municipal services, healthcare and emergency medical facilities, food and water sources such as community gardens, shopping for daily necessities; places for both programmed and spontaneous gatherings; and multi-functional space to accommodate the different programmatic ideas	neighborhood centers should include branch municipal services, healthcare and emergency medical facilities, food and water sources such as community gardens, shopping for daily necessities, places for both programmed and spontaneous gatherings, and community caches of emergency supplies, such as medicine, food and water;	central facilities outside the tsunami inundation zone would contain community caches of emergency supplies such as medicine, food and water;

	that participants listed; e.g. ham radio station, community bulletin boards, kitchens and pantries;		
<b>Reliance on Natural Capital</b>	community gardens could provide some food temporarily;		would survive by relying on available natural capital for basic materials; e.g. fish and shellfish for food, streams for water, forests and available flat land for shelter;
<b>Points of contact</b>	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.
<b>Anomalies</b>	<ul style="list-style-type: none"> <li>• No specific government team in Redmond.</li> <li>• Participates mentioned that social capital was not necessarily neighborhood based. Social networks extended outside the city and county.</li> </ul>	<ul style="list-style-type: none"> <li>• The local government table maintained that most goods and services would continue to come from government.</li> <li>• need for more resilient transportation systems (new bridges, wider and broader streets etc.)</li> <li>• there was an emphasis on personal preparedness through better training and communication, home generation of electricity and home</li> </ul>	<p>The Makah Tribe felt more resilient due to the following conditions:</p> <ul style="list-style-type: none"> <li>• Tighter and better organized informal social structure that makes them less reliant upon formal planning;</li> <li>• An abundance of natural capital along with knowledge of how to exploit this resource;</li> <li>• Better prepared due to being much more aware of the risks that the change event pose to their community;</li> <li>• Members generally keep their fridges and pantries well stocked because of</li> </ul>

		<p>storage of water;</p> <ul style="list-style-type: none"> <li>• disaster information and preparedness training should be disseminated within neighborhoods and implemented in k-12 school curriculum, with the help of increased translation capability;</li> <li>• the Incident Command Structure should be brought to the neighborhood level;</li> <li>• a standard disaster language and vocabulary should be developed;</li> <li>• neighborhood centers would also include decentralized energy districts.</li> </ul>	<p>their remoteness;</p> <ul style="list-style-type: none"> <li>• All homes have a secondary heat source- wood stove or propane;</li> <li>• Community does regular tsunami drills;</li> <li>• The change event is seen as an opportunity to go back to traditional ways of living with the land and education, rather than a catastrophe causing displacement, and;</li> <li>• Because of the above mentioned, the Makah would survive, as they have in this area for thousands of years.</li> </ul>
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**7.7 Appendix G. Draft Article Submission to JAPA**

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

Submission to “Building Back Better,” *JAPA* Special Issue on Disaster Planning

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April 22, 2014

## **Abstract**

Conventional hazard mitigation and disaster planning processes typically begin with descriptive hazard scenarios illustrating a probable event, and including a vulnerability analysis centered on the built environment. Accordingly, they end with preparations for and responses to disruptive events, which typically focus on elements driving the scenario and on vulnerability analyses such as the “hardening” of built-environmental assets or their removal outside threatened areas altogether. These often ignore or understate the importance of natural and social sources of adaptive capacity. “Building back better” is typically interpreted as just “building,” and large gaps exist between hazard mitigation plans and general land-use and comprehensive plans. This paper describes three “proof-of-principle” experiments designed to Strengthen the Federal Emergency Management Agency (FEMA)’s RiskMap process in Washington State, so that hazard mitigation is more readily integrated with other forms of planning. Community workshop-type resilience assessment exercises began with stakeholders identifying a broad range of built, natural and social assets that contribute to human well-being (HWB) in the community, before introducing predictive earthquake scenarios to determine impacts to HWB. Participants then identified existing or new assets that would be most effective in enabling adaptation to changed circumstances (a “new normal”). Participants from three different communities discussed how the development of these assets would both achieve comprehensive community planning goals as well as hazard mitigation. Neighborhood-scale socio-spatial organization emerged as an important priority. Our work, while preliminary, suggests that asset-based approaches enable communities to better prepare for and adapt to post-disaster “new normal” scenarios that can arise from shifting ecological, economic and social conditions.

**Key words:** Resilience, Risk Assessment, Disaster Recovery, Scenario Planning, Hazard Mitigation, Social Capital.

### **Introduction: The Problem**

“We need stronger neighborhoods, increased walkability, greater sense of place, mixed land uses, closer neighbor and family ties and trust”– these were some of the conclusions from a recent series of community tabletop exercises held in the Washington State cities of Redmond, Everett and Neah Bay. These outcomes would be expected if the exercise focused on Smart Growth, but here community stakeholders were addressing earthquake risks. Individuals did mention a need for the usual earthquake mitigation measures such as retrofitting or strengthening key structures and infrastructures, developing redundant energy sources and improving general emergency response capacity, but those did not drive the concluding discussions. Rather, a new approach to discussing earthquake risks that began with an inventory of community assets – built, natural and social “capital” – instead of emphasizing vulnerabilities, prompted this different response from stakeholders largely familiar with emergency preparedness. The experience holds promising lessons for efforts to better integrate disaster planning with general land use and community planning for everyday betterment and well-being in a broad sense – a goal that has proven both alluring and elusive to disaster planners in recent years (Pearce, 2003; Wamsler, 2006).

Conventional disaster and hazard mitigation planning views the mitigation-preparation-response-recovery sequence in linear terms, dependent on an ability to predict events and their

impacts, largely in order to preserve or restore pre-event conditions (Beatley, 2009, pp. 6-8). Such planning is typically driven by a vulnerability analysis. The direct association of vulnerability reduction with resilience underlies the FEMA National Mitigation Framework. In the Framework FEMA suggests that long-term vulnerability reduction is achievable when communities and businesses “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”(National Mitigation Framework 2013, p. 24).

Recent efforts to incorporate sustainability into the goals of community disaster recovery recognize that restoration of the *status quo ante* is practically impossible and often socio-ecologically undesirable (Paton & Johnston, 2006, pp. 7-8; Smith & Wenger, 2007). “Hazards” are more constructively viewed as uninvited by potentially 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,” where “better” is defined according to community cultural and social values and principles of sustainability (Chan et al., 2012; Millennium Ecosystem Assessment [Program], 2005). Adaptive capacity may be revealed only 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).

Some progress has been made towards integrating hazard mitigation into other types of planning through the mandating of mitigation elements in comprehensive plans, and through incorporation of best practices and techniques of mitigation in zoning codes, subdivision codes

and other instruments (FEMA, 2013; Schwab, 2010). However, there is still a need to enable greater stakeholder participation in creative discussions around even better mitigation practices, and to relate such practices to communities' overall development policies and unique environmental and socio-economic conditions, especially given the ever-changing nature of the hazards themselves.

The applicability of more adaptive approaches is relatively well established for situations of gradual change, or for extreme but more predictable and spatially limited hazards such as flooding (Alberti, 2008; Burkett, 2012, p. 23ff; Freitag, Bolton, Westerlund, & Clark, 2009). In contrast, events such as earthquakes and their associated hazards present unique challenges to planned adaptation; they are diffuse in their impacts, relatively rare, and have exceptionally short warning time frames and extremely high consequences (Burby, 1998, p. 150). Communities continue to have great difficulty incorporating predictive scenarios of this kind of risk into an adaptive planning process in advance of an event (Lee, Preston, & Green, 2012), especially when the process begins with a scenario of destruction and an effort to identify vulnerabilities (Orchiston, 2011). In such a setting, community members are prone to find the exercise discouraging in general and to focus only on their immediate response to the emergency, defining its effects primarily in terms of impact on the physical environment. Emergency managers frequently have difficulty achieving broad and extensive participation of community stakeholders in these exercises, as well as in coordinating mitigation strategies with the community's general policies and plans for development. The conventional focus on the community's physical, built assets exacerbates this challenge, particularly when it ignores non-material social and cultural capital and values, and related ecosystem services (Aldrich, 2012; Stokols, Lejano, & Hipp, 2013).

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

This paper presents substantive findings from an abbreviated set of predictive scenario planning exercises, in which the main goal was to highlight the specifics of local assets that could promote Human Well-Being (HWB) and adaptive capacities. The approach de-emphasizes the specifics of the risk scenario itself. Instead, it prompts stakeholders to link or compare comprehensive planning goals on the one hand, and existing potential mitigation and adaptation strategies on the other. The approach differs even from other asset-based methods that focus on asset protection rather than on adaptive capacity (e.g. Siembieda, 2010). The Federal Emergency Management Agency (FEMA) provided funding for these exercises as part of a project to explore new ways to increase community participation in the FEMA RiskMap discovery process, and to better integrate RiskMap into communities' on-going land use planning. Specifically, FEMA sought to introduce the risk reduction conversation earlier in the process and motivate people to see it as part of their daily lives.

Unlike most risk assessment efforts, our protocol does not begin with presentations of exposure and vulnerability. Rather, our approach first asks 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.

In some ways our approach can be compared 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 approach begins by describing a hazard scenario in detail first, and seeks primarily to identify vulnerabilities as well as strengths, 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. Instead of cataloging dysfunctions or vulnerabilities, we ask questions that then 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 model (AI) (Emery & Flora, 2012). Our application of AI principles is with the recognition that, in the words of Cooperrider:

“we are still in our infancy in understanding non-deficit, strength-based or life-centric approaches to change. William James called for it back in 1902, in *Varieties of Religious Experience*, when he said we know a lot about the kind of change that happens when people feel threatened, feel fear and violence is coming at them, but we don’t know much about the kind of change that happens when, in his words, ‘everything is hot and alive within us and everything reconfigures itself around it’ (Cooperrider, 2012).

This project was specifically designed to explore what happens when the focus is on things “hot and alive” – how this more positive emphasis and sequence of discussion can prompt ideas for disaster response that are more adaptive than is usually the case in hazard mitigation planning exercises.

We are also interested in how a broader, more balanced and integrative consideration of different types of assets – i.e. 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; for example, Green and Haines (2012) categorize community assets as physical, human, social, financial, environmental, political, and cultural capital. We draw our simpler classification from the *Millennium Ecosystem Assessment* literature (Millennium Ecosystem Assessment [Program], 2005) and particularly from Mulder et al. (2006), leaving out human capital (“personal growth and development”), and define the remaining three 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. Most assets can be associated with more than one type of capital depending on its actual use. A park, for example, might normally be considered a source of natural ecosystem services, but if it is substantially engineered for a special physical purpose (as in a baseball field), it might be considered “built”; or, if it functions primarily as a gathering place or festival venue (as in a farmers market), it might be considered “social.” The classification mainly allows us to see how the quality of life provided by one type of asset or capital under current conditions 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 in discussion.

The project is based on workshop exercises 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 hazard mitigation planning. The project was framed as action research, intended to assist the communities with on-going planning, as well as yield useful findings for broader FEMA policy and academic understanding. Officials advertised the workshops to their existing networks of stakeholders in hazard mitigation planning. Participants were therefore not any more representative of the entire community than these stakeholder networks already were, especially in the larger and more diverse cities of Redmond and Everett. The objective of the workshops was to test the new format for discussion among people who are already familiar with emergency and disaster planning. This, of course, limited the perspectives and probable 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 hazard mitigation planning.

In all three participating communities, comprehensive and other overall planning documents lacked explicit discussion of hazard mitigation elements. We recognized that comprehensive plans attempt to express a consensus and often avoid controversial measures. In this exercise, we expected to find some 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.<sup>i</sup>

The community meetings were held in Redmond in September 2013, Everett in October 2013, and 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. Responses were recorded on a prepared template (Figure 1). Community maps were provided for spatial reference, and participants were encouraged 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 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*.

In order to focus the discussion, participants were divided into groups that corresponded to Millennium Ecosystem Assessment (MA) categories of goods and services for HWB,<sup>ii</sup> including: *basic material for a good life; health; security; and good social relations* (Millennium Ecosystem Assessment [Program], 2005)<sup>iii</sup>. A facilitator from the project team was assigned to prompt each group for ideas focused on the group's assigned MA category of goods and services.

Round One ("pre-disruption") began with a brief presentation of the community's overall socio-economic and spatial profile, including information gathered primarily from comprehensive planning and mitigation plan documents. Community profiles were presented in HWB categories to prepare participants for group discussion within these HWB subject areas. 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 essential material things or activities like "water," "exercise" and "medicine"; non-material things like "information" and "cultural expression"; and combinations of material and non-material things like "refugee services" and "social gathering over food." Sources and providers were specific to the community or its surroundings and could be located on a map, though 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/providers, and placed a red check alongside the sources/providers that were completely outside of community control. Facilitators also highlighted each source/provider as essentially a form of either "built," "natural" or "social" capital, depending on the purpose mentioned by the participants. Then each group assigned a spokesperson to present highlights to the room.

Round Two (immediately post-disruption) began with the introduction of a hazard/change agent. In our cases, an earthquake scenario highlighting the maximum probable event was used as the change agent, although the particular earthquake event modeled 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 and Everett, the impacts were modeled using HAZUS simulation software using local data and largely drawn from preexisting Hazard Mitigation Plans.

The simulation was presented broadly, describing general types of impact experienced by different neighborhoods across the city based on their building stock, infrastructure service, accessibility, and soil conditions given magnitude of shaking. The presentation does not describe site-specific impacts, except for the probabilities of disruption to key facilities such as highways, hospitals and fire and police stations. Participants then discuss how, during the week or so following the earthquake, they would obtain (i.e. through what sources and providers) the goods and services they identified during Round One. Participants could add to the initial lists of goods/services and sources/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 generalized publicly vetted community goals and objectives, as laid out in the comprehensive plan, hazard mitigation plan and/or 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 that might occur to them based on the previous rounds of discussion, but the facilitator took care not

to suggest specific measures and plan recommendations. Participants then reviewed the sources and providers of quality of life that they 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/providers that would increase community resilience but could be implemented as part of a non-recovery evolutionary 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 itself.

### **Relevant Characteristics of the Project Communities and their Participants**

Certain characteristics of the three communities that participated in the project so far provide important background for interpretation of the workshop results.

Redmond is a suburb of Seattle that has grown quickly from a small agricultural railroad town to a polycentric incubator for high-tech industry. While the campuses for such firms as Microsoft and Nintendo have significant physical footprints, we expected the community overall

to be more reliant on the “social capital” of software and social media networks that reach beyond the built environment of Redmond, than on the “built capital” of physical infrastructure. Microsoft in particular has a sophisticated comprehensive system for maintaining operations globally given the threat of disruption at its headquarters in Redmond or at other important centers.

Redmond’s residential population is smaller than its employee population, and residents are on average young, well-educated recent arrivals in the city, many of them immigrants from Asia. The city’s 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, as well as an extensive park and trail system. On the more seismically stable surrounding hills, single-family housing predominates in single-use residential neighborhoods, with some large office parks and industry (the Microsoft campus is on one of the hills). For the most part the upland residential areas have no 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 hazard mitigation plan notes that these communities may be isolated following an earthquake.

The Redmond workshop exercise 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, and a number of Community Policing Advisory Board members, Community Emergency Response Team (CERT) trainees and resident members of the general public. The event that we modeled consisted of a magnitude 7.2 Seattle crustal fault earthquake, which included greatest damage from shaking to the Overlake neighborhood,

home to Microsoft's main campus as well as strip-type automobile-oriented commercial areas. It also included damage from shaking as well as liquefaction that 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 full north-south length of the U.S. West 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 refugees and other recently arrived immigrants. The city's pre-war central business district and older residential 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 which includes extensive naval facilities. Newer post-war strip development predominates 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 primarily single-use 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 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 hazard 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 non-profit 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, fire, housing authority, transit and 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, we modeled an event entailing a 7.4-magnitude earthquake on the South Whidbey Island crustal fault. This included greatest damage from shaking in the area of the 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 in the city center would experience widespread damage.

Based on participant feedback and more extensive follow-up meetings with the community hosts for Everett (who had observed the first exercise in Redmond), we made some modifications to the exercise protocol for the Everett exercise. We clarified our instructions, and reduced the time we spent describing the community profiles, the disruption scenario, and existing comprehensive plan and hazard mitigation plan provisions. This allowed more time for discussion in Everett and, later, in Neah Bay.

Neah Bay is a small 865-resident (2010 census) coastal community located on Makah Tribal lands on the Olympic Peninsula. Home to one of the largest tribal marine fisheries in the

U.S., and with its forest resources and emerging eco-tourism industry, it exemplifies a community that relies heavily on “natural capital.”

Located at the most northwesterly tip of the 48 contiguous United States, Neah Bay is an isolated community. There is only one two-lane road connecting the town with surrounding communities, and the road 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, an 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 near 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. 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 hazard 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 which required the exercise play to be shortened by ½ hour, and the smaller number of Neah Bay participants allowed for only two HWB teams of 5 – 6 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.

## **Exercise Results**

A number of clear themes emerged from participant discussions in the three exercises (refer to Figure 3).

The first three themes below characterized the Rounds One and Two discussions (pre- and immediate-post-disruption sourcing of quality of life, respectively):

1. Institutional (governmental or large-scale commercial) sources/providers of HWB in normal circumstances would be less reliable in the immediate aftermath of the simulated earthquake. Regardless of which theme served as the focus for their discussion group (i.e. basic materials, security, health or social relations), participants listed many institutional sources/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 focused on listing 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 assumed that most businesses would be unreliable or run out of supplies in the immediate aftermath of an earthquake. However, in contrast to the urban communities of Redmond and Everett, participants in Neah Bay felt comfortable that 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. The multifunctional adaptability of some institutional facilities enhanced their importance 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: e.g. churches/mosques/temples and schools for shelter and food distribution; trails for movement when roads are broken; parks for shelter (camping) and refuge/assembly; arenas for shelter, assembly and information.
3. Decentralized technology and infrastructure systems were seen as useful mainly as part of a localized communitarian response, though participants in Redmond felt this response could extend beyond the immediate community through social media networks. Participants in Neah Bay felt that the informal structure of their community networks made them more

resilient and less reliant on formal planning. In particular, they spoke of the sharing of housing and food as a reliable cross-community asset for survival in the immediate aftermath of the disruption. Participants in all workshops discussed alternatives to large centralized systems, but primarily in the context of reliance on neighbors and social networks rather than through an individualistic “prepper” response.

For the Round Three discussion on how to increase adaptive capacity in anticipation of a “new normal,” the themes listed above emerged in the following ways:

4. There was clear consensus that the creation or strengthening of neighborhood centers would be one of the most effective means of putting residents in a better position should an earthquake occur. Neighborhood centers should be walkable from most residences, and include branch municipal services, healthcare and emergency medical facilities, grocery and other shopping for daily necessities, and places for both programmed and spontaneous gatherings. If necessary, 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 MA categories of HWB), as well as in the mixed-category discussions generated by the World Café-style rotation among tables.<sup>iv</sup> At the time of the Neah Bay exercise, the community had already begun considering 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 considerable discussion about how to strengthen these neighborhoods’ self-sufficiency.

5. There was also a broad consensus that programming of space and activities on a neighborhood scale should have the goal of building trust and increasing communication among neighbors. Specific programmatic ideas varied among the three exercises and the various table groups, but ideas that came up in multiple settings 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. While natural capital received little attention as a source of goods and services in the urban communities, residents of Redmond and Everett saw parks and habitat restoration areas as potential sources of water and even food (wildlife) during an emergency. Participants recognized how the cleanliness of open water bodies and aquifers took on an added significance in this perspective. Participants in Neah Bay felt confident that they could exploit post-event natural capital providers of basic goods and services. Water was available in existing streams and fish and shellfish normally for export could easily be made available locally.
  
7. The built, social and natural capital emphasized separately in the three points above were largely linked in participants’ comments. New neighborhood centers should include multi-functional 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.

Evaluations were very positive. Participants in all three workshops were supportive of the exercise (Figure 4). While changes were made after the workshop in Redmond to both the Everett and Neah Bay workshop protocols, none of these changes seemed to diminish the enthusiasm for the activities undertaken or the conclusions reached.

### **Concluding discussion**

The exercises we describe here constitute only a partial “proof of principle” for an asset-based appreciative inquiry approach to community discussions about potential disasters. Based on three participating community exercises, we find clear themes that at least provide some direction for further testing and research. We also find some guidance for efforts to improve hazard mitigation planning and better integration with general comprehensive planning.

FEMA tasked us specifically to explore new ways to integrate the conversation of resilience into FEMA’s RiskMap “Discovery” process. Our work suggests that the RiskMap process would benefit from beginning with questions of HWB and allowing those to drive

discussion of community values. These values can be expressed as the providers of HWB goods and services, prompted by questions in an Appreciative Inquiry mode:

1. What do you like about your community?
2. What helps define the quality of life you value?
3. What community characteristics provide assurance that you and your community will recover from a major change?
4. 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, preparedness and recovery capacity with ideas for enhanced well-being 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.

In a key example of how the connection between hazard mitigation planning and more general planning became obvious, the participants found that urban form was as important as the geology 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. The location of liquefaction, variable magnitudes of ground acceleration from neighborhood to neighborhood, and the types of buildings prone to damage, were specific to the type of earthquake we simulated for these exercises. (For example, the short-period waves of crustal faults would produce

different impacts than other types of events would, such as a Cascadia Subduction Zone earthquake off the Pacific coast, which would have a more generalized impact across a wider area.)

However, 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 service center was also 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 itself 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 – but 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.

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 (especially on a very local scale) is a crucial substitute or back-up 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 misdirected the effort. Where a community does not rely on built capital, the software is 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 acknowledged implicitly another function of social capital in resilience: it enables a community to self-organize. Conventional hazard mitigation and disaster planning emphasize built-environmental preparations for and responses to disruptive events, especially when considering timeframes outside the periods immediately before and after the events (e.g. warning systems and emergency response). According to this emphasis, vulnerable structures should be either “hardened” or sited outside threatened areas altogether; and “building back better” is typically interpreted as just “building.” Mitigation of impacts to vulnerable built capital remains a critical aspect of resilience, but mitigating all that is vulnerable and to all possible threats is not an achievable objective.

Mitigation does not in itself enable a living community to self-organize. 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 increasing, sand is being blown 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.

An approach based on a more ecological concept of resilience emphasizes communities’ total capacity not just to survive a disruption, but also to adapt to the irreversible, unpredictable, and on-going 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 premising planning discussions on a definition of this more holistic set 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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<sup>i</sup> We define “better” as “community-defined HWB”. However, our exercise did not challenge the group to make trade-offs or define priorities.

<sup>ii</sup> We refer to HWB for purposes of this analysis, but used “quality of life” in presentations during the exercise.

<sup>iii</sup> MA includes “*freedom of choice and action*” as a fifth category. During this exercise each group was asked to consider choice in a general way, though it also emerges in the range of sources and providers listed for any given good or service.

<sup>iv</sup> 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.