

Addressing Climate Change Impacts through Disaster Planning

A Discussion Paper about Community Resilience

November 2015

Brief: *The socio-economic impacts of climate change continue to grow incrementally with each event. Higher temperatures, changing landscapes, rising seas, increased risk of drought, fire and flood, stronger storms with greater storm damage, increased heat related illness and disease and higher economic losses are all directly related to climate change. Disaster preparedness will not prevent the effects of climate change, but can drastically reduce the impacts upon people and community.*

Problem

In 2012, the United States experienced more than two-thirds of the world's disaster damage from storms, drought, fire, and earthquakes, including the worst drought in a generation, exceptionally forceful thunderstorms, and the largest Arctic ice melt on record.¹ Collectively, these mounting disasters expose us to a dangerous "new normal," in which climate change is likely worsen the scale of disasters.²

According to the Climate Impacts Group (CIG) - a University of Washington based interdisciplinary research group that studies the impacts of natural climate variability and global climate change - possible impacts of human-based climate change in the Pacific

Northwest include the following (CIG, 2009):

- increased conflict over water, and increased urban demand for water;
- changes in forest growth and species diversity and potential increases in forest fires; and
- changes along coasts, such as increased coastal erosion and beach loss due to rising sea levels, increased landslides due to increased winter rainfall, permanent inundation (especially in south Puget Sound around Olympia), and increased coastal loading due to sea level rise.

Climate Facts & Observations

- Seventy percent of the electricity in the Pacific Northwest is supplied by hydroelectric power. Decreased stream flows will reduce the electricity supply from these suppliers.
- Over the past 50 years, the amount of rain falling in the most intense 1% of storms has increased 20%.³
- In the 1950s, minor coastal flooding along the Atlantic, Gulf, and West Coasts only occurred less than once per year at any given location; it now occurs on average about once every three months.

¹ NOAA, December 5, 2012.

² Shukman, D. 4 December 2014

³ Shukman, D. 4 December 2014

- Warmer temperatures have increased the range of Vector Borne Disease carriers (mosquitos, ticks, and rodents).
- Over 25 disaster declarations have been recorded from 2001 - 2012 due to severe droughts, extensive flooding, landslides, and storms.
- The University of Washington's Climate Impacts Group has estimated that the number of acres in the Pacific Northwest that burn annually will increase 60% in the 2020s and more than double in the 2040s. Some areas, like the Okanogan Highlands, Blue Mountains, and the Eastern and Western Cascades, will see quadruple acres burned in the 2040s.

Potential Costs

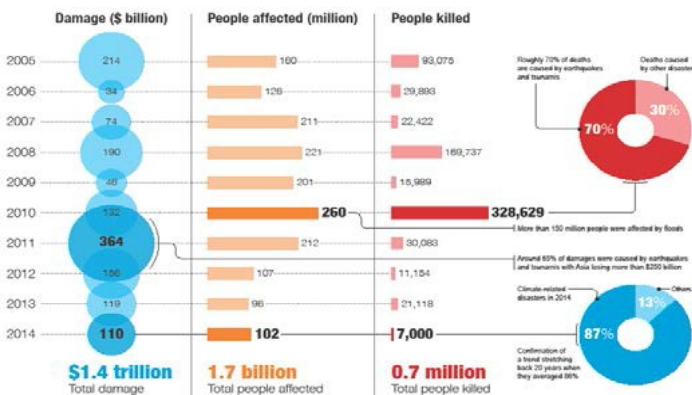
- In Puget Sound counties, structures having a value of about \$29 billion are located in flood hazard areas.
- Irrigated agriculture in the Columbia River Basin is valued at over \$1.5 billion.
- Potential economic cost of doing nothing by 2020 is estimated at \$10 billion per year. ⁴
- Warmer surface temperatures in the oceans have been related to more frequent and stronger storms.

Planning for Climate Change

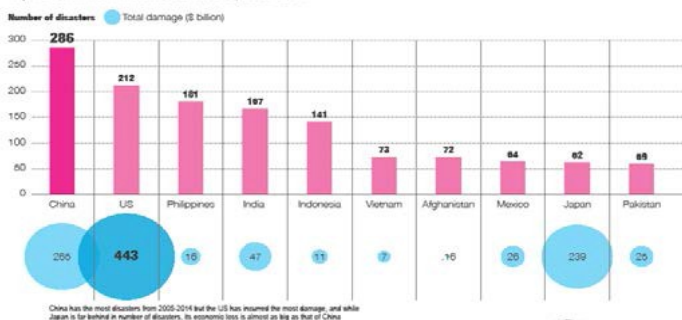
Historically, many disasters have been viewed as random occurrences rather than as part of a trend in climatic conditions or interrelated events. Frequently, the responses have tended to treat occurrences as individual events, repairing the damage and rebuilding as quickly as possible, often times in the same manner as existed prior to the disaster.

Increasingly, however, science and historical trends are able to shine a light on the causal relationship between climate change and increased intensity and frequency of disasters. Sea level rise has been tied to melting of arctic ice as well as other factors, and the increasing occurrence and severity of wildfires are linked to warming temperatures and dryer conditions.

HFA Decade The Economic and Human Impact of Disasters in the last 10 years



Top 10 countries with most disasters, 2005-2014



⁴ Hedia Adelsman, September 6, 2013

The effects of climate change can include intensified wildfires, higher sea levels, extreme rainfall and flooding, windstorms, crop diseases spreading to new areas, heat waves and more. By the gradual nature of change in climate patterns we can see the linkages in effects. The predictions of melting arctic ice, tied to sea level rise, can help us identify the timing and severity of potential inundation along our coastal areas at precise locations. Matched with site specific data, we are provided with insights on impacts to specific buildings, transportation route disruptions or even forecasts of economic interruptions.

Even with our increased awareness of the greater frequency and magnitude of such events, the majority of communities large and small are not prepared for major disasters. The communities that may be better prepared are the ones that have previously, and recently been affected by a disaster, having been spurred on through recovery to become more resilient. However, communities that have not yet been impacted by climate changes or have not experienced recent disasters will have difficult time justifying redirecting resources. Resilience planning can be hard to justify, particularly when changes may be gradual, such as through climate change, and not attributable to a sudden natural event.

When we talk about disaster planning at the local level, the focus of discussion is often in reference to emergency management. The all-hazards

emergency management community typically plan for just that — all types of emergencies, whether manmade or natural. Emergency planners often plan for response – how to get first responders to the scene, and assist in recovery from personal impacts, damages to buildings, roads, utility systems and services. They are supplemented by skills and knowledge in prevention and protection. In the “new normal” changing climate and weather patterns are adding a new element of urgency to disaster preparedness.



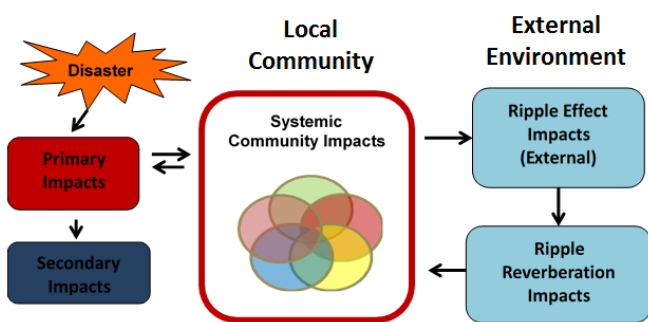
One valuable lesson that we’re still learning is in knowing how a community can self-organize following a disaster and effectively and expediently bounce back in a more resilient and sustainable way – building back better. This shifts planning from the standard operations of rebuilding our communities the way they were prior to a disaster to building back in a way that enables the whole community to be more resilient, and avoid repeat disasters.

As we are better able to understand the linkages between climate change and the potential impacts on elements in our world, we are also better able to anticipate the types of events that may

occur as well as the consequences of a disaster. Having a better understanding of the timing, location and impacts of a disaster enables us to also better prepare.

The better we understand the broad spectrum of impacts from a disaster, the better we'll be able to anticipate and appropriately respond to an event when it happens. For this, the full impacts of the inevitable disasters and understanding how to quickly recover from them needs to be emphasized. In planning for the increased likelihood of wildfires, for instance, effective planning also considers the increased propensity for erosion and mudslides following spring rains. This can sequentially trigger the loss of vegetation for migratory species, loss of orchards or feeding grounds, impacts to the cattlemen and fruit growers, the loss of jobs for workers in the agricultural industry, and impacts on the economy from those lost jobs.

Cascading Impacts of Disaster



Adapting to climate change, as accommodating growth can drive comprehensive planning, and be instrumental in achieving the community's vision of well-being. One

means of accomplishing this is through better coordinated and focused efforts at the local level for pre-disaster planning.

Just as planners prepare for future growth and development through goals and policies structured in a comprehensive plan, preparing for the effects of climate change can be addressed by creating a pre-disaster plan. Having a plan, and knowing how to implement it quickly and efficiently, can save lives, time and resources.

Knowing ahead of time who you're going to bring to the table (e.g., public and private sectors, philanthropic community) to plan out your community's rebuilding process will save time in structuring a rebuilding or recovery committee. This may be accomplished by undertaking a review of various local policy documents, such as comprehensive plan, mitigation plan, capital improvement plan, wildfire protection plan, etc., and making sure they are in sync with each other on directives such as the direction, magnitude, and character of future development. This will provide a better understanding ahead of time what your community recovery priorities will be when opportunities are available for rebuilding following destruction, providing solid direction to those serving on a recovery committee.

Pre-disaster planning also goes hand in hand with local area mitigation plans, which many communities have established as a pre-requisite for eligibility for the Hazard Mitigation Grant Program. Some hazard mitigation funding is even available for climate resilient mitigation activities, such as

aquifer storage and recovery, floodplain and stream restoration, flood diversion and storage, and green infrastructure methods.⁵

Just as mitigation plans identify vulnerabilities and associated measures to prevent loss of life and property for 'hardscape', or structures such as bridges, culverts, structures and utilities, a pre-disaster plan can extend beyond to address the vulnerabilities of the 'soft-scape' features of our communities, including health care systems and services, economic and environmental elements, and the organizational and decision making structures necessary for effective and efficient recovery.

Post disaster planning and the community's ability to self-organize can be most effective if you have a pre-disaster plan to identify what to do in the emergency situation, when time is of the essence. This helps save time and energy in wasted efforts in identifying leadership, identifying the necessary resources, and coming to a consensus on how to rebuild in a resilient manner that avoids recurring damages.

The Intersection of Climate Change, Government and Preparedness

How government decides to address climate change sets the tone for a climate change agenda across the various agencies, organizations, and even the private sector and households.

⁵ FEMA, Mitigation Products Fact Sheet

If government takes an aggressive approach, and sets a clear and actionable agenda, the people will rally around that agenda and the benefits will be evident. If, however, government takes a lukewarm approach, or denies the current or future impacts of the dramatic change in our climate, then agencies and other government emergency managers are limited in their ability to address and plan for those impacts.⁶

Local Agency Capacity to Design Disaster Plans

Many public agencies may not currently have the capacity or the expertise to identify the range of vulnerabilities within their communities, or develop policies and plans that would enable them to respond effectively to climate change. Agencies with limited capacity internally can look to other partners and other resources in their community to plan for, respond to, and recovery from the disasters that extend into months and years beyond an event.



Adaptive planning and governance mechanisms will be needed at all

⁶ FEMA LLIS.gov, 2014

government levels to incorporate new data, understand evolving research, and respond in a timely way to rapidly changing climate impacts. Where capacity, knowledge and expertise exists at the Federal or state level, or in academic institutions or NGOs, local agencies can create alliances to formulate the necessary knowledge-base and resources to develop and implement these programs.

FEMA has developed tools that provide guidance to governmental agencies on how they can address disaster recovery, both pre- and post-event. The National Disaster Recovery Framework focuses on improved coordination among Federal, state, local and Tribal agencies and establishing the necessary partnerships and resource networks to provide greater focus on pre-disaster planning.⁷

Similarly, the American Planning Association provides guidance with their report *Planning for Post-Disaster Recovery: Next Generation*.⁸

With resources available from agencies such as EPA and HUD (i.e. Challenge Grant, and Smart Growth America) local communities may have access to strategies and principles of sustainability and resilience that can be integral to climate change and pre-disaster planning at the community level.

To more effectively prepare for future disasters, state and local agencies could meaningfully incorporate projected climate

change impacts and preparation planning into all of their existing programs and policies. For example, state agencies could integrate climate change preparation into existing sustainability plans, agency risk management plans, or other long-range plans. Preparation plans should include contingencies due to the uncertainties about the intensity and timing of impacts.⁹

Develop a pre-disaster plan for your community

Federal, state and local governments have a primary responsibility to prepare for climate change by ensuring continuity of services in public health and safety. Emergency response, critical aspects of built infrastructure including communication, energy and transportation, and the ecological processes and systems are all such elements that everyone depends on for sustenance.¹⁰

Planning for infrastructure is based upon the average and extreme conditions which our culture has faced for centuries. When determining whether to build near bodies of water, for example, we use the concept of the 100-year floodplain. But the averages and extremes are no longer stable. What are now categorized as “100-year flood events” are likely to become more frequent in the future. If we build new infrastructure based upon historically-based averages, this infrastructure will face risk and damage

⁷ National Disaster Recovery Framework, FEMA

⁸ American Planning Association, 2015.

⁹ The Governor’s Climate Change Integration Group, Oregon 2008

¹⁰ CNA.org, 2010

not anticipated by our current planning and decision-making processes.

And, just as changing dynamics in population and employment growth drives community planning and our future vision, planning for, responding to, and recovering from a disaster can ultimately improve community well-being.

Recommendations

Preparing for climate change involves enhancing our physical structures and facilities. It also means taking measures to reduce the financial impacts of disasters, protecting our cultural resources, and having the capacity to responding in expedient and effective manner. We do this by creating and implementing a plan.

Our current comprehensive plans involve addressing the density, location and intensity of land use with our communities for decades into the future. Our emergency management plans help us identify the number and types of emergency services that may be called to action for a wildfire or other disaster. We also may have interagency agreements that guide the cooperative use of personnel and equipment in the event of a flood crossing multiple communities.

What most communities do not have is a plan that includes identifying and protecting against vulnerabilities to climate-related disasters. Such plans can be designed to provide improved

coordination across departmental and service-provider silos.

Pre-disaster planning focuses on identifying in advance of a disaster all the partners, resources and information that will be needed during a disaster.

It involves a commitment on the part of the community leaders to adopt policy or recognition of the actions to be taken in the event of an emergency, and more importantly to make a commitment to the actions that may either eliminate or lessen the severity of damages when an event occurs.

Characteristics of a good pre-disaster plan:

The following are characteristics that may be incorporated into an effective local agency pre-disaster plan:

- Incorporates components that demonstrate integration with other relevant regional, state, and federal economic response and recovery entities.
- Provides data on what the pre-disaster baseline was, and best practices to be applied in stages of preparation and recovery. References or identifies points of integration with other planning efforts in the community (i.e., land use plans, hazard mitigation plans, etc.).
- Provides evidence that vulnerable populations have been adequately engaged and represented in the planning process.

- Identifies an office or team tasked with managing economic incident response and/or recovery.
- Includes or acknowledges the role of non-profit organizations, volunteer organizations, community foundations, and non-traditional lenders to support resiliency building and recovery efforts.
- Includes an assessment of community organizations and their ability to manage and contribute to post-disaster recovery programming.
- Cultivates public-private partnerships to foster mutual support for economic development goals.
- Establishes standards to relax or streamline permitting and zoning bylaws to encourage quick return of businesses.
- Identifies interface between critical infrastructure organizations (e.g., water board) and economic development organizations.
- Contains a strategy or plan for rapid return of utilities following a disaster.
- Has a program in place promoting/assisting local businesses in preparing business continuity plans.
- Considers the vulnerabilities or methods of risk avoidance for key industry sectors.
- Analyzes vulnerabilities within the community and establishes how to deal with the impacts to vulnerable buildings, services, and populations. Planning for recovery also means understanding the weaknesses – hazard identification – and knowing what you’re going to do to protect your weaknesses.
- Incorporate pre-disaster planning strategies into the comprehensive plan process
- Incorporate pre-disaster planning into mitigation strategies
- Provides enhanced efforts to educate elected officials and community executives and leaders on the possible effects of climate change upon people, infrastructure and the economy.¹¹
- Includes a concerted effort toward an All Hazard approach to planning with an emphasis on the effects of climate change to include all stakeholders.
- Incorporates preparedness, mitigation, response and recovery into all aspects of the plan¹²
- Explores enhancement of social media capabilities and processes to reach specified communities and vulnerable populations in the areas of: warning, education, information dissemination and investigation

¹¹ CNA.org, 2010

¹² CNA.org, 2010

- Provides enhanced community education efforts describing the impacts of climate change upon site specific areas in order to personalize the issues - to address “What’s in it for me?”¹³
- Ultimately planning for, and recovery from, disasters advances community vision and overall well-being by providing a driver of a community’s vision statement. Providing such as incentive pre-disaster, and an opportunity for ‘do-overs’ in the case of post-disaster recovery.

Resources

Surging Seas Mapping Tool

Available at:

<http://ss2.climatecentral.org/#12/40.7298/-74.0070?show=satellite&level=5&pois=hide>

This interactive tool was specifically created for local communities that do not have extensive resources to analyze their vulnerability to sea level rise. Maps are available to northwest coastal cities and counties. These can be used to do a rough, estimated analysis of potential sea-level rise impacts to vulnerable populations in the community, or identify critical facilities that will be impacted based on various sea-level rise scenarios.

Climate Commons, California Landscape Conservation Cooperative

Available at:

<http://climate.calcommons.org/>

Climate Commons contains datasets, documents, and other web resources that are related to climate change impacts and adaptation in California. This resource includes guidance and tools for scenario planning and conducting vulnerability assessments.

Coastal Resilience, The Nature Conservancy

Available at:

<http://maps.coastalresilience.org/network/>

This interactive tool allows users to visualize flood risks due to sea level rise and storm surge and identify risk areas. The tool was developed to help decision-makers identify ways to reduce risk and build resilience.

Coastal Resilience Index, Mississippi-Alabama Sea Grant Consortium and the National Oceanic and Atmospheric Administration’s Coastal Storms Program

Available at:

http://masgc.org/assets/uploads/publications/662/coastal_community_resilience_index.pdf

The Coastal Resilience Index is a self-assessment tool that is designed to help community leaders in guiding the discussion of resilience to coastal hazards.

Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS), Social and Environmental Research Institute

Available at:

<http://www.vcapsforplanning.org/>

VCAPS is a process that was developed to help communities increase resilience to extreme weather and climate change.

¹³ CNA.org, 2010

Climate Change Impacts and Adapting to Change, U.S. Environmental Protection Agency

Available at:

<http://www.epa.gov/climatechange/impacts-adaptation/index.html>

This resource allows users to view climate change impacts and adaptation efforts by region or by sector. The sections containing adaptation efforts include examples of adaptation, key points, and links related to adaptation in the region or sector.

Climate Change, U.S. Department of the Interior Bureau of Indian Affairs

Available at:

<http://www.bia.gov/WhoWeAre/BIA/climatechange/index.htm>

BIA identifies funding opportunities for tribes for projects to address climate change adaptation and environmental planning and list federal resources associated with climate change.

Hardening and Resiliency: U.S. Energy Industry Response to Recent Hurricane Seasons, U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability

Available at:

<http://www.oe.netl.doe.gov/docs/HR-Report-final-081710.pdf>

DOE developed this report to document industry efforts to harden and improve resiliency of assets following the 2005 and 2008 hurricane seasons.

Adaptation Clearinghouse, Georgetown Climate Center

Available at:

<http://www.georgetownclimate.org/adaptation/clearinghouse>

Georgetown Climate Center's Adaptation Clearinghouse contains over 1,000 resources (including adaptation plans, assessment guidance, case studies, tools, websites, etc.) to help communities adapt to different impacts of climate change. The database allows users to search by resource type, sector (including energy and infrastructure/built environment), and climate change impact.

Tribal Climate Change Project, University of Oregon and the U.S. Department of Agriculture Forest Service Pacific Northwest Research Station

Available at:

<http://tribalclimate.uoregon.edu/>

The Tribal Climate Change Project contains publications and tribal climate change profiles that document how tribes across the United States are addressing climate change. The Tribal Climate Change Network also established the PNW Tribal Climate Change Network to foster communications between tribes and other entities about climate change policies and programs.

Tribal Climate Change, Northern Arizona University Institute for Tribal Environmental Professionals (ITEP)

Available at:

<http://www4.nau.edu/itep/climatechange/>

ITEP's Tribal Climate Change Program includes training, technical assistance, tools, and educational resources to assist tribes in addressing the impacts of climate change. This resource includes webinars, training programs, and newsletters.

Risk Mapping, Assessment, and Planning (Risk MAP), U.S. Department of Homeland Security Federal Emergency Management Agency

Available at:

<https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map>

FEMA's Risk MAP tool contains high quality flood maps and tools and outreach support to assist a variety of stakeholders, including state and local officials, in mitigating flood risk.

Preparedness Resources for Tribes, U.S. Department of Homeland Security Federal Emergency Management Agency

Available at:

<https://www.fema.gov/preparedness-resources-tribes>

FEMA's list of preparedness resources includes training courses, funding programs, and tips for tribes to prepare for emergencies such as extreme weather events.

Case Studies

Vulnerability Assessment

Through its Envision Tillamook County Coastal Futures project, Climate Impacts Research Consortium (CIRC - Pacific Northwest RISA) is helping the people of Tillamook County—from area homeowners and businesses to local governments and state planners—visualize how both climate change and local planning will affect their natural and human landscapes. To accomplish this, Envision Tillamook researchers are modeling all 100 kilometers (62 miles) of Tillamook County's coastline in Envision, a powerful computer program developed by CIRC researcher John Bolte. Envision

is revealing how area landscapes are projected to change as population grows and sea levels rise.¹⁴

Drought Prevention

FEMA is beginning to evaluate mitigation activities that address drought and water shortages and whether they will qualify for Hazard Mitigation Assistance grant funding. Generally, FEMA will fund drought mitigation activities when those projects can demonstrate a reduced risk of future damages, hardships, or losses and suffering from disasters. Drought related projects must conform to normal mitigation requirements, such as being in compliance with 44 CFR part 9, solve a problem independently, and be cost effective and reduce the future risk of drought related damages, hardship, loss or suffering.

City of Baltimore's Disaster

Preparedness and Planning Project

The Disaster Preparedness and Planning Project (DP3) is a new initiative by the city of Baltimore's Department of Planning in an effort to address existing hazards while simultaneously preparing for predicted hazards due to climate change. This program integrates hazards mitigation planning, floodplain mapping, and climate adaptation planning into one plan, linking research, outreach, and actions to create a risk-preparedness system for addressing existing and future impacts. Using FEMA's requirement to update the city's All Hazards Mitigation Plan (AHMP), the city's Office of Sustainability has developed an integrated project to produce a comprehensive system for addressing existing and future impacts, while integrating adaptation recommendations with planning

¹⁴ Nathan Gilles, May 2015

processes for decision-making and prioritization of future capital and operating budgets.¹⁵

References

American Planning Association, 2015. *Planning For Post-Disaster Recovery: Next Generation*; PAS Report 576.

City of Baltimore-Office of Sustainability, Disaster Preparedness and Planning Project, August 2015. <http://www.baltimoresustainability.org/disaster-preparedness-and-planning-project#sthash.luAL9KHZ.dpuf>

CNA.org, 2010, *Why the Emergency Management Community Should Be Concerned About Climate Change*, Retrieved on May 5, 2015. <http://www.emergencymgmt.com/emergency-blogs/managing-crisis/Catastrophic-Planning--Often-Neglected-but-Vital.html>

Department of Energy/Office of Indian Energy, September, 2015, *Tribal Energy System Vulnerabilities to Climate Change and Extreme Weather*. <http://energy.gov/sites/prod/files/2015/09/f26/Tribal%20Energy%20Vulnerabilities%20to%20Climate%20Change%208-26-15b.pdf>

NOAA, *Arctic continues to break records in 2012: Becoming warmer, greener region with record losses of summer sea ice and late spring snow*, Dec.5, 2012 http://www.noaanews.noaa.gov/stories2012/20121205_arcticreportcard.html

Hedia Adelsman, September 6, 2013, *Climate Change Seminar for Journalists*.

FEMA LLIS (Lessons Learned Information Sharing), 2014, retrieved on May 7, 2015. <https://www.fema.gov/lessons-learned-information-sharing-program>

FEMA Mitigation Products Fact Sheet - *Climate Resilient Mitigation Activities for Hazard Mitigation Assistance*. October 6, 2015. <http://www.fema.gov/media-library/resource-documents/collections/479>

Nathan Gilles, Northwest Climate Magazine, May 2015. *Shoring Up for Climate Change - Homeowners Prepare for Climate Change Along the Oregon Coast*.

Pittman, E. July 19, 2010, *Emergency Management Magazine*, *Emergency Managers Warm To The Idea Of Climate Change* Retrieved on May 05, 2015. <http://www.emergencymgmt.com/disaster/Emergency-Managers-Climate-change.html?page=2&>

Shukman, D. December 4, 2014, BBC News, *Science & Environment*, retrieved on May 7, 2015. <http://www.bbc.com/news/science-environment-30311816>

The Governor's Climate Change Integration Group: *Final Report to the Governor*, Oregon 2008 CCIG Report page 21.

Wallace, C. & Inocencio, A., 2013, *Grays Harbor County Citizen Expectation Survey Preliminary Results*. Retrieved on May 02, 2015. <http://www.co.grays-harbor.wa.us/info/DEM/Index.asp>

¹⁵ City of Baltimore, 2015

Wright, A. M., May 13, 2013, *Looking Back to Get Ahead: FEMA's Strategic Foresight Initiative on Natural Disaster Preparedness*, New Security Beat, Retrieved on April 20, 2015.

<http://www.newsecuritybeat.org/2013/05/ahead-femas-strategic-foresight-initiative-weighs-natural-disaster-preparedness/>