

# **Effective Governance for Multi-Jurisdictional, Multi-Sector Climate Adaptation**

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## **Introduction**

An increasing number of San Francisco Bay Area organizations—including major cities, counties, water districts, land conservation managers, transportation agencies, flood control districts, community-based organizations, and academic institutions—are now working to develop and implement projects and plans to prepare the Bay Area for a changing climate. In many cases, the problems these groups are addressing, such as extreme storms, sea level rise, heat waves, and energy/water supply issues, move across traditional city and county boundaries. Furthermore, as national climate adaptation experts have pointed out, successful solutions to the impacts of climate change will require not only government agencies, but also private and non-profit sector actors including energy utilities, transportation and communications companies, health care providers, and private landowners.

Given this complex institutional environment, a critical factor to the Bay Area’s eventual success will be an effective multi-jurisdictional, multi-sector decision-making and governance structure. In this report, part of the Kresge Foundation-funded regional adaptation needs assessment by the Joint Policy Committee, we add to the recent work on governance conducted by the Bay Area Conservation and Development Commission (BCDC) (*Adapting to Rising Tides*), the Association of Bay Area Governments (ABAG) (*Regional Resilience Initiative*), and others in the region, and pose a series of questions that should be addressed through in-depth discussions among Bay Area leaders in the coming months.

Our findings are presented in five sections.

- A literature review focuses on information related to multi-jurisdictional, multi-sector adaptation planning.
- An initial review of governance in six selected adaptation-related initiatives—New York City, Southeast Florida, Chicago, Sonoma County, Kings County, and the Bay Area Integrated Regional Water Management Plan.
- An inventory of the key players that will be involved in Bay Area climate adaptation planning and implementation.
- Findings from a workshop discussion on regional/local decision-making among selected Bay Area adaptation leaders.
- Governance questions that require more in-depth discussion and a proposed roadmap for Bay Area leaders to address them.

## **I. Literature Review**

### **Methodology:**

This review was focused primarily on scholarly works, studies, and frameworks for adaptation. The searches for these studies were conducted through database research and Google searches of relevant terminology. More general sources of information were also collected through evaluation of cited resources and interlinked information in previously examined documents or websites. Approximately 250 sources were initially evaluated based on promising titles or executive summaries.

### **Key Findings:**

1. There is an enormous amount of information in print about the potential effects of climate change. There is also a growing body of literature that analyses and comments on early adaptation efforts, particularly those directed to understanding, research, and planning.
2. While there is a very large body of scholarship on the science and predicted or observed effects of climate change, the literature on specific applications of adaptation governance is thin by comparison and relatively recent. In particular, there is little information about actual implementation of adaptation plans and processes, particularly as they intersect with multi-jurisdictional governance. As one paper stated, “research on climate adaptation to date suggests that few adaptation processes have reached [the phase of management], partly because the barriers before and in the implementation stage are so significant and partly because climate change adaptation has emerged as a concern only recently.”<sup>1</sup> This general sentiment can be found in much of the recent adaptation literature. As a result, much of the theorization and many of the case studies focus only on the information gathering and planning phases of climate adaptation. This will require some extrapolation of the available studies and creative assembly of the pieces to develop information that helps the Bay Area develop a governance approach. This also puts additional importance on learning in “real time” from other regions and stakeholders that are currently addressing climate change adaptation.

### **Key Relevant Documents:**

#### ***California Adaptation Planning Guide***

California Emergency Management Agency & California Natural Resources Agency (2012)  
[http://resources.ca.gov/climate\\_adaptation/local\\_government/adaptation\\_policy\\_guide.html](http://resources.ca.gov/climate_adaptation/local_government/adaptation_policy_guide.html)

Overview: The California Adaptation Planning Guide (APG) “provides guidance to support regional and local communities in proactively addressing the unavoidable consequences of climate change” and “provides a step-by-step process for local and regional climate vulnerability assessment and adaptation strategy development.” The APG includes a main “Planning Guide” that lays out the essential framework for adaptation planning and vulnerability assessments and three accompanying documents: (1) “Defining Local and Regional Impacts,” (2) “Understanding Regional Characteristics,” and (3) “Identifying Adaptation Strategies.” The APG answers

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<sup>1</sup> : Susanne C. Moser & Julia A. Ekstrom, *A Framework to Diagnose Barriers to Climate Change Adaptation*, 107 PNAS 22026 (2010).

essential questions such as “How complicated is the climate adaptation planning process?”; “Who needs to be involved?”; and “What is the best way to get started?”

The APG details a nine-step process for vulnerability assessment and adaptation strategy development for eight specific sectors: (1) public health, socioeconomic, and equity impacts, (2) ocean and coastal resources, (3) water management, (4) water supply, (5) forest and rangeland, (6) biodiversity and habitat, (7) agriculture, and (8) infrastructure. The document “Understanding Regional Characteristics” details the climate change effects and major areas of concern for each region of California, including the Bay Area. The document “Identifying Adaptation Strategies” lists specific example strategies that can be implemented in a number of defined categories, including factors to consider, information resources specific to each action item, and co-benefits.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: While the frameworks and guidance in the APG do not specifically address multi-jurisdictional governance, the adaptation strategies in these sources can be a helpful starting point for a multi-jurisdictional approach to climate change adaptation. Many adaptation action items that are necessary for single entities (cities, counties, etc.) will also be required for regional approaches. Once steps toward adaptation are identified, the regional governance levers that allow those steps to be completed can be more easily identified.

### ***A Survey of Climate Change Adaptation Planning***

H. John Heinz III Center for Science, Economics and the Environment (2007)

[http://www.heinzcenter.org/Workshops\\_files/A%20Survey%20of%20Climate%20Change%20Adaptation%20Planning.pdf](http://www.heinzcenter.org/Workshops_files/A%20Survey%20of%20Climate%20Change%20Adaptation%20Planning.pdf).

Overview: This somewhat dated but comprehensive document reviews eleven existing (2007) adaptation planning efforts in the U.S. plus seven planning efforts outside this country, as well as a number of adaptation planning guidebooks. The guidebook reviews include helpful reporting on their decision-making structures. The guidebooks were evaluated against a set of criteria and compared with one another. Very basic information is presented for the planning initiatives with web links for more detail.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: This review and similar reports were not conducted specifically to address multi-jurisdictional governance concerns about climate change. However, the planning documents and sources that are evaluated within these documents contain decision-making and governance information that can still be of use for future efforts to highlight sources on specific topics.

***Method Development for Identifying and Analyzing Stakeholders in Climate Change Adaptation Processes***

Karin Andre et al., 14 J. Environ. Pol. & Planning 243 (2012)

[http://www.researchgate.net/publication/232031554\\_Method\\_Development\\_for\\_Identifying\\_and\\_Analysing\\_Stakeholders\\_in\\_Climate\\_Change\\_Adaptation\\_Processes](http://www.researchgate.net/publication/232031554_Method_Development_for_Identifying_and_Analysing_Stakeholders_in_Climate_Change_Adaptation_Processes)

Overview: This paper provides a system of identifying stakeholders for climate adaptation planning. The authors highlight the value of stakeholder identification to climate change, and conclude that the best stakeholder in this context is flexible “but also systematic enough to fulfill practical and scientific requirements for the . . . advancement of ongoing adaptation processes and implementation.” The paper first goes into some depth about the importance of identifying stakeholders before discussing some of the methods of stakeholder identification, beginning with a basic division between primary and secondary stakeholders (primary stakeholders are those who will be affected by the measures and policies, while secondary stakeholders are those who are responsible for implementation). The framework suggested by the authors is a 5-step method. The first step is to “make a broad inventory of all potential stakeholder types.” The authors suggest four criteria that can be used to identify stakeholders in a climate adaptation situation: (1) functional criterion; (2) geographical location criterion; (3) knowledge and abilities criterion; and (4) hierarchical level criterion. The second step is to specify the generic roles of the stakeholders that should be involved in the participatory process. Step three is to select and classify stakeholders for the adaptation project at hand using the previous criteria. Step four is to associate stakeholders with roles. Step five is to analyze the interests and influence of the identified stakeholders. Each of these steps is explained in some theoretical detail, and the authors provide some specific advice and lessons from their case studies to guide the exercise.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: One of the most important issues for comprehensive Bay Area adaptation planning will be managing large numbers of diverse stakeholders. Climate impacts will reach into many areas of Bay Area life, involving human health, infrastructure, natural systems, the economy and more. Therefore, a better understanding of stakeholder selection and roles could be very helpful to creating a successful adaptation planning process.

***A Framework to Diagnose Barriers to Climate Change Adaptation***

Susanne C. Moser & Julia A. Ekstrom 107 PNAS 22026 (2010)

<http://www.pnas.org/content/107/51/22026.full>

***Identifying and Overcoming Barriers to Climate Adaptation in the San Francisco Bay Area: Results from Case Studies***

Susanne C. Moser & Julia A. Ekstrom, California Energy Commission (2012)

[http://www.climatechange.ca.gov/adaptation/third\\_assessment/](http://www.climatechange.ca.gov/adaptation/third_assessment/)

Overview: The first paper presents a “systematic framework to identify barriers that may impede the process of adaptation to climate change.” The authors present a three-part framework to identify impediments to the adaptation process. First, the authors provide background about adaptation practices and define a “barrier” in this context. In particular, they differentiate barriers to adaptation from limits on adaptation. Limits are physical, ecological, or other factors that place an absolute limit on the ability of a system to adapt. Barriers are “obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc.” The paper lays out a three-part framework for discovering barriers. Part one is the “process of adaptation”, including understanding the problem, planning adaptation actions, and managing implementation of the selected options. Part two looks at issues that cut across all phases of climate adaptation, such as leadership, communication, and issues of resources. The third part of the framework uses a “simple matrix” to help identify ways to overcome a given barrier.

The second paper (1) identifies adaptation barriers encountered by local government entities in the Bay Area, (2) tests the usefulness of the diagnostic framework described in the first paper, and (3) draws larger lessons about the adaptation process and importance of adaptation barriers. The paper looks at initiatives in Hayward, San Francisco, Santa Clara and Marin, plus the Joint Policy Committee’s regional adaptation project.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: The first paper provides guidance that will be most helpful in determining the scale and scope of regional adaptation planning in the Bay Area. What number and type of barriers will be encountered depending on the chosen approach? The paper’s focus is on “the *intentional, planned* adaptation process without presuming a particular set of actors, level of planning, or involvement of government; rather, we attempt to account for the complexity of a deliberate and more involved process.” The authors conclude that “choosing a particular scope and scale of adaptation has significant implications for the number and types of barriers activated and encountered by choosing different adaptation actions or pathways. System transformations will require different and likely more challenging barriers to be overcome than planning or implementing immediate measures to cope with a climate-driven disaster.”

The second paper found that, in the Bay Area, “institutional and attitudinal barriers dominate, but economic barriers are also important, even in wealthy locales. Leadership emerged as a critical factor in moving forward on adaptation. Science mattered some, but policy and planning opportunities were more significant in motivating or launching the adaptation process. The study also found that communities have assets, aids, and advantages that can help them avoid barriers and that there is significant opportunity to affect and overcome the barriers that are being encountered in the “here and now.” However, local communities need outside intervention to address “legacy” and “remote” barriers. With still very little visible adaptation activity “on the ground,” the study concluded that a big portion of what communities are doing to date is working on overcoming the barriers to adaptation instead.

***A Framework for Dialogue Between Local Adaptation Professionals and Policy Makers***

Rasmus Klocker et al, Stockholm Environmental Institute (2011)

<http://www.stockholmresilience.org/21/publications/artiklar/5-9-2011-a-framework-for-dialogue-between-local-climate-adaptation-professionals-and-policy-makers.html>

Overview: This paper explains how climate adaptation planning, still at very early stages in most areas, looks to “mainstream climate adaptation into sectoral policies.” This is an “upscaling” model in which lessons learned from local change processes are used to inform decision-making at higher administrative levels.” The authors discuss how this “political approach” requires a dialogue between policy makers designing regulatory policy and professionals engaged in research projects.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: This work is directly relevant to the Bay Area as we move from numerous local adaptation projects and studies, often with no links to broad Bay Area policy-making, to more comprehensive regional planning. How can local climate adaptation projects best use their data, experiences and insights to inform policy? How do local climate adaptation lessons become relevant for public policy? What are the opportunities and risks involved in exploiting local case studies for climate adaptation policy making? How do research projects navigate the many expectations and demands from the clients of policy in order to make their contributions relevant? The authors present a methodological framework and a new vocabulary for researchers and their partners to consider more explicitly the different ways case studies can be used to inform policy processes.

***Adapting to Climate Change Through Local Municipal Planning: Barriers and Challenges***

Thomas Measham et al, Mitigation and Adaptation Strategies for Global Change, December 2011, Volume 16, Issue 8, Pages 889-909

<http://link.springer.com/article/10.1007%2Fs11027-011-9301-2>

Overview: This paper outlines how most evaluations of local government adaptation planning focus on recognized constraints such as limited resources and lack of information. The authors argue that this focus has obscured a wider set of constraints that need to be addressed if adaptation is likely to advance through local planning. They propose that there are more fundamental challenges affecting local, place-based planning by “drawing on the related field of community-based environmental planning (CBEP).”

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: While the paper considers a case study of 3 municipalities in Sydney Australia, the authors focus on 3 challenging factors —leadership, institutional context and competing planning agendas—that will be critical to Bay Area multi-jurisdictional planning. They show how these factors can serve as constraints or enabling mechanisms for achieving climate adaptation depending upon how they are exploited in any given situation. The paper concludes that, through addressing these

issues, local, place-based planning can play a greater role in achieving climate adaptation.

***Climate Adaptation Planning in Practice: An Evaluation of Adaptation Plans from Three Developed Nations***

Benjamin L. Preston et al., 16 Mitig. Adapt Strateg. Glob. Change 407 (2011)

<http://libra.msra.cn/Publication/48565505>

Overview: This paper evaluates 57 adaptation plans from the United States, Australia, and the United Kingdom, using evaluation criteria from 19 existing guidance instruments for adaptation planning.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: The selected adaptation plans are evaluated and used to identify weaknesses and strengths. Specific attention is paid to weaknesses that could inform Bay Area planning, such as “disparities between the elements of adaptation planning typically suggested in guidance instruments and those that actually appear within planning documents” and “a limited appreciation of the wider governance context in which both climate change and its management will manifest.”

***Urban Environmental Challenges and Climate Change Action in New York City***

William Solecki, 24 Environ. & Urbanization 557 (2012)

<http://eau.sagepub.com/content/24/2/557.abstract>

Overview & Summary: This evaluation looks at the efforts of New York City to respond to current and future climate impacts, covering the history of NYC’s response to environmental challenges and the climate issues that NYC is projected to face in the future. The article then discusses the development and efforts of the New York City Panel on Climate Change.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: The Bay Area and other metro areas can learn much from how New York’s well financed and organized adaptation initiative has begun to define and implement a set of climate actions over the past five years.

***Climate Changes Impacts, Vulnerabilities and Adaptation in the San Francisco Bay Area: A Synthesis of PIER Research Reports and Other Relevant Research***

Julia A. Ekstrom and Susanne C. Moser, California Energy Commission (2012)

[http://www.climatechange.ca.gov/adaptation/third\\_assessment/](http://www.climatechange.ca.gov/adaptation/third_assessment/)

Overview: This 63-page report summarizes existing and projected climate change impacts on the San Francisco Bay Area.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: A better understanding of the key impacts and vulnerabilities in the region can inform regional leaders who are determining the structure and range of multi-jurisdictional, multi-sector planning and decision-making.

### ***California Vulnerability and Adaptation Study***

California Institute for Energy & Environment (2012)

<http://uc-ciee.org/climate-change/california-vulnerability-and-adaptation-study>

Overview: This study is a wide-ranging look at adaptation and vulnerability in California, comprising 30 reports involving 120 researchers from seven UC campuses and other institutions. The study addressed questions like: What do rising sea levels mean for coastal communities? With the vital Sierra snowpack shrinking, can California ensure ample water for homes and for its world-leading agriculture and wine industries? As temperatures climb, where is California most at risk for devastating wildfires or public-health threats to our most vulnerable citizens? The results provide planners, public-health officials, land-use managers, and others with research-backed information to develop adaptation strategies.

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: 10+ of these reports are related to Bay Area climate impacts and adaptation strategies. While they focus primarily on climate science, there are many clues for governance and decision-making across jurisdictions and sectors. (The second Moser/Ekstrom report on Bay Area barriers and the Ekstrom/Moser report summarizing Bay Area climate impacts, cited above, are both a part of this 30-study compendium.)

### ***Adapting to Rising Tides (Six Reports)***

Bay Conservation and Development Commission (2011-12)

<http://www.adaptingtorisingtides.org/project-reports/>

Overview: BCDC's Adapting to Rising Tides Project, focused on the East Bay shoreline from the Bay Bridge to the San Mateo Bridge, has produced six excellent reports:

- Vulnerability and Risk Assessment Report
- Addressing Social Vulnerability and Equity in Climate Change Adaptation Planning
- Impacts on Transportation Infrastructure
- Assessing Climate Change Vulnerability and Risk
- Existing Conditions and Stressors Report
- Climate Impacts Statement

Relevance to Bay Area Multi-Jurisdictional, Multi-Sector Decision-Making: These reports focus the spotlight on the Bay Area's most critical and complex multi-jurisdictional adaptation arena,

the impacts on bay and coastal resources from sea level rise and extreme storm events. BCDC's study on governance is in draft form for release later in 2013.

*Annotated Bibliography – See Appendix A*

## **II. Review of Existing Adaptation Planning Processes**

This section reviews the governance efforts of four metro areas in the U.S. that can inform the Bay Area's design of multi-jurisdictional, multi-sector adaptation planning, as well as two Bay Area adaptation-related processes. We look at New York City, Southeast Florida, Chicago, King County (WA), Sonoma County and the Bay Area Integrated Regional Water Management Plan. The information below was obtained through phone interviews and literature review. This review does not include the Bay Area's premier multi-jurisdiction adaptation project, BCDC's Adapting to Rising Tides, which has already been extensively chronicled at [www.adaptingtorisingtides.org](http://www.adaptingtorisingtides.org)

### **Key Findings**

1. **Dearth of Regional Case Studies** – While we reviewed several useful examples of city and county adaptation planning processes, there is no clear case study that demonstrates a binding governance structure across jurisdictional lines, comprehensive or otherwise.
2. **Valuable City & County Lessons** – The available case studies, however, offer important lessons that should inform the eventual decision-making structure for Bay Area adaptation, no matter what the level of inter-jurisdictional collaboration. Particularly, city and county examples shed light on various options for organizing scientific research teams, interdepartmental teams, and executive bodies.
3. **Managing Internal and External Stakeholders** – While the leaders of a major city such as Chicago or New York would appear to have an advantage in moving forward with adaptation efforts within a given jurisdiction, such leaders can still face considerable challenges in getting various departments to work together willingly and effectively. Moreover, these cities have recognized the importance of engaging a broad range of external stakeholders such as utility companies and community organizations. Their lessons emphasize the necessity of cataloging the parties that the region needs to collaborate with early on, considering the best order for engaging them, and focusing on the data these stakeholders care about to drive the discussions. Learning from the organizational approaches in these cities can be an important part of establishing an effective approach for the Bay Area.

The Bay Area's understandable focus on sea level rise and related storm events can sometimes obscure the importance of planning for other climate impacts. The U.S. planning efforts reviewed here covered a wide range of topics and sub-topics including:

- **Air**
  - Air quality, temperature
- **Agriculture**
  - Farming, food
- **Communications**
  - Public education, landowner education, regulation notice, lobbying
- **Economy**
  - Economic development, diversity, stability
- **Energy**
  - Energy sources, demand
- **Emergency Management**
  - Flooding, storms, fire
- **Health**
  - Safety, public services
- **Heating/cooling**
- **Infrastructure/transportation**
  - Roads, bridges, public transportation
- **Land use/built environments**
  - Building codes, urban design, development
- **Natural environments**
  - Wetlands, forests, wildlife disease management
- **Science**
  - Climate science, emissions tracking, forecasting, data systems
- **Water**
  - Flood control, drinking water, sediment, wastewater treatment, drought control

Given that most U.S. metro regions have not yet implemented formal climate adaptation programs, many of the potential governance models and lessons learned for the Bay Area are likely not publicly adopted, but instead are currently under discussion. Continuing research must be done when these efforts become public.

## New York City—[PlaNYC: Climate Change](#)

### *One City and the Overlap of Federal, State, and Local Authorities*

The unique feature of New York City’s work is that although it is focused on the five boroughs of New York City and not the larger metropolitan area, the city’s efforts inevitably require interaction with many other entities, including regional, state, and federal governments plus private owners of communications and other infrastructure.

The original climate action plan drafted by NYC in 2007, as well as its 2011 update, enumerate mitigation and adaptation initiatives for the city to undertake, but not the details of which departments should take these actions. The 2011 plan does indicate, however, that various interagency task forces have been created to address sections of the plan that cross multiple city departments, including groups for wetlands, energy, and parks. In addition, a Green

Infrastructure Task Force “will exploit opportunities provided by planned public infrastructure projects,” and a Green Codes Task Force has “developed 111 specific proposals for sustainable improvements to [NYC] codes, many of which have already been enacted.” Finally, the NYC Panel on Climate Change’s 2010 report details many more functional specifics, including which codes/standards various departments have to follow, and describes a process of managing these departmental functions by changing the standards themselves at whatever jurisdictional level (local, state, or federal) is appropriate.

New York City’s 2007 climate action plan called for the creation of two entities: the NYC Panel on Climate Change, made up of climate science experts, and the NYC Climate Change Adaptation Task Force, consisting of city, state, and federal agency representatives responsible for various aspects of city operations. These groups were first convened in 2008, and in 2010, the NYC Panel on Climate Change released its 354-page report, *Climate Change Adaptation in New York City*. In chapter five of the report, the panel took an in-depth look at how multi-jurisdictional laws and regulations relate to climate change adaptation, as demonstrated by the example table below on land use.

Climate change adaptation in New York City				Ch 5. Law and regulation
<b>Table 5.1. Examples of laws, regulations, and standards</b>				
Sector	Type	Jurisdiction	Examples	Source
Land use	Statute	Federal	National Environmental Policy Act (NEPA)	U.S. Congress
	Statute	State	NYS Environmental Quality Review Act (SEQRA)	NYS Legislature
	Regulation	State	DEC SEQRA regulations	NYS Department of Environmental Conservation
	Statute and regulation	Local	City Environmental Quality Review (CEQR)	NYC Council and Office of Environmental Coordination
	Statute	Local	NYC Zoning Resolution	NYC Council
	Statute	State	Tidal Wetlands Act	NYS Legislature

The NYC adaptation report listed a number of examples of laws, regulations, and standards touching on various categories of adaptation. In addition, the report identified specific climate measurements that will be important to track as the climate changes, and discussed how these measurements could inform the drafting of “climate protection levers” -- rules that govern New York City operations, amended to ensure resilience in the face of a changing climate. The NYC Climate Adaptation Task Force reviews these recommendations, formulating strategies to update policies across local and national jurisdictions, and implementing revised standards across city departments.

The table below provides an example of possible levers for adapting to flood risks.

**TABLE 5. Examples of Standards and Possible CPLs**  
**Coastal Flooding and Storm Surge**

Current Standard	CPL Recommendations	Stakeholder
FEMA 1-in-100 year flood zone	Incorporate sea level rise projections into regulatory maps of coastal areas, including FEMA Flood Insurance Rate Maps (FIRMs), A- and V-zones, and the SLOSH model.	Federal Emergency Management Agency
NYS DOT requires that bridges be designed with a substructure opening adequate to accommodate the 1-in-100 year flood volume for in-state bridges and the 1-in-500 year flood volume for interstate bridges. <sup>1</sup>	Consider adjusting requirements of substructure openings to account for the increase in flood elevation and flood extent expected with the projected elevations of the 1-in-100 year flood for the 2080s.	New York State Department of Transportation
NYS DOT requires non-navigable waterway bridges to have a 2 ft freeboard clearance above the 1-in-50 year flood level. <sup>2</sup>	Evaluate the need to include sea level rise projections into the NYS DOT mandated two-foot freeboard clearance for bridges.	New York State Department of Transportation
FHWA requires bridge owners to inspect bridges for potential scour associated with the 1-in-100 and 1-in-500 year floods. <sup>3</sup>	Incorporate SLR projections for the elevations of the 1-in-100 year flood into FHWA's requirement that bridge owners check for scour associated with the 1-in-100 and 1-in-500 year event.	Federal Highway Administration
The Waterfront Revitalization Program <sup>4</sup> establishes policies for the development and use of New York City's Coastal Boundary lands. <sup>5</sup>	Incorporate sea level rise projections into the New York City Coastal Zone Boundary.	New York City Department of City Planning, NYS Department of State

Standards such as those described above would compel action related to specific adaptation goals listed by the NYC Panel on Climate Change. For example, the Panel found that a goal of adapting development and building codes to climate change forecasts could be achieved by incorporating sea level rise projections into FEMA Flood Insurance Rate Maps and other regulatory maps of coastal areas. The report describes the current standard and leaves it up to the NYC Climate Change Adaptation Task Force to determine how the standard would need to change to in order to meet the adaptation goal.

Other recommended levers include updating the outside base air temperature (currently 89°F) for building air conditioning standards, and reviewing the effect of heat on construction materials (which would require creating a standard).

Strategies related to these legal/process levers include advocating for policy changes at state and federal levels to update standards, as well as drafting standards linked to climate protection levels where they do not currently exist.

Finally, in August 2012, the New York City Council passed legislation that institutionalized the NYC Panel on Climate Change and NYC Climate Change Adaptation Task Force, requiring their regular meeting and reporting in order to continue climate adaptation efforts beyond the current administration.

A key participant in organizing New York’s program offered several key lessons learned:

- 1) **Political Support** – Having strong backing from a particularly strong mayor was critical. Being housed in the Mayor’s office was instrumental in getting the substantial resources needed for the planning process.
- 2) **Context** -- In working with large city departments, it was important to frame climate adaptation planning as an extension of existing planning and facility evaluation activities. Rather than being seen as an entirely new activity for already burdened city departments, climate

planning is introduced as another factor (albeit a very important one) for managers to consider in their on-going risk management efforts.

3) **Broad Engagement** – The city needed to engage all levels of the government and the private sector in order to be successful. In particular, the insurance industry is critical since it has a large stake in adaptation efforts to minimize the risk of increased claims as the result of climate change related events. In addition, it was important to involve private infrastructure owners, utility companies, and communication providers early on. The city focused on reaching out to major private sector stakeholders first, but continued to reach out and elicit input from building owners, hospital and nursing homes managers, nongovernmental organizations, and environmental justice communities.

4) **Focus on Resilience** – An important lesson learned was that by framing discussions on improving the city’s resilience to future weather events rather than focusing on climate change appealed to a broader range of individuals. Asking stakeholders if they have to deal with and plan for heat waves, floods, and other well-understood risks increased their involvement.

5) **Urgency** – Finally, in addition to focusing on resilience, Freed believed that an emphasis on the need for adaptation planning and coordination to assist stakeholders with growing risks they currently faced, rather than on future risks, can build more urgency internally and externally to plan and act at an accelerated pace.

### **Southeast Florida Climate Compact:**

#### ***Approaching Regional Planning Carefully: Recommendations-Only Governance***

The Southeast Florida Climate Compact is a project of four counties in southeast Florida (Broward, Miami-Dade, Palm Beach, and Monroe) that include over 100 cities. The efforts of this region in addressing intergovernmental interaction and its management appear to be unique among existing U.S. climate adaptation projects.

The region’s efforts present two key takeaways. First, Southeast Florida provides a valuable example of how to initially approach climate adaptation as a broad region. Second, the SE Florida approach provides one example of a multi-jurisdictional governance model, where recommendations are provided for individual municipalities to adopt, without placing a mandate or authority over each city or county’s actions.

The Southeast Florida work began with the four counties organizing a regional climate leadership summit in 2009 to discuss climate change mitigation and adaptation. The summit ended with the drafting of a Compact among the four counties to jointly develop a regional climate action plan. The Compact was adopted by all four counties by January of the following year.

The Compact created a “Compact Staff Steering Committee” (consisting primarily of county administrators, assistant city managers, and sustainability officers) and assigned staff and resources from each county to implement the compact under the direction of the steering committee. The steering committee then created three working groups (Built Environment, Transportation, and Land and Natural Systems), each consisting of more than thirty individuals from different geographic areas of each county.

Over the next two years, the Steering Committee and working groups developed the regional climate action plan, which was finalized and published in October 2012. During the process, the counties recognized the need to formalize collaborative efforts among local governments and expanded the steering committee to include municipal representation.

Southeast Florida provides one possible “voluntary” multi-jurisdictional, multi-sector governance model. The *Southeast Florida Regional Climate Action Plan* “does not provide a mandate for any county or municipal actions, but rather serves as a living document with options that each regional or local government may adopt and utilize based on their interests and vision for the future.”

The climate action plan includes recommendations across various categories of adaptation and the implementation guide offers a framework on how local governments can create their own specific program to enact the action plan’s recommendations. The counties recognized that local conditions and variations in local governments would require different actions to be devised and managed in each city or county. The objective of the regional plan is to integrate adaptation into existing decision-making systems or create new policies as necessary, and municipality-specific implementation was seen as the best way to achieve this.

An interview with Steve Adams, Senior Advisor on Climate Adaptation at the Institute for Sustainable Communities, and a key consultant to the Southeast Florida Climate Compact identified several key lessons from Southeast Florida’s progress:

1) **Reviewing the Need for Collaboration** – Adams raised a crucial question that multi-jurisdictional regions must consider from the very beginning: on which specific climate issues (and to what extent) their communities should work collaboratively rather than individually. The benefits and costs of working in concert should be given serious attention given the time and resources that such collaborations can require. For Southeast Florida, the need for at least some collaboration and the disadvantages of working in isolation became apparent when leaders from two counties met separately with the U.S. Congressmen they share. After those meetings they discovered that they had gathered conflicting statistics on climate impacts in the region and were undertaking duplicative climate research and planning.

2) **Tradeoff of Decentralized Implementation** – As mentioned above, Southeast Florida viewed the benefit of working in collaboration primarily as the efficiency of sharing resources in research and planning. It did not enter into the process intending to implement actions across the region, and in fact, the compact includes no mandate to ensure any actions are taken at all,

whether locally or regionally. However, the four counties recognized that they each had their own goals and incentives to move forward on climate change planning and could work together for guidance on what actions to implement on their own. Moreover, by delaying any efforts to implement region-wide actions, the counties hoped to move more quickly, to make progress, and to use that success to propel the efforts forward, gathering more support from key stakeholders along the way.

3) **Investing in Teambuilding** – A major lesson taken from Southeast Florida’s experience was the necessity of facilitating introductions and fostering relationships among the various county and municipality staff members from the start. Adams said he would focus more heavily on teambuilding if he were to replicate such a project. Furthermore, he found it very important to have an annual climate summit that brought participants together to continue to build relationships and to function as an annual checkpoint by which time parties would aim to have made reportable progress.

### **Chicago Climate Action Plan: Adaptation**

#### ***A dominant city working with a large metropolitan area***

Chicago included adaptation efforts as a key part of its 2008 Climate Action Plan and evaluated actions by various criteria, including regional impact. While the plan itself is a project implemented only within the city’s jurisdiction, the climate action plan recognized that collaborative efforts were already taking place in regards to water management, and stated that the city planned to work with the Metropolitan Water Reclamation District to prepare a watershed plan for climate change. In addition, the city made a deliberate choice to conduct research on behalf of the greater Chicago region during its planning process and provide those findings to leaders throughout the area.

The climate action plan recognized the need for cooperation among the Chicago area’s municipalities and pointed to the creation of the six-county Metropolitan Mayors Caucus, which itself created the *Greenest Region Compact of Metropolitan Chicago*. This document commits more than 275 mayors in the caucus “to work to preserve the region’s resources, climate and economic vitality for future generations.”

Key lessons and takeaways from Chicago’s climate change mitigation and adaptation efforts have been summarized in an excellent report “Lessons Learned: Creating the Chicago Climate Action Plan” available at <http://coolcities.us/resources/ForumLinks/CAP/LessonsLearned.pdf>. Key lessons listed in the paper are organized below into central themes. Each of these lessons is described in further detail in the full report.

#### **1) Broad Involvement**

Engaging and maintaining a broad spectrum of stakeholders was most important. This included having strong support from the Mayor’s Office as well as support from other government, civic,

and business leaders. It is also important to have a commissioner of the Department of Environment (or similarly situated champion) to move climate planning ahead and dedicated city staff. Chicago also highlighted the value of a strategic nonprofit partner, foundations, a task force of local leaders, a research advisory committee, and long-term public-private partnerships.

## **2) Important Early Considerations**

Chicago found that it was critical to be clear up front about who owned the plan, noting that a decision was made to make this a city-wide plan backed by the Mayor's office rather than under the banner of only one lead department. It also emphasized the need for new, dedicated funds to support research, planning, and implementation; building on existing planning initiatives; and moving to some implementation early in the process.

## **3) Maintaining Progress**

Other lessons learned in Chicago related to continuing and enhancing the project's efforts once they were underway. The city found that frequent climate summits were important to get input and to update external stakeholders, while separate opportunities were provided for city commissioners and sister agencies to offer input. Furthermore, Chicago found that solid research was essential to lend leaders credibility when establishing future goals and actions. This research base was also important to providing an ongoing resource the city would use as the process moves ahead.

- Chicago also highlighted the necessity of an aligned communications strategy and a way to track progress and continually reassess strategies.

## **King County Climate Plan and King County-Cities Climate Collaboration**

### ***County Leadership of Adaptation Planning and Facilitating Collaboration among Cities***

King County was one of the first municipalities in the U.S. to address climate mitigation and adaptation. The county laid out a broad and ambitious approach in its 2007 Climate Plan, focusing on actions the county could take within its own jurisdiction. For governance within the county, leaders organized an interdepartmental climate change adaptation team, as well as a climate change technical advisory group, and coordinated with science teams already housed within county departments such as the Water and Land Resources Division and Road Services Division.

The county's plan recognized the need for regional coordination, especially in areas such as surface water management, freshwater quality and water supply. In 2011, the county began to take additional coordination steps including forming the King County-Cities Climate Collaboration, and hosting events open to cities within King County through the Responding to Climate Change Brownbag series and the GreenTools Sustainable Cities Roundtables.

The King County-Cities Climate Collaboration is a centralized forum for cities within King County. Participation requires dedicating staff to the collaboration and making a financial

contribution based on the city's population. The goal is for participating city staff to develop resources to support local efforts so they can hire additional staff to implement jointly coordinated regional projects. Multiple cities in the county participated in developing this initiative, including Bellevue, Black Diamond, Kirkland, Mercer Island, Redmond, Renton, Seattle, Shoreline, Snoqualmie and Tukwila.

### **Sonoma County Regional Climate Protection Authority**

#### ***A conscious decision to be inclusive, bringing together all 9 cities and the County***

The Sonoma County Regional Climate Protection Authority (RCPA) is the only legally constituted (AB 881, 2009) multi-city climate authority in the Bay Area. Since 2005, Sonoma County has had one of the most aggressive and innovative GHG reduction programs in California, led by the non-profit Climate Protection Campaign, Sonoma County Water Agency and other public/private stakeholders.

From the beginning, Sonoma County mounted a very strong effort to make climate protection an integrated, multi-jurisdictional initiative, not just the purview of a few "green" cities and towns. A great deal of importance was put on this collective approach, both because climate issues cross city boundaries, and to assist smaller cities in becoming full participants in the effort. One campaign was seen as the most efficient way to move forward with multiple jurisdictions. RCPA was created in 2009 to institutionalize this extensive work, improve coordination on climate change issues, and establish a clearinghouse for efforts to reduce emissions. The RCPA is made up of the same Board of Directors as the Sonoma County Transportation Authority (SCTA) and includes representatives from each of the nine cities in Sonoma County and the Board of Supervisors. Staff from the SCTA and RCPA are co-housed in Santa Rosa.

The RCPA is now beginning to add climate adaptation initiatives to its GHG reduction efforts. RCPA staff believe that the multi-city approach used for the last eight years will be most helpful in tackling climate impacts that cross not only city borders but county borders as well with neighboring Napa and Marin. Strategies developed to-date are limited but growing. RCPA is working with partners including the Sonoma County Agricultural Preservation and Open Space District, County Regional Parks, and the Sonoma County Water to promote conservation and restoration of the region's carbon sequestration potential, as well as to develop adaptation strategies to protect natural resources from climate change impacts. In addition, RCPA is discussing a possible countywide vulnerability assessment with the North Bay Climate Adaptation Initiative. A significant issue for RCPA staff is determining how to engage productively with the many state agencies working on adaptation-related issues.

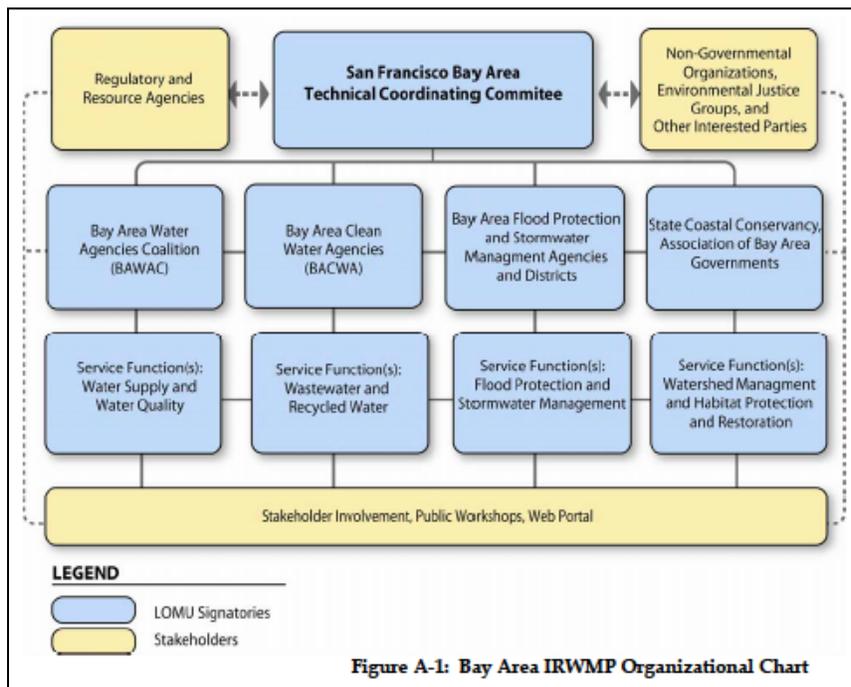
### **2013 Bay Area Integrated Regional Water Management Plan: Climate Change**

***A unique, region-wide collaborative process including diverse stakeholders that promises state funding as a powerful reward***

The 2013 Bay Area Integrated Regional Water Management Plan (IRWMP) will include the impacts of climate change for the first time. This new chapter in the state-mandated plan is intended to make water resources management and land use planners, as well as policy makers, throughout the Bay Area aware of climate change impacts on water resources so they can evaluate, prioritize and incorporate policies and strategies that anticipate, plan for, and mitigate climate change. The 2013 Plan will identify the most vulnerable areas for climate change related to water management. It will also suggest mitigation measures to address these impacts. The climate change chapter will work at the regional level (not at the individual agency level) and will feature a set of next steps stakeholders to take.

The IRWMP is an interesting and rather unique region-wide initiative involving water agencies, local governments, flood control districts, NGOs, and a number of other organizations for collaborative water management. The IRWMP is a both a planning process and a document that identifies Bay Area water challenges and opportunities and how water resources management agencies and communities can work together to plan for and manage the whole lifecycle of water for the benefit of our seven million residents, its ecosystem and its wildlife. The region qualifies and can compete for specific state funding when the state approves its Integrated Regional Water Management Plan. The region also becomes part of a statewide network of integrated regional water management planning regions. The 2013 IRWMP will address water supply reliability, water quality, flood protection, public health standards, habitat and watershed resources, and the overall health of the bay. The plan is undergoing a lengthy development process and will be formalized under a Letter of Mutual Understandings (LOMU) signed by all agencies and organizations involved.

The graphic below illustrates the organization of this diverse set of participants:



### III. Inventory of Key Bay Area Climate Adaptation Stakeholders (by Impact)

This chart illustrates the complexity of Bay Area climate adaptation planning, decision-making and implementation. The top row shows climate-related “events” (one-time and recurring) and the longer-term climate changes that may significantly affect the Bay Area’s human health, economy and natural systems. The column under each heading shows the key stakeholders—both governmental and non-governmental—who will be involved in preparing for climate impacts, building our resilience, and dealing with post-event damage.

<b>Wildfires</b>	<b>Energy Disruptions and Shortages</b>	<b>Water Disruptions and Shortages</b>	<b>Inland Flooding (Extreme Storm Events)</b>	<b>Coastal /Bay Flooding (Sea Level Rise &amp; Storms)</b>	<b>Heat Waves and Extreme Heat Days</b>	<b>Ocean Acidification</b>	<b>Increased Prices on Basics— Food, Energy</b>
Cities	PG&E	Water Supply Agencies	Stormwater Agencies	BCDC	Health Departments	CARB	National food system suppliers
Counties	Municipal Utilities and CCA’s	State Department of Water Resources	Flood Control Districts	Coastal Conservancy	Hospitals and Clinics	US EPA	Local food producers
Local Fire Departments	Calif. Energy Commission	Cities	Wastewater Agencies	Cities	Cities	IPCC	State and Federal government
Local Police and Sherriff Departments	Calif. Public Utility Commission	Counties	Water Quality Agencies	Counties	Counties	Major GHG emitting nations	Cities
Cal Fire	Cal ISO	Electric Utilities	Cities	Flood Control Districts	PG&E	Advocacy organizations	Counties
Cal EMA	Local energy producers	Community-based organizations	Counties	Airport Authorities	Municipal Utilities	NOAA	PG&E
Department of Forestry	Cities	Advocacy organizations	Transportation Agencies	Ports	Transportation agencies	Gulf of the Farallones NMS	Municipal Utilities and CCAs
State and Federal Parks	Counties		Health Departments	Transportation Agencies	Land Managers		Local energy producers
Regional and Local Parks Districts	Building energy efficiency programs		Community-based organizations	Wastewater Agencies	Food producers		Community-based organizations
Forest Service	Building energy conservation		Superfund site owners	Stormwater Agencies	Wine producers		Advocacy organizations

	programs						
Fish and Wildlife	Community-based organizations		Military	Water Quality Agencies	BAAQMD		
PG&E	Advocacy organizations		Advocacy organizations	Health Departments	Community-based organizations		
Municipal Utilities				PG&E	Advocacy organizations		
Water Supply Agencies				Municipal Utilities			
Community-based organizations				Telecommunication companies			
				Regional and Local Park Districts			
				State and National Parks			
				Community-based organizations			
				Military			
				Landfills and hazardous waste sites			
				Advocacy organizations			

#### **IV. Findings from Bay Area Governance Workshop**

The workshop will be held in mid-March and the findings will be added to the draft report before it is finalized.

## **V. Next Steps: 3 Recommendations for the Next 12 Months**

The literature review and the examination of other U.S. urban adaptation efforts conducted for this initial study have helped us to gain a greater understanding of how policy leaders in other locales and academic experts are addressing the issue of climate adaptation governance. We expect there will be much more to learn from both these sources over the next year as climate adaptation governance structures around the country move from private discussions to public debate and implementation.

The development of the chart in Section III has improved our knowledge about the wide range of government agencies and non-governmental organizations that will be involved in successful Bay Area adaptation planning and implementation. It is a complex picture and will be a challenge to effectively bring all stakeholders together for both collaboration and decision-making.

In particular, we note what is probably the single most pervasive issue for adaptation governance in the Bay Area: land use planning and its jurisdictional challenges—particularly in the context of sea level rise/storm events that will flood coast and bayside areas. These decisions will involve real-world impacts that don't follow city and county boundaries. At the same time, decisions made by one city about protecting or giving up its bayside or coastal assets will have a significant impact on its neighbors. And, many of our cities and towns lack the resources to undertake this planning on their own. While sea level rise and land use decisions are inextricably linked, other climate impacts are also related to development decisions made by cities and counties. Whether the Bay Area accommodates the next decades' growth in hotter or cooler sub-regions may significantly affect our water and energy supplies—systems that will already be stressed by climate change. Finally, research in Southern California suggests that the magnitude of damage resulting from wildfires is more closely correlated to patterns of development than to the influences of climate change.

The next phase of this continuing work should tackle these governance issues head-on. We believe one of the next steps should be to collate and synthesize the knowledge gained to-date by BCDC, ABAG, San Francisco Planning and Urban Research (SPUR), Joint Venture Silicon Valley, the JPC, and other Bay Area institutions that have been exploring governance issues for climate adaptation, disaster preparedness and community resilience. As the region needs multi-jurisdictional decision-making capability for climate change, so too does it need to combine forces now for study and decisions on these critical governance issues. This joint effort could include more in-depth research on key questions, workshops for regional leaders, and a regional simulation exercise for potential climate impacts that will clearly identify strengths and weaknesses in our governance structures.

### **1. Research:**

In the course of this review, we identified five key research questions concerning legal authority that should be addressed by a follow-on, well-funded research project.

1. What are the specific legal authorities that currently exist in the Bay Area for implementing different types of adaptation strategies?
2. What are the Bay Area adaptation strategies that would be most difficult or impossible to implement with these existing authorities?
3. What changes to existing law would be needed to overcome these barriers?
4. What new authorities are needed in the Bay Area to meet these challenges?
5. What are the most appropriate legal options for the Bay Area—joint powers authorities, memoranda of understanding, special districts, contracts, etc.— for institutionalizing multi-jurisdictional governance?

At the same time, we have identified, a set of additional questions for research and discussion that focus on collaboration and cooperation.

1. For each climate impact, what are the best roles for state, regional and local governments to play to form an effective, collaborative and team-oriented approach?
2. Which climate impacts can be effectively addressed by local programs and approaches? Which will demand multi-jurisdictional approaches?
3. What are the “carrots” and “sticks” that will bring organizations to the table and provide incentives for strong collaboration and joint decision-making?

## 2. Leader Workshops

The next phase should bring together a diverse set of top state, regional and local leaders for facilitated workshops featuring blunt conversation about the serious climate challenges facing the region and the need for much-improved cross-jurisdictional collaboration. The land use decisions outlined above should be first on that topic list. The lack of effective multi-jurisdictional, multi-sector governance is not unique to climate adaptation in the region; it is an issue that arises in a number of discussions about how to protect and build a prosperous and equitable Bay Area for the new global economy of the 21<sup>st</sup> century. Focused workshops, convened on neutral safe ground such as UC Berkeley or a regional foundation, will allow civic leaders to work together along with other experts to create innovative Bay Area governance solutions for climate adaptation.

## 3. Regional Climate Impacts Simulation Exercise

A regional climate impacts simulation exercise, similar to the tabletop and community exercises run for earthquakes and other disasters, could provide a valuable opportunity to identify the strengths and weaknesses of Bay Area governance for climate adaptation. While disaster exercises focus on a single event and the immediate aftermath (and post 9/11, post-disaster response is highly organized) this climate impacts simulation would spotlight the preparation

work needed for a given impact and multi-jurisdictional governance needed for the long-term recovery period.

#### 4. Increased Collaboration with Other Major Adaptation Efforts

The JPC and other Bay Area partners have formed an alliance of representatives from adaptation groups in the four largest metropolitan areas in the state. These local experts are now working with staff in the Governor’s Office of Planning and Research on statewide adaptation issues. Similarly, BCDC staff have researched sea level rise efforts around the U.S. and worked with their counterparts on key coastal adaptation issues. Through this research project, we have developed and strengthened connections with adaptation planners in New York, Southeast Florida, and other urban areas. During the coming months, the JPC and its partners should build on these efforts through more detailed interviews with participants in these and other similar programs, and by creating regular channels of communication for the free exchange of innovative strategies, best practices, and lessons learned.

## Appendix A – Annotated Bibliography

Overviews of Adaptation Governance and Policy Planning	
California Emergency Management Agency & California Natural Resources Agency, <i>California Adaptation Planning Guide</i> (2012), <a href="http://resources.ca.gov/climate_adaptation/local_government/adaptation_policy_guide.html">http://resources.ca.gov/climate_adaptation/local_government/adaptation_policy_guide.html</a>	See details above.
Center for Science in the Earth System (The Climate Impacts Group), <i>Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments</i> (2007), available at <a href="http://iclei.org/fileadmin/user_upload/documents/Global/Programs/CCP/Adaptation/ICLEI-Guidebook-Adaptation.pdf">http://iclei.org/fileadmin/user_upload/documents/Global/Programs/CCP/Adaptation/ICLEI-Guidebook-Adaptation.pdf</a> .	Excellent framework for adaptation decision-making. Specific recommendations for adaptation planning. This source also has an excellent appendix of climate change resources that will prove valuable for future, more detailed inquiry into the specifics of climate change adaptation planning and governance.
OECD, <i>Cities and Climate Change</i> (2010).	This OECD document discusses both broad aspects of climate change and those aspects that are more closely tied to cities and regional-scale governance. In addition to background information on climate change and the development of adaptation and mitigation policies, there is a section devoted to local and regional governance. The suggestions are not specific to the United States, however. Additionally, although the discussions of risks, policy issues, and governance is a good overview of climate change

	issues that will require adaptation, this document is not specific to adaptation frameworks and includes discussion of mitigation policies as well.
SMEC Australia, <i>Climate Change Adaptation Actions for Local Government</i> , Australian Government, Department of Climate Change and Energy Efficiency (2010).	Provides frameworks for making climate change decisions, but on a less detailed level than some of the other sources. Also discusses specific adaptation options that correspond to certain sectors of governance.
Emma L. Tompkins et al., <i>Surviving Climate Change in Small Islands: A Guidebook</i> , Tyndall Centre for Climate Change Research (2005).	Although this document is directed toward island concerns, the adaptation framework is still very comprehensive. This document also provides a relatively detailed account of implementation of adaptation planning.
UKCIP, <i>Climate Adaptation: Risk, Uncertainty, and Decision-Making</i> , UKCIP Technical Report (Robert Willows & Richenda Connell eds., May 2003).	Provides an eight-step process for making adaptation decisions: (1) identify problem and objectives, (2) establish decision-making criteria, (3) assess risk, (4) identify options, (5) appraise options, (6) make decision, (7) implement decision, and (8) monitor, evaluate, and review. Lacks detail about implementation.
The Clean Air Partnership, <i>Cities Preparing for Climate Change: A Study of Six Urban Regions</i> (2007).	Provides another comprehensive overview of adaptation planning. Less detailed than some of the other overviews, but contains good information about stakeholder involvement.
Andrea Prutsch et al., <i>Guiding Principles for Adaptation to Climate Change in Europe</i> , ETC/ACC Technical Paper 2010/6 (Nov. 2010).	Addresses climate change adaptation in Europe, but provides a general framework that can be used in the United States as well. In addition to a framework for adaptation policy and planning, this document includes good practice examples and a large list of references and further reading.
Philipp Spath & Harald Rohrer, <i>Climate Change and Regional Governance – Towards Robust Procedures of Negotiation and Planning</i> .	Addresses issues facing climate change governance at a regional scale. Uses Austria as a case study, so the specific details of their analysis may not be applicable to U.S. concerns and governance framework.

### Previously Completed “Literature Reviews” or Assemblages of Adaptation Resources

H. John Heinz III Center for Science, Economics and the Environment, <i>A Survey of Climate Change Adaptation Planning</i> , available at <a href="http://www.heinzcenter.org/Workshops_file/s/A%20Survey%20of%20Climate%20Change%20Adaptation%20Planning.pdf">http://www.heinzcenter.org/Workshops_file/s/A%20Survey%20of%20Climate%20Change%20Adaptation%20Planning.pdf</a>	See details above.
Manfred Stock & Oliver Walkenhorst, <i>AMICA Adaptation and Mitigation – an Integrated Climate Policy Approach – Literature Review</i> (2006), available at <a href="http://www.amica-climate.net/uploads/media/amica-literature-review.pdf">http://www.amica-climate.net/uploads/media/amica-literature-review.pdf</a> .	Review of climate change literature from a German organization. Includes both adaptation and mitigation sources. Provides sources for specific adaptation and mitigation challenges (flooding, heat waves, coastal erosion, etc.). Also includes sources from scientific literature and governance and policy theories; includes list of resources from institutions and online resources for climate change.

Patty Glick et al., <i>A New Era for Conservation: Review of Climate Change Adaptation Literature</i> , National Wildlife Federation (Mar. 2009).	Discusses some general adaptation considerations and framework approaches. Also includes sector-specific literature review and summary. However, this review is more narrowly focused on ecological adaptation and natural resource preservation.
Mekong River Commission, <i>Review of Climate Change Adaptation Methods and Tools</i> , MRC Technical Paper No. 34 (Dec. 2010).	Extensive list of resources and tools for planning for adaptation. This document is focused on tools useful to the Lower Mekong Basin, so some of the tools will not be applicable to developed nations or regional governance. However, the list of adaptation tools is usefully broken down into specific steps of the adaptation planning process.

### Theoretical Frameworks for Local/Regional Adaptation and Governance

Karin Andre et al., <i>Method Development for Identifying and Analysing Stakeholders in Climate Change Adaptation Processes</i> , 14 J. Environ. Pol. & Planning 243 (2012).	See details above.
Alejandro E. Camacho, <i>Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure</i> , 59 Emory L.J. 1 (2010).	Promotes the use of “learning infrastructure” to overcome the uncertainty inherent in climate change governance. Also promotes adaptive governance as necessary for climate change. The article “proposes a comprehensive strategy for managing uncertainty that promotes interagency information sharing.”
Ibon Galarraga et al., <i>The Role of Regional Governments in Climate Change Policy</i> , 21 Environ. Policy & Governance 164 (2011).	Discusses the importance of regions and regional decision-making in relation to climate change adaptation. Looks at efforts in 23 “leading regions in climate policy.” Provides a survey of the types of adaptations that are being attempted, and tries to orient the role of regions in the broader climate change policy framework.
J. Corfee-Morlot et al., <i>Cities, Climate Change and Multilevel Governance</i> , OECD Environmental Working Papers 14 (2009).	Discusses the role of cities in climate adaptation planning. Points out areas where city planning and policy can effectively contribute to climate change adaptation.
L. Lebel et al., <i>Governance and the Capacity to Manage Resilience in Regional Social-Ecological Systems</i> , 11 Ecology & Soc. (2006).	Study about the sustainability of regional development. Some of the findings could be applicable to a general framework of adaptation when that adaptation involves multiple stakeholders across jurisdictions. The document focuses on achieving resilience. The propositions explored are: “(1) participation builds trust, and deliberation leads to the shared understanding needed to mobilize and self-organize; (2) polycentric and multilayered institutions improve the fit between knowledge, action, and social-ecological contexts in ways that allow societies to respond more adaptively at appropriate levels; and (3) accountable authorities that also pursue just distributions of benefits and involuntary risks enhance the adaptive capacity of vulnerable groups and society as a whole.”
CLIMATE AND DISASTER RESILIENCE IN CITIES (Rajib Shaw & Anshu Sharma eds., 2011),	Book containing many separate chapters on climate change adaptation at a local level. Topics include: “Overview of Urban

<p>available at <a href="http://site.ebrary.com/lib/berkeley/docDetail.action?docID=10461009">http://site.ebrary.com/lib/berkeley/docDetail.action?docID=10461009</a>.</p>	<p>Development and Associated Risks”; “Mapping Climate and Disaster Resilience in Cities”; “From Resilience Mapping to Action Planning”; “Capacity Development and Training: Blended Learning Program”; and “Building Local Government Resilience through City-to-City Cooperation”.</p>
<p>Kathryn A. Foster, <i>Regional Problem Solving: A Fresh Look at What It Takes</i>, available at <a href="http://brr.berkeley.edu/2011/12/regional-problem-solving-a-fresh-look-at-what-works/">http://brr.berkeley.edu/2011/12/regional-problem-solving-a-fresh-look-at-what-works/</a>.</p>	<p>Essay geared toward providing practitioners with a framework to guide regional decision-making. Addresses the concept of building capacity. This resource is not climate-change specific, but is a good, quick discussion of working toward solving problems on a regional level.</p>

### Theoretical Frameworks for Climate Change Adaptation

<p>Susanne C. Moser &amp; Julia A. Ekstrom, <i>A Framework to Diagnose Barriers to Climate Change Adaptation</i>, 107 PNAS 22026 (2010).</p>	<p>See details above.</p>
<p>OECD, <i>Competitive Cities and Climate Change</i>, OECD Conference Proceedings (Oct. 2008).</p>	<p>Transcript of an OECD conference about how cities can interact with climate change adaptation. Much of the information is international in scope, but there are many applicable framework points regarding the value of cities and local action in adapting to climate change.</p>
<p>W. Neil Adger et al., <i>Successful Adaptation to Climate Change Across Scales</i>, 15 Global Environ. Change 77 (2005).</p>	<p>Discusses a framework for measuring the “success” of adaptation. Provides theory for evaluating efficiency, effectiveness, equity, and legitimacy of adaptation planning and policy. This information could be useful as part of evaluation procedures built in to either the evaluation process (after adaptation plans are made) or into the analysis of governance (while attempting to set up successful adaptation plans and potential success is in the future).</p>
<p>Anja Bauer et al., <i>The Governance of Climate Change Adaptation in Ten OECD Countries: Challenges and Approaches</i>, Institute of Forest, Environmental, and Natural Resource Policy Discussion Paper 1-2011 (2011).</p>	<p>Studies approaches to climate change adaptation in Australia, Austria, Canada, Denmark, Finland, Germany, Norway, Spain, the Netherlands, and the United Kingdom. Considers the approaches to climate change adaptation being undertaken at the national level, and concludes that “most governance approaches are restricted to soft, voluntary ways of coordination and steering, and that national adaptation strategies often mark a centre piece around which complex governance setups emerge.” Contains analysis framework that could also be used to examine regional efforts, and will also be of use when examining climate change adaptation efforts that intersect with national policies and requirements.</p>
<p>N. Ranger, <i>Adaptation as a Decision Making Under Deep Uncertainty: A Unique Challenge for Policymakers?</i>, in CLIMATE: GLOBAL CHANGE AND LOCAL ADAPTATION (2011), available at <a href="http://link.springer.com/book/10.1007/978-94-007-1770-1/page/1#section=949713&amp;page=1">http://link.springer.com/book/10.1007/978-94-007-1770-1/page/1#section=949713&amp;page=1</a>.</p>	<p>Examines the uncertain nature of adapting to climate change and addresses some of the problems that this uncertainty may raise for those trying to make policy and action decisions for climate change adaptation. Proposes some framework ideas for managing the uncertainty and stresses the differences between planning for climate change adaptation and other policy decisions.</p>

## Case Studies or Evaluations of Past/Current Work

<p>Benjamin L. Preston et al., <i>Climate Adaptation Planning in Practice: An Evaluation of Adaptation Plans from Three Developed Nations</i>, 16 Mitig. Adapt. Strateg. Glob. Change 407 (2011).</p>	<p>See details above.</p>
<p>Cynthia Rosenzweig, <i>Managing Climate Change Risks in New York City's Water System: Assessment and Adaptation Planning</i>, 12 Mitig. Adapt. Strat. Glob. Change 1391 (2007).</p>	<p>Reviews New York City's efforts to adapt its water system to climate change. Includes a 9-step adaptation assessment procedure and divides potential climate change adaptations into categories (management, infrastructure, policy) that are assessed for relevance to time-frame, costs, and other risks.</p>
<p>Rasmus Klockner Larsen et al., <i>A Framework for Facilitating Dialogue Between Policy Planners and Local Climate Change Adaptation Professionals: Cases from Sweden, Canada and Indonesia</i>, 23 Environ. Sci. &amp; Pol. 12 (2012).</p>	<p>Examines a framework for communication between various stakeholders in climate change adaptation by looking at three large research projects in Sweden, Canada, and Indonesia. Looks at the connection between local lessons in climate change adaptation, which are seen here as highly contextual, and broader-scale policy decisions. Could be useful for including cross-level communication in an adaptation context.</p>
<p>James D. Ford et al., <i>A Systematic Review of Observed Climate Change Adaptation in Developed Nations</i>, 106 Climatic Change 327 (2011).</p>	<p>Systematically reviews the literature on climate change adaptation in developed nations to come to an assessment of the state of progress in adaptation efforts. The article concludes that there is "limited evidence of adaptation action." The article reports sub-conclusions that are relevant to the efforts of this project. The study identifies climate change adaptation that is taking place and where those efforts are concentrated. Useful as an overview of the landscape of adaptation efforts in developed nations.</p>
<p>Ecologic Institute, <i>Adaptation to Climate Change: Policy Instruments for Adaptation to Climate Change in Big European Cities and Metropolitan Areas</i>.</p>	<p>Case studies and analysis of European efforts to adapt to climate change. Includes a brief introduction of adaptation planning frameworks and concepts which might be useful and mirror other frameworks. The case studies illustrate challenges and solutions in various European cities. Likely a useful source for examples of policy ideas and challenges but less useful for specific governance paths.</p>
<p>Lea Berrang-Ford et al., <i>Are We Adapting to Climate Change?</i>, 21 Global Environ. Change 25 (2010).</p>	<p>A "systematic" literature review that seeks to answer the question of how much we are adapting to climate change and planning for adaptation. Useful if information about current attempts to adapt and the literature surrounding adaptation is needed to provide stakeholders with a view of the adaptation landscape.</p>
<p>Lasse Peltonen et al., <i>Governance of Climate Change Adaptation: Policy Review</i>.</p>	<p>Examines European Union adaptation policies to assess current efforts as well as to present some basic frameworks for adaptation policy planning. The emphasis on Europe (Baltic Sea Region) lessens this source's usefulness, but the document's sections on regional governance examples have applicable lessons.</p>
<p>Evan Flugman, <i>Facilitating Adaptation to Global Climate Change: Perspectives from Experts and Decision Makers Serving the Florida Keys</i>, 112 Climatic Change 1015 (2012)</p>	<p>A study of adaptation attitudes and planned responses in the Florida Keys. Utilizes surveys of stakeholders to draw conclusions about the needs and complications of climate change adaptation for the studied region and for regions more generally. Also discusses financing options.</p>

## Literature on Climate Change, Adaptation, and Vulnerability

<p>California Institute for Energy &amp; Environment, <i>California Vulnerability and Adaptation Study</i>, <a href="http://uc-ciee.org/climate-change/california-vulnerability-and-adaptation-study">http://uc-ciee.org/climate-change/california-vulnerability-and-adaptation-study</a>.</p>	<p>See details above.</p>
<p>Alistair Hunt &amp; Paul Watkiss, <i>Climate Change Impacts and Adaptation in Cities: A Review of the Literature</i>, 104 <i>Climatic Change</i> 13 (2011).</p>	<p>A review of the current literature on climate change impacts on cities. Extends beyond the basic science and includes some recommendations for further research that suggest ways forward for developing plans to deal with climate change risk that are specific to cities.</p>
<p>James Meadowcraft, The World Bank Development Economics World Development Report Team, <i>Climate Change Governance</i>, Policy Research Working Paper 4941 (May 2009).</p>	<p>Examines climate change governance as a long-term proposition. Addresses essential elements of governance from a somewhat theoretical perspective and particularly is concerned with “institutional inertia” that might hinder effective development of climate change adaptation policies and solutions. Theorizes climate change governance as a learning oriented process that must take into account uncertainties and deal with resistance.</p>
<p>G. A. Kiker et al., <i>Adaptation in Coastal Systems: Vulnerability and Uncertainty Within Complex Socioecological Systems</i>, in <i>CLIMATE: GLOBAL CHANGE AND LOCAL ADAPTATION</i> (2011), available at <a href="http://link.springer.com/book/10.1007/978-94-007-1770-1/page/1#section=949713&amp;page=1">http://link.springer.com/book/10.1007-94-007-1770-1/page/1#section=949713&amp;page=1</a>.</p>	<p>Discusses vulnerability and adaptation in the context of coastal systems. Includes sections on risk analysis and uncertainty in climate change adaptation. Points to effects specific to coastal systems. Also provides frameworks for dealing with climate change adaptation and, among other things, examines the importance of stakeholder participation in adaptation efforts.</p>
<p>Kristie L. Ebi et al., <i>Regional Impacts of Climate Change: Four Case Studies in the United States</i>, Prepared for the Pew Center on Global Climate Change (Dec. 2007), available at <a href="http://www.c2es.org/docUploads/RegionalImpacts-FullReport.pdf">http://www.c2es.org/docUploads/RegionalImpacts-FullReport.pdf</a>.</p>	<p>Looks at climate change effects using four case studies of U.S. regions. One of the case studies is the risk of wildfire in the Western United States. Discusses the potential impacts of climate change and ways to plan for the change through adaptation.</p>
<p>Amica, <i>Adaptation Tool</i>, AMICA-CLIMATE.NET, <a href="http://www.amica-climate.net/adaptation_tool.html">http://www.amica-climate.net/adaptation_tool.html</a>.</p>	<p>Tools for adaptation measures and efforts. Includes a matrix for identifying vulnerabilities. This document is from a German organization, but the emphasis on responses to particular challenges could still prove useful when identifying vulnerabilities and potential solutions to adaptation challenges (and identifying levers to implement these measures).</p>
<p>Sarah Cottrell Propst, <i>Innovative Approaches for Adapting to Water Variability in the West</i>, Report for the Georgetown Climate Center (2012), available at <a href="http://www.georgetownclimate.org/sites/default/files/Water%20Variability%20in%20the%20West.pdf">http://www.georgetownclimate.org/sites/default/files/Water%20Variability%20in%20the%20West.pdf</a>.</p>	<p>Discusses adaptation efforts of New Mexico, the Water Utility Climate Alliance (which includes the San Francisco Public Utilities Commission), and Colorado.</p>