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State Hazard Mitigation Plans and Climate Change: Rating the States

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Columbia Law School

**State Hazard Mitigation Plans & Climate Change:
Rating the States**

Matthew Babcock

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Errata: This report was revised post-publication on November 19, 2013 to correct the error on page 10 that Colorado was the only landlocked state in category 4. Vermont also is a “landlocked” category 4 state, though is relatively close to the coast and likely shares similar sensibilities with its coastal neighbors.

Executive Summary

Climate change is affecting and will continue to affect the frequency and severity of natural hazard events, a trend that is of increasing concern for emergency managers and hazard mitigation agencies across the United States. Proper response to these hazards will require preparation and planning. Unfortunately, states are not required to include analysis of climate change in their State Hazard Mitigation Plans, which leads to uneven treatment of the issue and missed opportunities for mitigation planning. This survey identifies those state plans that address climate change and climate-related issues in an accurate and helpful manner and those that do not. Several states will be releasing updated State Hazard Mitigation Plans in 2013 and 2014, and this survey forms a basis for improving those plans through shared lessons learned and targeted communication. The results of the survey indicate that coastal states are more likely to include a discussion of climate change, possibly due in part to recent emphasis on and awareness of the relationship between climate change and sea level rise, coastal storms, and related hazards. The relative lack of discussion of climate change in land-locked states may point to a need for greater communication of how risks such as drought, floods, heat events, and non-coastal storms are affected by climate change. State plans that currently include climate change analyses and adaptation plans may be used as examples for improving other plans. This survey provides a basis for further analysis comparing future plans and determining whether they include an improved discussion of climate change.

Introduction

State Hazard Mitigation Plans (SHMPs)

In accordance with Section 322 of the Disaster Mitigation Act of 2000 (42 U.S.C. §5165), all States must have an approved statewide hazard mitigation plan in place in order to receive federal disaster mitigation funding from the Federal Emergency Management Agency (FEMA). The purpose of these State Hazard Mitigation Plans (SHMPs) is to limit potential losses due to natural and other hazard events through the coordination of mitigation activities prior to such an event. SHMPs are required by FEMA rules (44 CFR §201.4 and §201.5) to include: a description of the hazard mitigation planning process; identification of the specific hazards, risks, and vulnerabilities in the state; identification and ranking of the mitigation actions available; and description of the process to integrate mitigation efforts across agencies and levels of government. Each SHMP must be submitted to, reviewed and approved by FEMA every three years. States can submit plans to FEMA for either a Standard designation or an Enhanced designation that enables the state to receive additional funding. An Enhanced designation requires that all parts of the state's Standard plan have been deemed satisfactory and that the state has demonstrated success in mitigating the impacts of disasters, has integrated its current mitigation efforts successfully, and has the capacity to manage the current and increased level of available funding. In general, the state agencies responsible for the creation and implementation of the SHMP have discretion over which of the types of hazards and mitigation activities are discussed in the SHMP and what level of technical and scientific detail is represented.

Climate Change and Hazard Mitigation Planning

With the increasing scientific study of climate change has come an improved understanding of how climate change is and will affect the incidence and intensity of a broad range of natural hazards. The acknowledgement that human activity has already changed the global environment to the extent that even ceasing emissions now will not stop some level of climate change has led to a recent increased focus on climate adaptation efforts and how those efforts are related to hazard mitigation. The Strategic Foresight Initiative (SFI), organized by FEMA,¹ has listed the following climate change related trends as posing additional challenges to emergency managers and hazard mitigation agencies that require additional thought and planning to address: rising temperatures, increased storm intensity and frequency, rising sea levels, changing drought and fire risk, and shifting human health and disease patterns.

¹ Strategic Foresight Initiative, Summary of Findings (May 2011), <http://www.fema.gov/library/viewRecord.do?id=6010> (last accessed 11 July 2013). SFI is a collaborative effort of the emergency management community facilitated by FEMA. SFI was launched to improve understanding of how climate change may affect the future of emergency management. For more information, see FEMA, Strategic Foresight Initiative, <http://www.fema.gov/strategic-planning-analysis-spa-division/strategic-foresight-initiative> (last accessed 11 July 2013).

While FEMA acknowledges the implications of climate change for hazard mitigation, there is no requirement or mention of climate change in the FEMA rules that govern the review process for SHMPs. Even though all SHMPs contain information on the future probability of hazard events, the lack of specific climate guidelines may be one reason for the uneven treatment of climate change impacts in the SHMPs, as some states include thorough discussions and others mention the issue in only a minimal fashion. While it is true that there are many hazard mitigation actions that can be undertaken without acknowledging climate change that still help to increase community resilience, hazard mitigation planning is and will be less effective and less efficient in many locations if the hazard profile and mitigation action plans are based on historic climate data alone. For example, a community can prepare for seasonal flooding without acknowledging climate change, but if the flood protection plan does not recognize that sea level rise and more intense storms are likely to result in higher flood levels in the future, the preparation may be inadequate and people may rely on those inadequate preparations to protect their homes and families. In other words, there will be, at best, missed opportunities for hazard management and, at worst, increased vulnerability if SHMPs ignore or inaccurately integrate climate change related impacts.

Purpose of this Survey

The overall purpose of this survey was to determine to what extent and in what manner climate change related issues are incorporated into existing SHMPs, with an emphasis on identifying which states have a more accurate and thorough discussion of the issue. This survey was directed toward providing a baseline to work from for future analysis of the new SHMPs that are scheduled to be submitted to FEMA in 2013 and 2014.

Methodology

Collection of SHMPs and Database Creation

The first step of this survey was the collection of the SHMPs from the responsible state agencies. In some cases, only MSWord versions were available or the mitigation plan was divided into multiple PDFs. In these cases, the plans were converted into single PDF files, one for each state. SHMPs were found, collected, and analyzed for all 50 states (the plans for U.S. territories and Washington D.C. were not considered as part of this survey). The SHMPs analyzed were all approved by FEMA during the period 2010 to 2012, with the exceptions of Indiana (the latest version available was from 2008), New Hampshire and Vermont (the 2013 draft versions were used).²

² Indiana has an approved 2011 version but it is not publicly available. Due to security concerns, Delaware's 2010 SHMP is also not available publicly but the sections relating to natural hazard vulnerability assessment and mitigation planning were released to CCCL upon request.

A database was created using the collected SHMPs that lists for each plan: administrative information such as the name, date, responsible agency, and online address of the plan; information on what type of hazards are mentioned in the plan (both in general and those specifically linked to climate change); what are the timescales considered in terms of hazard projections and mitigation action implementation; to what extent is climate change mentioned in the plan in terms of hazards; and to what extent are hazard mitigation actions presented in terms of climate change adaptation. The extent to which climate change was mentioned in terms of hazards was determined by searching for key words (climate change, global warming, sea level rise, changing hydrologic conditions, etc.) and by reviewing risk assessment sections related to hazards that could be affected by climate change (drought, flooding, extreme temperatures, storms, coastal hazards, etc.). For each plan that discussed climate change, it was noted whether the discussion of hazards was of a quantitative or qualitative nature or both, whether the discussion of climate adaptations was implicit or explicit in its connection to climate change impacts, and whether the mitigation actions were general or targeted to a specific climate change related issue. Additionally, for each plan there is an overall summary and a category ranking. The SHMPs were placed into 4 broad categories based on how extensive a discussion of climate change was included in the plan. Further discussion of the ranking categories can be found in the Findings section of this paper.

Limitations

As this survey was meant to be the starting point for further analysis of the SHMP in relation to climate change, the ranking system was intentionally broad (for an example of a more formalized ranking system see Berke, Lyles, and Smith, 2009). Some elements of the analysis are straightforward, such as whether a plan uses the words climate change, but others are more subjective. For example, the decision to not mention the words ‘climate change’ explicitly in an SHMP may be due to the political situation in a specific state and not due to an absence of knowledge at the mitigation agency level. It is possible for an SHMP to prepare for sea level rise and increased flooding without acknowledging that these phenomena are due to global climate change, but that omission lacks clarity that may cause an underestimation of the rate of sea level rise or the extent of future flooding.

Some of the difficulty in ranking states also lies in how to rank the inclusion of resiliency efforts that will help states cope with climate change impacts but that are not directly tied to climate change science. A state that prepares a heat wave action plan may be preparing for higher global temperatures, but it is impossible to know unless the plan states so explicitly. For some plans that included a minimal discussion of climate change, the inclusion of an action plan or statement that supports further integration of climate change issues in future SHMPs helped tip the balance into a higher ranking (whether or not these plans and promises are kept in the new plans is a likely subject for further study).

Findings – Description of Ranking Categories

General

Each of the reviewed SHMPs was placed in a category based on the overall quality of the discussion of climate change impacts on hazards and climate change adaptation actions. SHMPs placed in category 4 featured the most complete and helpful integration of climate change related information, whereas SHMPs placed in category 1 featured the least complete and/or unhelpful integration of such information. Table 1 provides a general description of each category and lists the states placed in that category, and Figure 1 provides a visual representation of these rankings. The four categories are discussed in further depth below.

Table 1. Summary Descriptions of Ranking Categories

Category	Description	SHMPs
1	No discussion of climate change or inaccurate discussion of climate change.	AL, DE, GA, ID, IN, IA, KY, MS, MO, MT, NE, NV, NM, ND, OK, TN, SD, WY
2	Minimal mention of climate change related issues.	AZ, AR, IL, KS, LA, OH, PA, SC, TX, UT, VA
3	Accurate but limited discussion of climate change and/or brief discussion with acknowledgement of need for future inclusion.	FL, ME, MI, MN, NJ, NC, OR, RI, WV, WI
4	Thorough discussion of climate change impacts on hazards and climate adaptation actions.	AK, CA, CO, CT, HI, MD, MA, NH, NY, VT, WA

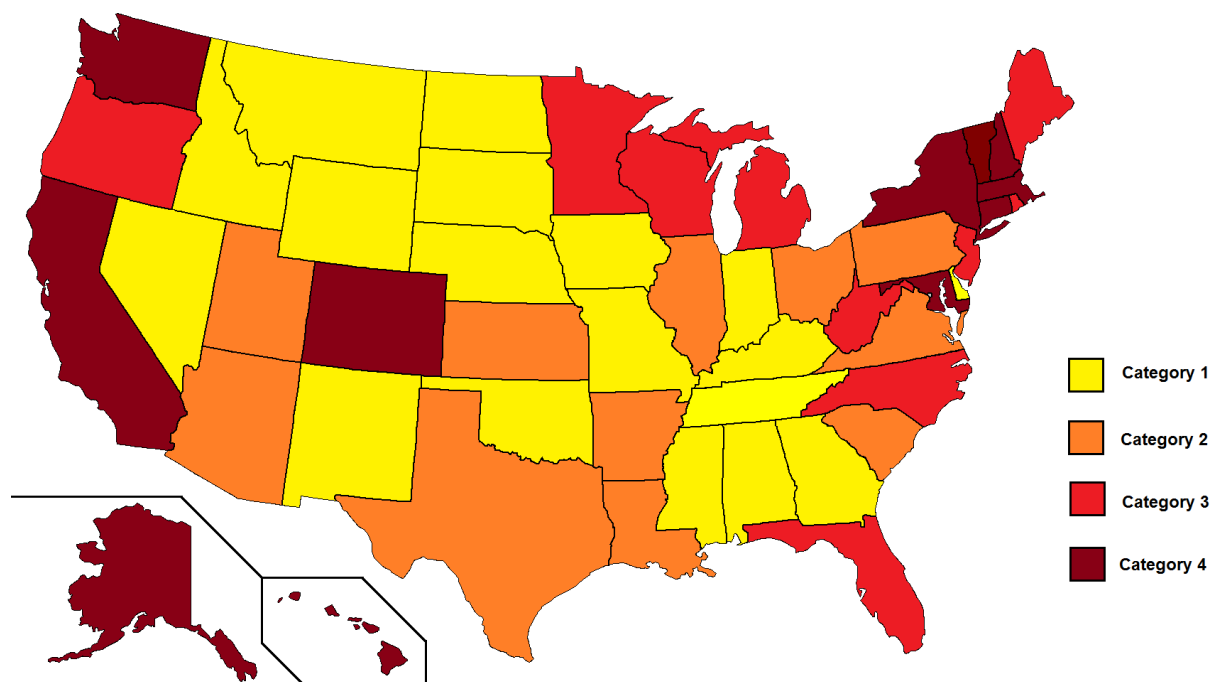


Figure 1. Visual representation of the ranking category for each state.

One general trend is that coastal states appear to fall into higher ranking categories than landlocked states. While this is not always true, it may be that sea level rise and increases in frequency and intensity of storms and related hazards are more immediately linked to the need for mitigation efforts or that mitigation officers are more aware of those threats than they are of drought and heat events. Political attitudes no doubt also play a role in how climate change is perceived and addressed.

This pattern raised the possibility that states were not addressing climate change because the hazards present in those states were not affected by climate change (e.g., earthquakes). The National Climate Assessment (NCA), created by the U.S. Global Change Research Program (2009), identifies regional hazards due to climate change. The regional hazards identified by the NCA were compared to the SHMPs prepared by several States whose SHMPs contained little discussion of climate change (Category 1 and 2). Table 2 presents the findings. Not all states were assessed: one sample state from each region in the NCA was selected. In general, despite being at risk from hazards related to climate change (as determined by the NCA), and despite addressing several of those hazards in their SHMPs, these states rarely connected climate change with their discussion of these hazards. Based on this sample, it is unlikely that states are omitting a discussion of climate change because climate change will not affect the hazards they face.

Table 2. National Climate Assessment Risks and SHMPs

Region	State	Hazards Identified in National Climate Assessment	Hazards in State Hazard Mitigation Plan <u>Not</u> Discussed in Relation to Climate Change	Hazards in Plan Discussed in Relation to Climate Change
Southwest	Arizona	Drought, heat waves, winter storms, floods, warm downslope winds	Dams, Earthquakes, Extreme Heat, Flooding, Landslides, Severe Wind, Subsidence, Wildfires, Winter Storms	Drought
Southeast	Georgia	Heavy rainfall and floods, drought, extreme heat and cold, winter storms, severe thunderstorms and tornadoes, tropical cyclones	Hurricanes, Storm Surge, Wind, Severe Weather, Tornadoes, Inland Flooding, Severe Winter Weather, Drought, Wildfire, Seismic Hazards, Sinkholes, Dam Failure	None
Midwest	Indiana	Regional floods, severe thunderstorms, summer drought, heat waves, winter storms	Flood, Dams, Tornados, Earthquakes, Winter Storms	None
Great Plains	Montana	Droughts, floods, convective storms, cold waves, winter storms, extreme heat and cold	Dam Failure, Earthquake, Flooding, HazMat, Landslides, Severe Storms, Tornado, Volcanic Eruptions, Winter Storm	Wildfire
Northeast	Pennsylvania	Floods, Nor'easters, ice storms, heat waves, drought, tropical cyclones, fog	Coastal Erosion, Earthquake, Flooding, Hail, Hurricane, Landslides, Lightning, Subsidence, Tornado, Wildfire, Winter Storm	Drought, Extreme Temperature, Invasive Species, Disease
Northwest	Idaho	Flood-Producing Extreme Precipitation, winter storms, drought, heat and cold waves,	Flood, Earthquake, Wildfire, Avalanche, Dam Failure, Drought, HazMat, Landslide, Lightning, Severe Storms, Volcanism, Wind, Tornadoes	None

Category 1

The SHMPs placed into category 1 either do not mention climate change related issues or mention these issues in an inaccurate, confusing, and/or dismissive way. Many of the SHMPs in this category rely solely on past incidences of hazard events to forecast future risk.

States that do not mention climate change or related issues at all in their SHMPs include Georgia, Indiana, Iowa, Nebraska, Nevada, Missouri, North Dakota, Oklahoma, and South Dakota. The SHMPs from Mississippi and Montana only minimally reference climate change (one or less than one full sentence) as a source of added complexity in hazard mitigation and as a possible influence of wildfire, respectively. New Mexico's SHMP mentions climate science only in terms of EL Nino/LA Nina cycles. Wyoming's SHMP mentions that modeling should be used to predict future and describe past events, but it does not reference climate change directly.

The SHMPs in this category that do mention climate change related issues do so in a dismissive or confusing manner. For example, Alabama's SHMP's only mention of climate change states, "The probability and severity of hurricanes in Alabama is fairly well established and likely to remain constant, notwithstanding the potential effects of global warming on weather patterns". This brief comment is insufficient to know whether the hazard officers studied the effects of climate change on hurricane patterns and determined that Alabama's hurricane pattern was unlikely to change, or whether the potential effect of climate change on hurricanes was dismissed. Similarly, the only mention of climate change influencing hazards in Idaho's SHMP is a mention of the "intense debate" about the projection of future events. The Kentucky SHMP contains an example of an unclear discussion of climate change as the source of changing hazards: "As climate change and global warming continue to be areas of debate, one thing is certain: severe weather is more destructive and dangerous with each passing year". The comments in Kentucky and Idaho's SHMPs may unfortunately result in missed opportunities for hazard mitigation and increased damage from future events.

Even without mentioning climate change, some of the SHMPs in this category do discuss implicit climate adaptation measures, such as enhancing the State's participation in the National Flood Insurance Program (NFIP). However, participation in NFIP and related activities (such as buying out land in designated flood zones) is presented as a reaction to changing demographic and development patterns, usually without mention of changing weather patterns.

Category 2

The SHMPs in this category mention climate change related issues accurately but at a minimal level. Usually the discussion of climate change in category 2 SHMPs is general and qualitative. For example, Illinois and Ohio both mention climate change in several places within their SHMPs, but these discussions are brief qualitative mentions (e.g. "climate change will affect flooding", or "climate change will affect future predictions") without expansion of the topic. In the case of Pennsylvania, there is some additional mention of hydrological projections

that take into account climate change, but the discussion is less thorough than that found in the SHMPs placed in category 3. Similarly, Arizona, Arkansas, and Utah all mention climate change in the context of drought, but the discussion within each SHMP is very brief. As with all of the SHMPs placed in this category, the discussion of climate change is accurate but minimal and, unlike category 3, lacks a discussion of the need for improved climate change analysis in future plans.

Some SHMPs placed in this category accurately discuss the risks posed by sea level rise but do so without further exploration of other potential effects of climate change. Texas and Virginia, for example, include specific sections on sea level rise and present helpful qualitative and quantitative information on the causes and effects of this hazard. Louisiana's SHMP mentions that there are other state initiatives that are involved with and responsible for dealing with the issue. In each of these three plans though, there is minimal if any discussion of climate change impacts on other important hazards that affect these coastal states such as hurricanes and flooding.

Category 3

SHMPs in this category include accurate and helpful discussion of climate change related impacts to a greater extent than those in category 2 and/or typically acknowledge the need for continued improvement of this issue in their plans. The discussion of climate change effects is more explicit and contains more quantitative information than those in category 2.

With the exception of Florida and Oregon, the SHMPs in this category also contain separate sections that discuss climate change impacts explicitly, many times in a manner that emphasizes the importance of the issue. West Virginia's SHMP's climate section has a helpful discussion about the amplifying effect of climate change on many natural hazards, and North Carolina's acknowledges climate change within the larger category of long-term hazard mitigation planning.

As mentioned, one important characteristic that many of the SHMPs in this category share is that they discuss and emphasize the need to increase their discussion and analysis of climate change related issues. Michigan, Minnesota, New Jersey, West Virginia, and Wisconsin all emphasize the need for increased discussion of climate change related issues in future SHMPs.

Similarly, the states of Michigan, Minnesota, Oregon, Rhode Island, West Virginia, and Wisconsin make significant mention of state initiatives outside of the SHMP planning process that are concentrating on climate change impact assessment and adaptation planning, such as Wisconsin's Initiative on Climate Change Impacts and Oregon's Climate Change Adaptation Framework. There may be opportunity to integrate these other state initiatives into the SHMP to a greater extent in order to ensure the climate information is reflected in the mitigation planning.

As these states release updated SHMPs in 2013 and 2014, particular attention should be paid to whether or not they have followed through on their plans to pay increased attention to climate change.

Florida is an interesting case in this category. The SHMP for Florida notes that the state will be one of the most affected by climate change with an emphasis on sea level rise effects, but the discussion is not as thorough as would be expected. Instead, the SHMP sets forth a strategy that contains research goals explicitly targeted at understanding and preparing for additional climate change effects. A review of the recently released 2013 Florida SHMP reveals that Florida lived up to its promise by including a separate section dedicated to sea level rise that addressed the research questions raised in the 2010 SHMP. An extensive 105 page appendix provides a summary of the research and data collected and analyzed by a team of experts as well as an assessment of risk and steps to mitigate that risk. However, Florida's assessment of climate change remains limited to sea level rise, despite recognition that drought and heat waves, both of which may be exacerbated by climate change, are significant hazards in Florida. Florida's efforts to improve its assessment of climate change and sea level rise were therefore successful, but its overall effort to address climate change still falls short of the more comprehensive discussions in category 4 plans.

Category 4

The SHMPs in category 4 include the most thorough discussions of both climate change impacts on the hazard profile and climate adaptation and mitigation plans. Many of the SHMPs in this category contain much quantitative assessment of risks and explicit adaptation plans of both general and targeted natures. These plans may be useful to look at as examples for other states in further developing their own discussions of climate change related issues.

All of the plans in this category have specific climate change sections, with the exception of Connecticut's, which instead opts for integrating climate change concerns throughout the document. Perhaps the most thorough climate change specific section can be found in California's SHMP. This plan contains a climate change section that provides a description of climate change and important concepts such as climate change adaptation and mitigation, a listing of all of the state's climate change initiatives, an overview and progress report on the state's climate adaptation strategy, and a discussion of principles and recommendations for integrating climate change in current and future hazard mitigation plans. Overall, the plan does a good job of combining the concepts of climate adaptation and hazard mitigation through the concept of resiliency. A copy of this section of California's SHMP is provided in the Appendix of this paper.

Colorado's SHMP is another interesting example of how to incorporate climate change information into the SHMP. Colorado is the only state far from the coasts to have a plan placed

in category 4.³ The effects of climate change on drought and water resources are the focus of the discussion, and the Colorado SHMP contains a series of Annexes dedicated to the state's drought response plan. Annex C of the SHMP is entitled Climate Change Implications and contains an overview of climate change in relation to drought and the results of several studies and models related to possible future conditions. It is a good example of a detailed section on one targeted effect of climate change, and a copy of this section is included in the Appendix of this paper.

Similar to some SHMPs in category 3, some of the SHMPs in category 4 discuss linkages to other state programs, though they do so in a more integrated way. Alaska's SHMP contains an integrated discussion of that state's Climate Change Impact Mitigation Program. Similarly, New York's SHMP provides a series of links and discussion of the various climate change related programs that the state is involved in. New York's plan is also interesting for explicitly stating that one of the reasons for including climate change information in the SHMP is to ensure that state hazard mitigation planners take the issue into consideration.

As mentioned above, plans in category 4 contain more quantitative and modeling data and integrate climate change more explicitly in the mitigation action plan sections. Massachusetts' plan is a good example of having both model based risk assessments and the inclusion of explicit climate change mitigation implementation plans. The State of Washington's SHMP defines climate change specifically as a Technological Hazard, which assists planners to consider both the cause as well as the effects of climate change. This SHMP also has helpful examples of local plans that discuss the concept of resiliency as a principle of climate change adaptation planning (California's SHMP also does this to some extent).

Conclusion

This survey confirmed that the SHMPs available from the 2010-2011 periods do not treat climate change concerns in a uniform fashion. How individual SHMPs discuss climate change ranges from not discussing it at all and missing the planning opportunity that comes with such a discussion to including an in-depth discussion that prepares state hazard mitigation teams for future hazards. One important observation is that many of the SHMPs in the middle of the ranking system (Categories 2 and 3) acknowledge the need for further discussion and analysis of climate change related issues. Overall, the database and findings of this survey should serve as a base for further analysis of the integration of climate change information into the SHMPs. Possible next steps include comparisons between the plans analyzed in this paper and the new versions scheduled for 2013-2014, more specific analysis of how to transfer what works from Category 4 plans to lower ranked plans, and further comparisons between the risk assessments

³ Vermont is the only other "landlocked" state in category 4. However, Vermont is relatively close to the coast and likely shares similar sensibilities with its coastal neighbors.

put forth by the SHMPs and the National Climate Assessment. It may also be helpful to investigate how FEMA can help spur additional climate change integration in the SHMPs.

References

For individual state hazard mitigation plan sources please see the database that accompanies this white paper.

Berke, P., Smith, G., and Lyles, W. (Forthcoming) “Planning for Resilience: An Evaluation of Coastal Hazard Mitigation Plans.” *Natural Hazards Review*.

Hazard Mitigation Planning and Hazard Mitigation Grant Program, Final Rule, 72 Fed. Reg. 61552 (October 31, 2007)(to be codified at 44 C.F.R. pts. 201, 204, 206).

Strategic Foresight Initiative. (2011). Climate Change: Long Term Trends and Their Implications for Emergency Management. Retrieved from www.fema.gov/pdf/about/programs/oppa/climate_change_paper.pdf

Appendix – Climate Change Sections from California and Colorado State Plans

California: SHMP p. 102-116

4.5 An Emerging Risk Factor: Climate Change

A relatively new and increasingly important factor affecting all four disaster management functions is climate change caused by global warming. Climate change reflects new uncertainties and factors shaping and conditioning hazard mitigation planning. It is addressed in this chapter as a factor intensifying impacts of many natural hazards described in Chapters 5 and 6. Scientific literature developing over the past several decades has confirmed that release of greenhouse gases—such as carbon dioxide (CO₂), methane, chlorofluorocarbons (CFCs), and nitrous oxide—is creating changes to the earth’s climate leading to a variety of negative effects. Impacts of meteorological changes have been under observation by risk management and natural hazards researchers for several decades.

Climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state’s infrastructure, water supplies, and natural resources.¹ The state has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing. Extreme weather events, such as heat waves, wildfires, droughts, and floods, are likely to be some of the earliest climate impacts experienced.²

In order to address these changes, California has developed a variety of laws, policies, and programs to both mitigate (or reduce) the emission of greenhouse gasses into the atmosphere and adapt to the changes that will take place.

One source of confusion for the climate change issue is use of the terms “mitigation” and “adaptation.” *Adaptation* involves minimizing the impacts of climate change already set in motion. The ultimate goal of adaptation is to enhance society’s long-term resilience to imminent climate impacts. Thus in hazard mitigation planning, *adaptation* is essentially synonymous with the term *mitigation*.

By contrast, the term *climate mitigation* describes actions taken that reduce greenhouse gas emissions to avoid unmanageable conditions in the future. In this document, *climate mitigation* is always expressed as such to avoid confusion with hazard mitigation. Although this SHMP addresses climate adaptation, climate mitigation is closely linked to adaptation and thus both should be considered in Cal EMA and state agency policy-making.

In the following sections, relevant state laws and policies are described, preliminary strategies for addressing climate change are outlined, and principles for incorporating climate change into state and local hazard mitigation planning are identified.

¹ California Natural Resources Agency. 2009 *California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2008*. p. 15.

² Ibid.

4.5.1 California's Climate Change Initiatives

California has been a leader in adopting initiatives to address climate change through the reduction of greenhouse gas emissions and the adaptation to climate change impacts. Although climate change is a global issue, actions taken by California can have far-reaching effects by encouraging other states, the federal government, and other countries to act. As the world's fifteenth largest emitter of greenhouse gases from human activity and natural sources and with trillions of dollars of real estate at risk due to increasing climate-related hazards, California is uniquely positioned to act to reduce greenhouse gases and to adapt to climate change impacts.³ The following summarizes the major initiatives of the state.

Executive Order S-03-05 and AB 32 – California Global Warming Solutions Act of 2006

The initial push for greenhouse gas reduction was set in motion by Executive Order S-03-05 in 2005, which established climate change emission reduction targets for the state for the purpose of mitigating global warming. The Executive Order established greenhouse gas reduction targets as follows:

- By 2010, reduce to 2000 emission levels
- By 2020, reduce to 1990 emission levels
- By 2050, reduce to 80 percent below 1990 levels

Subsequently, the California legislature passed and the Governor signed Assembly Bill (AB) 32, known as the California Global Warming Solutions Act of 2006. The law establishes a comprehensive program to achieve quantifiable, cost-effective reductions of greenhouse gases on a scheduled basis. It requires the California Air Resources Board (ARB) to develop regulations and market mechanisms that will ultimately reduce California's greenhouse gas emissions by 25 percent by 2020. Mandatory caps begin in 2012 for significant sources. Specifically, AB 32 requires the ARB, among other things, to:

- Establish a statewide greenhouse gas emissions cap for 2020, based on 1990 emissions by January 1, 2008
- Adopt mandatory reporting rules for significant sources of greenhouse gases by January 1, 2009
- Adopt a plan by January 1, 2009, indicating how emission reductions will be achieved from significant greenhouse gas sources via regulations, market mechanisms and other actions
- Adopt regulations by January 1, 2011 to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas, including provisions for using both market mechanisms and alternative compliance mechanisms

Measures similar to AB 32 have been adopted by many other states, with California leading the way. In response to an industry challenge to one of these state laws, the United States Supreme Court ruled that greenhouse gases should be considered pollutants. This decision emphasized the court's view that the federal Environmental Protection Agency (EPA) has a responsibility to pass nationwide regulations governing such emissions. On December 7, 2009, the EPA finalized its finding under the Clean Air Act that greenhouse gases in the atmosphere endanger both the public health and the environment for current and future generations. The EPA also found that the combined emissions of greenhouse gases from motor vehicles engines are contributing to the buildup of greenhouse gases in the atmosphere and, thus, to the climate change problem.

³ California Natural Resources Agency. *Final Statement of Reasons for Regulatory Action, Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97*. December 2009.

Ultimately, this finding paves the way for EPA regulation of greenhouse gas emissions. Meanwhile, California is proceeding with implementation of AB 32 through related initiatives and programs described in the subsections that follow.

AB 32 Scoping Plan

AB 32 required the California Air Resources Board (ARB), the lead agency for implementing AB 32, to develop a Scoping Plan outlining the state's strategy to achieve the 2020 greenhouse gas emissions reduction goals. On December 11, 2008, ARB adopted its Scoping Plan, setting forth a framework for future regulatory action on how California will achieve that goal through sector-by-sector regulation. ARB must adopt, no later than January 1, 2012, rules and regulations to implement the greenhouse gas emissions reductions envisioned in the Scoping Plan. The AB 32 Scoping Plan outlines a set of actions designed to reduce overall greenhouse gas emissions in California to 1990 levels by 2020 and proposes a comprehensive set of actions designed to reduce overall greenhouse gas emissions in California, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health. The Scoping Plan presents greenhouse gas emission reduction strategies that combine regulatory approaches, voluntary measures, fees, policies, and programs. Reduction strategies are expected to evolve as technologies advance and progress toward the state's goal is monitored.

SB 97 – CEQA Guidelines for Mitigation of Greenhouse Gas Emissions

Following the passage of AB 32, Senate Bill 97 was passed in 2007. SB 97 directed the Governor's Office of Planning and Research (OPR) to develop draft CEQA Guidelines "for mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions."

Progress Summary 4.A: Greenhouse Gas Emissions

Progress as of 2010: On April 13, 2009, OPR submitted its proposed amendments to the Natural Resources Agency and, on July 3, 2009, the Agency commenced the Administrative Procedure Act rule-making process for certifying and adopting these amendments. Having reviewed and considered all comments received on the originally proposed text and the proposed revisions, the Natural Resources Agency adopted the CEQA Guidelines Amendments on December 30, 2009. The Office of Administrative Law adopted the amendments, which became effective on March 18, 2010. The amendments provide guidance to public agencies regarding the analysis and mitigation of the effects of greenhouse gas emissions in draft CEQA documents.

SB 375 – Greenhouse Gas Emissions Reduction

In October 2008, SB 375 further built on AB 32 by connecting the reduction of greenhouse gas emissions from cars and light trucks to regional and local land use and transportation planning. SB 375 asserts that "without improved land use and transportation policy, California will not be able to achieve the goals of AB 32." Accordingly, SB 375 has three goals: 1) to use the regional transportation planning process to help achieve AB 32 goals, 2) to use CEQA streamlining as an incentive to encourage residential development projects that are consistent with regional plans that meet greenhouse gas emission reduction targets, and 3) to coordinate the regional housing needs allocation process with the regional transportation planning process. SB 375 requires the California Air Resources Board (ARB) to establish greenhouse gas emission reduction targets for each region (as opposed to individual cities or households). Then each region's metropolitan planning organization (MPO) must create a Sustainable

Communities Strategy (SCS) as part of the Regional Transportation Plan (RTP) that will meet the target for the region, or an Alternative Planning Strategy (APS) independent of the RTP describing why the targets cannot be met. No on-the-ground change is likely to be seen for several years, until after each MPO actually adopts the sustainable communities plan called for in the law.

SB 732 – Strategic Growth Council

In September 2008, the Governor signed SB 732 creating the Strategic Growth Council (SGC). The SGC is a cabinet-level committee that is tasked with coordinating the activities of state agencies to:

- Improve air and water quality
- Protect natural resource and agriculture lands
- Increase the availability of affordable housing
- Improve infrastructure systems
- Promote public health
- Assist state and local entities in the planning of sustainable communities and meeting AB 32 goals

SB 732 gives the council authority to distribute Proposition 84 funds available for planning grants and incentives to encourage the development of regional and local land use plans designed to promote water conservation, reduce automobile use and fuel consumption, encourage greater infill and compact development, protect natural resources and agricultural lands, and increase adaptability to climate change. All projects and plans must be consistent with the state's planning priorities and reduce greenhouse gas emissions on a permanent basis consistent with AB 32 and any applicable regional plan. The planning grant criteria Priority Considerations award extra points for addressing climate change impacts on human and natural areas and adaptation planning to address these issues.

General Plan Guidelines

Climate change has also been recognized by the Governor's Office of Planning and Research (OPR) as a factor to be considered in preparation of local general plans. OPR is in the process of updating the 2003 *General Plan Guidelines*, which provide guidance to cities and counties in the preparation of their local general plans. The next update will reflect legislative requirements enacted since 2003 and provide new guidance on addressing climate change, adaptation, and related issues. The current *General Plan Guidelines* require a safety element as one of seven mandatory elements in the general plan. The primary aim of the safety element is to reduce the potential risk of death, injuries, property damage, and economic and social dislocation resulting from fires, floods, earthquakes, landslides, and other hazards. Local agencies are encouraged by California law to adopt Local Hazard Mitigation Plans (LHMPs) as part of their general plan safety elements.⁴ The LHMP must be consistent with the goals and objectives of both the local general plan and the SHMP. As such, the general plan and LHMP provide a local vehicle for implementation of the SHMP, including provisions dealing with climate change.

4.5.2 California Climate Adaptation Strategy (CAS)

In addition to leadership in greenhouse gas emissions reduction, California has moved forward in addressing adaptation to climate change. Adaptation is a relatively new concept in California policy. The term generally refers to efforts that respond to the *impacts* of climate change – adjustments in natural or human systems to actual or expected climate changes to minimize harm or take advantage of beneficial opportunities. Adaptation is directly linked to natural hazard mitigation.

⁴ AB 2140 provides financial incentives for local agencies to adopt LHMPs as part of the safety elements of their general plans.

Progress Summary 4.B: Climate Adaptation Strategy

Progress as of 2010: In December 2009, the *2009 California Climate Adaptation Strategy (CAS)* report was finalized. The CAS summarizes the best known science on climate change impacts in the state to assess vulnerability and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. This is part of an ongoing, evolving process to reduce California's vulnerability to climate impacts. California's ability to manage its climate risks through adaptation depends on a number of critical factors including its baseline and projected economic resources, technologies, infrastructure, institutional support and effective governance, public awareness, access to the best available scientific information, sustainably managed natural resources, and equity in access to these resources.

According to the CAS, the state has the ability to strengthen its capacity in all of these areas. Many of the climate mitigation strategies found in the AB 32 Scoping Plan, like promoting water and energy efficiency, are also climate adaptation strategies. By building an adaptation strategy on existing climate science and frameworks like the Scoping Plan, California has begun to effectively anticipate future challenges and change actions that will ultimately reduce the vulnerability of residents, resources, and industries to the consequences of a variable and changing climate. Now that the state has produced plans for climate mitigation and adaptation, closer coordination is needed to implement both approaches.

CAS Guiding Principles

To ensure a coordinated effort in adapting to the unavoidable impacts of climate change, the CAS was developed using a set of guiding principles:

- Use the best available science in identifying climate change risks and adaptation strategies.
- Understand that data continue to be collected and that knowledge about climate change is still evolving. As such, an effective adaptation strategy is "living" and will itself be adapted to account for new science.
- Involve all relevant stakeholders in identifying, reviewing, and refining the state's adaptation strategy.
- Establish and retain strong partnerships with federal, state, and local governments, tribes, private business, landowners, and non-governmental organizations to develop and implement adaptation strategy recommendations over time.
- Give priority to adaptation strategies that initiate, foster, and enhance existing efforts that improve economic and social well-being, public safety and security, public health, environmental justice, species and habitat protection, and ecological function.
- When possible, give priority to adaptation strategies that modify and enhance existing policies rather than solutions that require new funding and new staffing.
- Understand the need for adaptation policies that are effective and flexible enough for circumstances that may not yet be fully predictable.
- Ensure that climate change adaptation strategies are coordinated with the California Air Resources Board's AB 32 Scoping Plan process when appropriate, as well as with other local, state, national, and international efforts to reduce greenhouse gas emissions.

The CAS takes into account the long-term, complex, and uncertain nature of climate change and establishes a proactive foundation for an ongoing adaptation process. Rather than addressing the

detailed impacts, vulnerabilities, and adaptation of every sector, the CAS makes those determined to be at greatest risk the top priority.

4.5.3 CAS Preliminary Recommendations for Addressing Climate Change

The following preliminary recommendations on climate adaptation strategies included in the CAS were approved by the Climate Action Team (CAT),⁵ which represents all of state government. The CAT will lead in the coordination of measures and push to develop the necessary tools to effect adaptation protocols. California's mitigation and adaptation processes will be further integrated through extensive information exchange and consolidation of working groups from both efforts.

Implementation of the 12 preliminary recommendations for climate adaptation strategies included in the CAS will require significant collaboration among multiple stakeholders to ensure they are carried out in a rational yet progressive manner over the long term. These strategies include near-term actions that will be completed by the end of 2010 and long-term actions to be developed over time. The following summarizes these recommended strategies.

1. *Climate Adaptation Advisory Panel (CAAP)*. Appoint a panel (a) to assess the greatest risks to California from climate change and recommend strategies to reduce those risks, building on California's Climate Adaptation Strategy; and (b) to complete a report by December 2010.
2. *Water Management*. California must change its water management and uses because climate change will likely create greater competition for limited water supplies needed by the environment, agriculture, and cities. As directed by Senate Bill X71, state agencies must implement strategies to achieve a 20-percent reduction in per capita water use statewide by 2020, expand surface and groundwater storage, implement efforts to fix Delta water supply, quality, and ecosystem conditions, support agricultural water use efficiency, improve statewide water quality, and improve Delta ecosystem conditions and stabilize water supplies as developed in the Bay Delta Conservation Plan. [Note: this comprises a complex set of strategies that are perhaps more far-reaching than others recommended.]
3. *Land Use Planning*. Consider project alternatives that avoid significant new development in areas that cannot be adequately protected (planning, permitting, development, and building) from flooding, wildfire, and erosion due to climate change. The most risk-averse approach for minimizing the adverse effects of sea level rise and storm activities is to carefully consider new development within areas vulnerable to inundation and erosion. State agencies should generally not plan, develop, or build any new significant structure in a place where that structure will require significant protection from sea level rise, storm surges, or coastal erosion during the expected life of the structure.

⁵ To meet the state's greenhouse gas reduction targets, Governor Arnold Schwarzenegger issued Executive Order S-3-05 on June 1, 2005. The order directed the Secretary of the California Environmental Protection Agency (Cal EPA) to coordinate with the Secretary of the Business, Transportation and Housing Agency; Secretary of the Department of Food and Agriculture; Secretary of the Resources Agency; Chairperson of the Air Resources Board; Chairperson of the Energy Commission; and President of the Public Utilities Commission.

The Secretary of Cal EPA leads this **Climate Action Team (CAT)** made up of representatives from the agencies listed above as well as numerous other boards and departments. The CAT members work to coordinate statewide efforts to implement global warming emission reduction programs and the state's Climate Adaptation Strategy. The CAT is also responsible for reporting on the progress made toward meeting the statewide greenhouse gas targets that were established in the executive order and further defined under the Global Warming Solutions Act of 2006 (Assembly Bill 32).

4. *Agency Adaptation Planning.* All state agencies responsible for the management and regulation of public health, infrastructure, or habitat subject to significant climate change should prepare as appropriate agency-specific adaptation plans, guidance, or criteria by September 2010.

5. *State Project Assessment.* To the extent required by CEQA Guidelines Section 15126.2, all significant state projects, including infrastructure projects, must consider the potential impacts of locating such projects in areas susceptible to hazards resulting from climate change. Section 15126.2 was updated in March 2010 by the California Natural Resources Agency (CNRA) to direct lead agencies to evaluate the impacts of locating development in areas susceptible to hazardous conditions, including hazards potentially exacerbated by climate change.

6. *Hazard Mitigation Planning.* The California Emergency Management Agency (Cal EMA) will collaborate with CNRA, CAT, Energy Commission, and CAAP to assess California's vulnerability to climate change, identify impacts on state assets, and promote climate adaptation/mitigation awareness through the Hazard Mitigation Web Portal and My Hazards website as well as other appropriate sites.

7. *Habitat Protection.* The state should identify key California land and aquatic habitats that could change significantly during this century due to climate change and develop a plan for expanding existing protected areas or altering land and water management practices to minimize adverse effects from climate change-induced phenomena.

8. *Public Health Initiatives.* To build resilience to increased spread of disease and temperature increases, the California Department of Public Health will develop guidance by September 2010 for use by local health departments and other agencies to assess mitigation and adaptation strategies, including strategies to address impacts on vulnerable populations and communities and cumulative health impacts. The latter includes assessments of land use, housing, and transportation proposals that could affect health, greenhouse gas emissions, and community resilience for climate change, such as in the 2008 Senate Bill 375 regarding sustainable communities.

9. *Local Government Planning.* The most effective adaptation involves decisions that are the responsibility of local community planning entities. As a result, communities with general plans and Local Coastal Plans should begin, when possible, to amend their plans to assess climate change impacts, identify areas most vulnerable to these impacts, and develop reasonable and rational risk reduction strategies using the CAS as guidance.

10. *Wildfire Mitigation.* State fire-fighting agencies should begin immediately to include climate change impact information into fire program planning to inform future planning efforts. Enhanced wildfire risk from climate change will likely increase public health and safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, and vegetation conversions and habitat fragmentation.

11. *Energy Conservation.* State agencies should meet projected population growth and increased energy demand with greater energy conservation and an increased use of renewable energy. Renewable energy supplies should be enhanced through the Desert Renewable Energy Conservation Plan that will protect sensitive habitat while helping to reach the state goal of having 33 percent of California's energy supply come from renewable sources by 2020.

12. *Research*. Existing and planned climate change research can and should be used for state planning and public outreach purposes; new climate change impact research should be broadened and funded. By September 2010, the California Energy Commission will develop the CalAdapt website that will synthesize existing California climate change scenarios and climate impact research and to encourage its use in a way that is beneficial for local decision-makers.

4.5.4 Principles for Incorporating Climate Change

It is now clear that in coming decades natural disasters are broadly expected by members of the scientific community to intensify due to climate change. Emergency managers, planning agencies, private companies, and communities especially affected by climate change will be challenged to adapt their planning to take into account an increase in the type, extent, and intensity of natural hazards. Disasters expected to be more widely experienced in the future include avalanches, coastal erosion, flooding, sea level rise, extreme heat, drought, landslides, severe weather and storms, and wildland fires. As suggested in Section 4.2.1, particular interest and priority should be given to those climate change impacts having the potential to escalate to catastrophic levels. The following principles for incorporating climate change into state and local hazard mitigation planning are based on state law, policy, and emerging best practices. They are intended to be applied to interpretation of climate change issues in other chapters of the 2010 SHMP.

Assess the Opportunities and Constraints for Adaptation Policy

The first principle is that state and local agencies should determine “local adaptive capacity” based on an assessment of policy and socio-economic existing conditions. Similarly, these agencies should develop a mechanism for conducting an explicit accounting of barriers to climate adaptation policy (local policy, institutions, scale issues, spatial integration).

Adjust Hazard, Vulnerability, and Risk Assessments to Account for Climate Change

A second principle is that to inform their hazard, vulnerability, and risk assessments and policy based on these assessments, state agencies and local governments should use studies prepared by the State of California that describe the latest science regarding the impacts of climate change on California (see the Climate Change Portal: www.climatechange.ca.gov/). These studies have identified new hazards that may arise due to climate change, hazards that may change in frequency and severity, and hazards that will change in their spatial distribution. Moreover, as climate change may lessen the value of the historical record for assigning risk, these studies should provide forecasting data derived from updated models. In the 2010 SHMP, climate change impacts are recognized as having an effect on primary hazards such as flooding and wildfires described in Chapter 5; and secondary hazards, such as levee failure and landslides, as well as other climate-related hazards described in Chapter 6.

Identify Populations Vulnerable to the Impact of Climate Change

A third principle is that state and local agencies should identify people and communities most likely to experience negative effects of climate change-related hazards. Particular attention should be given to physically, socially, and economically vulnerable populations, since they may have less capacity to adapt to changing environments. This should be informed by the California Department of Public Health’s forthcoming guidance for use by local health departments and other agencies to assess mitigation and adaptation strategies, which include impacts on vulnerable populations and communities and assessment of cumulative health impacts.

Incorporate Climate Change Vulnerability Criteria into Identification and Prioritization of Hazard Mitigation Actions

A fourth principle is reflected in the following full statement of the CAS recommended Strategy #3, *Land Use Planning*:

Consider project alternatives that avoid significant new development in areas that cannot be adequately protected (planning, permitting, development, and building) from flooding, wildfire and erosion due to climate change. The most risk-averse approach for minimizing the adverse effects of sea level rise and storm activities is to carefully consider new development within areas vulnerable to inundation and erosion. State agencies should generally not plan, develop, or build any new significant structure in a place where that structure will require significant protection from sea level rise, storm surges, or coastal erosion during the expected life of the structure. However, vulnerable shoreline areas containing existing development that have regionally significant economic, cultural, or social value may have to be protected, and in-fill development in these areas may be accommodated. State agencies should incorporate this policy into their decisions and other levels of government are also encouraged to do so.

This recommended strategy should be applied to development of implementation measures in planning documents, decisions made under CEQA, grant applications and funding, capital project decisions, and land development and infrastructure financing.

Adopt Climate Change Adaptation Actions in Local Plans

A fifth principle is that cities and counties should adopt climate change adaptation actions in general plans, LHMPs, and Local Coastal Plans. Policy that anticipates climate change impacts, with the intention of reducing future risk, is inherently uncertain. In addition, adaptation measures vary widely because, in contrast to climate mitigation, which is more likely to provide equal benefits to stakeholders, the benefits of adaptation tend to be more spatially explicit. For example, coastal residents will disproportionately benefit from policy focused on adapting to sea level rise. Some key characteristics of effective adaptive policy are as follows:

- **Flexible.** Smith⁶ defines flexible adaptive policy as robust and resilient. It is policy that is applicable under a wide range of conditions. This is one response to uncertainty. Taking the idea of flexibility even further, de Loe et al⁷ advocate for reversibility as policy goal.

- **Cost-Effective.** The benefits of adaptive measures may not be realized for many years, if not decades. In an economic modeling sense, the further out the benefit, the lower current value due to discount rates. Another way of addressing this is to seek adaptive measures that have both long-term and short-term benefits or serve as both mitigation and adaptation measures.

- **Targets Irreversible Impacts.** Smith (1997) suggests that three situations are most appropriate for anticipatory adaptation: 1) irreversible impacts such as extinction, loss of an ecosystem (everglades), or extreme weather (hurricanes); 2) unfavorable trends where enacting adaptive policy now is more

⁶ Smith (1997)

⁷ de Loe et al (2001)

feasible than it is likely to be in the future (limiting population density in coastal areas); and 3) decisions, such as those regarding infrastructure, that have lengthy life spans.

- **Specific.** Anticipatory adaptation should target a specific climate impact and impact type. Smith and Wandel⁸ argue that uncertainty is best evaluated in the context of the issue in need of resolution. Most climate impacts that may require adaptive policy will have an expected speed of onset, rate of change, and scale.⁹ Policy will be more effective if tailored using the best available information about the anticipated impact. In addition to the timing and scale of impacts, the type of impact should also be articulated. Climate change acts directly on things like temperature and precipitation, but adaptive policy may focus on secondary impacts such as the impact of change in temperature and precipitation on crop yield. Depending on the specific impact, the resulting policy may vary.

Coordinate Adaptation and Climate Mitigation Actions

A sixth principle is that state and local agencies should ensure that actions taken for climate mitigation are coordinated with those taken for climate adaptation. Chart 4.A shows a figure from the *California Climate Adaptation Strategy* that illustrates the need for coordination.

Chart 4.A: Complementary and Conflicting Adaptation and Mitigation Actions

Source: *Climate Adaptation Strategy* (2009)

[Figure omitted]

Educate and Inform the Public about Climate Change

The seventh and final principle is that public outreach should be expanded to educate and inform stakeholders about climate change. The inclusion of stakeholders in the policy development process is widely advocated; what varies is the reasoning for this process and the definition of stakeholder. Stakeholders, defined as those who may be affected, are seen as critical participants in the policy-making process in order to assure their needs are met, to foster support for the resulting policy, and to reduce potential conflict. Stakeholders are also seen as a critical component of assessing vulnerability and establishing pre-existing adaptive capacity.¹⁰ In this case, stakeholders are defined not only as those who are potentially affected, but also local government and organizations. Another role for stakeholders in the preparation process was defined by Urwin and Jordan.¹¹ They called it “climate proofing,” where stakeholders play a role in identifying local actions. Climate proofing involves an evaluation of existing policy, including non-climate measures that may influence adaptive capacity.

Progress Summary 4.C: Local Climate Adaptation Policy Guide

Progress as of 2010: Taking these principles into account, Cal EMA is preparing to undertake a project helping to implement the 2010 SHMP through preparation of a Local Climate Adaptation Policy Guide (Adaptation Guide) for local governments. The Adaptation Guide will provide guidance for cities, counties, and special districts, as well as tribal organizations, regarding mitigation policies by which to adapt to climate change impacts. The project will be undertaken in cooperation with the California Natural Resource Agency (CNRA), with research and financial support from the California Energy Commission (CEC), and technical assistance provided by Cal Poly - San Luis Obispo.

⁸ Smith and Wandel (2006)

⁹ Smith et al (2000)

¹⁰ Smith and Wandel (2006)

¹¹ Urwin and Jordan (2008)

A key purpose of the Adaptation Guide is to help communities become more resilient through informed local planning leading to reduced losses from climate change impacts such as flooding, severe storms, mudslides, levee failure, wildfires, extreme heat, prolonged drought, and sea level rise. The Adaptation Guide will link SHMP hazard mitigation initiatives with science presented in the CNRA *2009 California Climate Change Adaptation Strategy* (CAS) and the *Climate Change Vulnerability Assessment* (CCVA) currently in preparation by the CEC. The Adaptation Guide will provide a decision-making framework for use by state, regional, local, and private sector stakeholders to aid in the interpretation of climate science for local impacts and create a systematic rationale for reducing risks from natural hazards exacerbated by climate change. Attention will be given to 1) multi-jurisdictional coordination strategies, 2) integration of climate adaptation with local comprehensive planning, and 3) land use and other policy options for dealing with climate adaptation.

The Adaptation Guide will offer new information by which at-risk communities can integrate climate adaptation actions with Local Hazard Mitigation Plans, general plan safety elements, Climate Action Plans, Local Coastal Plans, and regional sustainable growth planning. It will also benefit private-sector stakeholders by providing a decision framework by which businesses, industries, and non-governmental organizations (NGOs) can undertake their own strategic planning for adaptation with an eye to potential mitigation investments, product adaptation, and new marketing initiatives.