Consolidated Resources and Guidance for Climate Adaptation Planning in San Luis Obispo County:

Regional Guidance to the California Adaptation Planning Guide

October 2017

Ryan Silber

SLO COUNTY apcd
AMERICORPS
Local Government Commission
CivicSpark

Cover Photo Acknowledgement: Robert Johnson and Monterey County Water Resources Agency

TABLE OF CONTENTS

Executive Summary

This document centralizes the resources needed to implement climate adaptive planning in San Luis Obispo County. It is intended for use in conjunction with the *California Adaptation Planning Guide: Planning for Adaptive Communities* (*APGPAC*) for (1) conducting a vulnerability assessment and (2) identifying adaptive actions to implement. This companion document will follow the outline of the *APGPAC* with details pertinent to the county's scope. Adaptation plans, vulnerability assessments, climate change projection tools, and case studies are among the types of resources that can provide additional direction and are highlighted in this report. In addition, key relationships, funding, and capacity-building opportunities identified through stakeholder interviews and various other informational sources are pointed out. By having the aforementioned resources connected and organized according to the state issued adaptation planning process, the procedure will be more informed and less time intensive.

Overview

California has emerged as a world leader in addressing climate change issues through legislation, executive orders, and regulations. Out of necessity to protect individuals, communities, economies, and natural resources and to take advantage of opportunities, the state has pursued carbon reduction and preparation for the unavoidable impacts of climate change.

Recognizing that climatic impacts are already occurring and will likely be exacerbated over the coming century (IPCC 2013), the state has assessed vulnerabilities to these changes and provided guidance to communities in preparation for them. Among the steps taken was the issuance of the *California Adaptation Planning Guide (APG)*, a series of documents outlining a nine-step process to assess climate vulnerabilities and develop adaptation strategies. This process can be used for any planning initiatives or for a stand-alone adaptation plan. As laid out in Senate Bill 379, the *APG* should be used to assess climate adaptation strategies in future General Plan updates.

Following the state's lead, jurisdictions within San Luis Obispo County have been involved in regional vulnerability assessments and development of adaptation strategies, including a county guide to integrated adaptation planning. In addition to these studies and plans, many climate change impact assessment tools have been customized to the region.

Although much work towards creating climate resilient communities in San Luis Obispo County has taken place, many of the resources developed are disconnected and remain underutilized as government organizations often have limited time to focus on adaptation planning. In coordination with the *APG*, this report consolidates key information from and provides direction to these and other adaptation planning resources relevant to San Luis Obispo County.

Using this report alongside the *APG*'s overview document, *California Adaptation Planning Guide: Planning for Adaptive Communities (APGPAC)*, agencies within San Luis Obispo County can identify many of the resources needed to assess their climate change vulnerabilities and plan adaptive strategies according to state issued guidance. Adaptation plans, vulnerability assessments, climate change projection tools, and case studies are among the types of resources that can provide additional direction and are highlighted in this report. In addition, key relationships, funding, and capacity-building opportunities identified through stakeholder interviews and various other informational sources are specified. By having the aforementioned resources connected and organized according to the state issued adaptation planning process, the procedure will be more informed and less time intensive.

As this report is intended for simultaneous use with the *APGPAC*, which provides a walkthrough of the adaptive planning process, it will be organized according to the sections of the *APGPAC*. **Table 1** lays out the pattern that should be followed for using these two guides. The contents of each section of this report will not reiterate the *APGPAC* sections but expand upon them with increased guidance for planning specific to San Luis Obispo County. By utilizing the abundance of

available and ever evolving information about relationships between a changing climate and the natural and built environments, organizations and individuals can take the necessary steps towards building safe, healthy, prosperous, and resilient communities.

TABLE 1: Order of Reading

Order	*APGPAC*	This document
1	Executive Summary	Definitions
2	Introduction How will California be affected by climate Change? Why do climate adaptation planning? How can communities take action on climate adaptation? What is the difference between greenhouse gas mitigation and climate adaptation? How is climate adaptation related to hazard mitigation planning? How complicated is the climate adaptation planning process? What is the product of this effort and how will it be used? Who needs to be involved? How can the public be engaged? Are there any special or creative sources of funding for implementing climate change adaptation policies? What is the best way to get started? What is the State doing to address climate adaptation and how can the State assist local governments? Who developed the guide and why? Climate Change Adaptation Planning Process Climate Change Vulnerability Assessment	Climate Change Adaptation Planning Process
3	Climate Change Vulnerability Assessment	Climate Change Vulnerability Assessment
4	Step 1	Step 1
5	Step 2	Step 2
6	Step 3 Impact Sector Summary	Step 3

7	Step 4	Step 4
8	Step 5	Step 5
9	Adaptation Strategy Development	Adaptation Strategy Development
10	Step 6	Step 6
11	Step 7	Step 7
12	Step 8	Step 8
13	Step 9	Step 9 Conclusion
14	Adaptation Resources	

Table 1: **Read *APGPAC* sections first, followed by the corresponding section in this document. Begin by completing the overview section of this document.**

Definitions

In order to best aid the reader's understanding of the climate adaptation process, some key concepts are defined below. Unless otherwise noted, all definitions are from *California's 2009 Climate Adaptation Strategy* (CNRA 2009).

Adaptation – Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which minimizes harm or takes advantage of beneficial opportunities.

Adaptive Capacity – The ability of a system to respond to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, and to cope with the consequences.

Co-benefits – The benefits of policies, which for various reasons are implemented at the same time, acknowledging that most policies designed to address climate change also have other, often at least equally important, rationales (e.g., related to objectives of development, sustainability, and equity).

Exposure – The nature and degree to which a system experiences a stress or hazard.*****

Impact – An effect of climate change on the structure or function of a system.

Resilience – The ability of a system to absorb some amount of change (including shocks from extreme events), bounce back and recover from them, and, if necessary, transform itself in order to continue to be able to function and provide essential services and amenities that it has evolved or been designed to provide.

Sensitivity – The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., climatic or non-climatic stressors may cause people to be more sensitive to additional extreme conditions from climate change than they would be in the absence of these stressors).

Vulnerability – In the most general sense, a susceptibility to harm or change. More specifically, the degree to which a system is exposed to, susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes (vulnerability is a function of exposure, sensitivity, and adaptive capacity*).

Vulnerability Assessment – A practice that identifies who and what is exposed and sensitive to change and how able a given system is to cope with extremes and change.

* ***Source: Moser and Ekstrom. 2010.***

Climate Change Adaptation Planning Process

The adaptation planning process is essentially comprised of two smaller processes: (1) assessing vulnerabilities and (2) implementing adaptation strategies. The *APGPAC* provides considerations to be taken into account, but beyond filling out matrices, does not provide brainstorming type activities to support the ideation process. Activities not listed in the *APGPAC* can supplement the process as long as the general framework is still followed.

There are training materials available for those interested in expanding their knowledge base before taking on adaptation training. The EPA offers a 30 minute video training and the Institute for Social and Environmental Transition-International has a three part series covering in-depth adaptation planning. NOAA also offers a variety of instructor-led workshops on coastal adaptation planning.

The *APGPAC* stresses the importance of creating an adaptation team early on. The vulnerability assessment process includes identifying the severity of climate change impacts on community functions and their ability to respond, which requires working with individuals knowledgeable about these systems and the policies and programs around them. By identifying shared threats and opportunities with other groups, participation may increase.

Efforts should be taken to establish an adaptation team, but if this is not feasible (adaptation planning is occurring on a project basis, too often, etc.), there are groups that may still offer their assistance. The Central Coast Climate Collaborative represents a group of local and regional governments, businesses, academia, and community groups that share a focus on climate adaptation. Members would be valuable in an adaptation team but can also act in a limited capacity as potential project partners and a clearinghouse of information for local

adaptation planning. The Integrated Climate Adaptation and Resiliency Program (ICARP) is state sponsored and composed of the State Adaptation Clearinghouse and the Technical Advisory Council (TAC). A group comprised of local government, practitioners, scientists, and community leaders, the TAC supports local climate adaptation implementation actions.

Climate Change Vulnerability Assessment

There are a number of existing climate change vulnerability assessments that identify these risks in San Luis Obispo County. Before committing resources to conducting a new vulnerability assessment, explore these as they may contain the information being sought, including that detailed in steps 1-5. Notable vulnerability assessments conducted for San Luis Obispo County are listed in **Box 1**.

Box 1: San Luis Obispo County Vulnerability Assessments

- *ClimateWise* – San Luis Obispo County's primary adaptation planning document, it summarizes expected climatic changes in the county, provides strategies to adapt, and straightforward explanations of climate action planning concepts.
- *County of San Luis Obispo EnergyWise Plan* – This is the county's climate action plan which contains a standalone adaptation section (chapter 7). This chapter covers climatic changes anticipated in other vulnerability assessments, existing adaptation efforts in county, and suggested new measures.
- *Climate Change and Health Profile Report: San Luis Obispo County* – Produced by the California Department of Public Health, this report profiles local impacts and particular health impacts of climatic changes expected in San Luis Obispo County. Health inequalities are broken down by demographics and adaptation strategies are also provided.
- *Projected Future Climatic and Ecological Conditions in San Luis Obispo County* – This assessment details expected future conditions using plenty of data visuals and localized month-to-month projections. Focuses on temperature, precipitation, vegetation and wildfire, and sea level rise.
- *Sea Level Rise and Coastal Flood Risk: Summary for San Luis Obispo County, CA* – This report used the Surging Seas Risk Finder tool to identify areas at risk of sea level rise projected in the year 2100 (three feet above 1992 baseline levels) and flooding.
- *FEMA Flood Insurance Study for San Luis Obispo County* – This interactive FEMA map tool displays 100 and 500 year flood event and other flood hazard overlay maps. Search the maps by zip code and then click the interactive map icon. The associated study lays out engineering and hydrologic elements of waterways in the county and their flood implications.
  FEMA flood terminology is defined on *this page*. Keep in mind that 100 and 500 year flood events change with time. Most maps in the county are current as of 2017, but will become outdated with time.

- *Climate Change Impacts to Species and Ecosystems of San Luis Obispo County* – A collaborative workshop of subject matter experts wrote this memo on the top 10 climate impacts to natural systems in San Luis Obispo County that includes strategies to mitigate the impacts.
- *Developing Adaptation Strategies for San Luis Obispo County: Preliminary Climate Change Vulnerability Assessment for Social Systems* – Along with a succinct introduction to adaptation planning terminology and concepts, this report lists the main risks facing San Luis Obispo County, associated economic costs, specific vulnerabilities, sensitive populations, and measures to boost community resilience.
- *Morro Bay National Estuary Program Climate Vulnerability Assessment Report* – Specific to the Morro Bay National Estuary, this report looks at its future conditions and covers adaptive strategies focused around conservation, restoration, water quality enhancement, and outreach.
- *Plan Morro Bay: City of Morro Bay Community Vulnerability and Resiliency Assessment* – This document, intended to guide Morro Bay development and conservation, projects climate changes as well as economic and demographic conditions in the greater Morro Bay area.

This list is not comprehensive as other assessments of smaller areas and specific pieces of infrastructure within the county have been conducted. Searching for vulnerability assessments conducted by regional agencies, non-profits, or local governments in the region could be useful depending on project goals. Some of these groups could include planning and building departments, public works departments, utility providers, community service districts, and the Water Resources Control Board.

Even if an existing vulnerability assessment covers identified areas of interest, conducting further assessment could be beneficial. Global conditions that affect the rate of climate change are dynamic and science is continually improving. As a result, projections are likely becoming more accurate. Additionally, projections that focus on a smaller regional scope may produce more precise estimates as local dynamics can be examined in more depth.

Step 1- Exposure: What climate change effects will a community experience?

The ultimate goals of this section are to identify expected primary and secondary climate change exposures, how quickly these changes will onset, where in the region they will be experienced, and their degree of change from current conditions. A brief list of impacts and exposures identified in San Luis Obispo County vulnerability assessments are listed in **Box 2**.

Box 2: Anticipated Impacts and Exposures in San Luis Obispo County

- Hotter, drier, and longer summers
- More severe storms
- Accelerated sea level rise
- Increase in wildfire
- Loss of many oak and pine forests
- Accelerated erosion of coastal bluffs
- Declines in wetlands, marshes, and estuaries
- Declines in water quality and flow in streams and rivers
- Increase in erosion and sediment
- Lower groundwater recharge rates
- Less productive range for cattle
- Increase in natural disasters (floods, droughts, fires)

Source: Wikimedia Commons

Source: Koopman, Meis, and Corbett. 2010.

Interactive tools and maps that display anticipated climate changes are useful for identifying vulnerabilities. The *APGPAC* recommends using Cal-Adapt, a web-based tool that displays historic data and projections for California regarding extreme heat, average annual temperature, precipitation averages, snowpack, sea level rise, and wildfire. While this is a good tool for identifying exposures, particularly with its data visualization capabilities, the information is not specific to San Luis Obispo County. Tools and maps that account for local conditions and variances within SLO County should be used where possible. Some useful exposure identification tools are listed in **Box 3**.

Box 3: Tools for Identifying Exposures

- *Sea Level Rise and Coastal Flood Web Tools Comparison Matrix* – This table compares multiple sea level rise assessment tools across many categories and is useful if considering which sea level rise tool is best for planning purposes.
- *Surging Seas Risk Finder* – This tool considers storm surges and shoreline dynamics over time in its sea level rise projections. It can be used to identify property, income, and social vulnerabilities at risk in different scenarios.
- *U.S. Climate Resilience Toolkit* – This website is a database of case studies, tools, strategies, and more. The *tools page* can be used to find further exposure identification tools. *The Climate Explorer* projects future average, highs, lows, and extreme temperatures as well as precipitation projections searchable by zip code.

- *Climate Data Initiative* – This federal data portal contains historic climate data as well as tools, including those for predicting the effects of climate stressors. Focuses include health, transportation, water, food, ecosystems, and flooding among others.
- *Heat and Social Inequity in the United States* – This series of maps estimates changes to heat exposure by mid-century on a county level. Social and heat vulnerability are also assessed.
- *State of California Geoportal* – The California Geoportal provides easy and convenient ways to discover and share geospatial data resources.
- *Coastal Storm Modeling System (CoSMoS)* – This USGS sea level rise estimator accounts for local changing shorelines and storm processes in projecting coastal flooding. It is expected to be available for San Luis Obispo County in summer 2018.

The likelihood of different degrees of exposures occurring at future points in time should be recorded in this step as well. This will assist step 5 when the same action will be done for climate change impacts. Most tools display degrees of exposure under different scenarios and points of time but do not always provide a confidence interval. In cases where confidence intervals are not provided, 'likelihood' may be left up to the adaptation team's own interpretation of how likely the different emissions scenarios are.

The *APGPAC* recommends using 2050 and 2100 benchmarks for planning in this section but later designates the following timelines:

near-term: 2020-2040
mid-term: 2040-2070
long-term: 2070-2100

As long as this information is recorded at some sort of interval up to the year 2100, vulnerabilities can be adequately assessed into the future. Benchmarks of known significance, such as the buildout year for a general plan or sea level rise at which important infrastructure will be ineffective, are one way to approach this.

Step 2- Sensitivity: What aspects of a community (functions, structures, and populations) will be affected?

It is possible a list of important or vulnerable community functions, structures, and populations already exists. As mentioned in the *APGPAC*, this step is similar to that of hazard planning, so hazard mitigation plans, floodway management plans, previously conducted vulnerability assessments, and local coastal programs often contain these assessments. **Image 1** displays an assessment of sensitivities in San Luis Obispo County as identified in its adaptation plan *ClimateWise*. While not comprehensive, it provides a starting point to get thoughts in motion. **Box 4** lists tools for further identification of vulnerable populations.

Image 1: Sample Vulnerabilities Identified in San Luis Obispo County

- Differential social vulnerabilities, with the **elderly, infants, socially and culturally isolated individuals, and outdoor workers** – especially in the hotter inland areas – experiencing relatively greater exposure, sensitivity and/or lower adaptive capacity.
- Social vulnerabilities vary with regard to different climate-related hazards. A **growing and aging population** will exacerbate the challenges, while economic prosperity and well-functioning social networks could reduce these vulnerabilities.
- Several **institutionalized populations** are of special concern due to their location in flood, landslide and fire risk zones (college, prison), and the challenge of evacuating large numbers of people in short periods.
- **Coastal residents** are particularly vulnerable to sea-level rise and related hazards such as flooding, erosion and cliff failure. Many coastal residents are elderly and depend on transportation (and evacuation) routes that are at risk from erosion, flooding, wildfires, and landslides.
- Crucial **supporting infrastructure and services** will experience greater demands or challenges as climate change-related risks grow, including for already scarce water supplies, transportation and energy infrastructure, and emergency preparedness and services.
- Water supply shortages, which are already a serious problem, are expected to worsen. **Residents in rural areas that depend on groundwater alone and farming that relies on groundwater and/or state water allocations** are especially vulnerable.

Photo courtesy of Wikimedia Commons

***Source:** Koopman, Meis, and Corbett. 2010.*

Box 4: Vulnerability Identification Tools

- *Flood Vulnerability Assessment Map* – This map displays energy generation and extraction infrastructure overlaid on FEMA flood hazard maps.
- *MyHazards* – This tool, from the California Office Office of Emergency Services, allows individuals to type in addresses and see overlay of flood, earthquake, and liquefaction zones.
- *Social Vulnerability Index* – This tool uses census tract variables to identify communities with social vulnerabilities that would affect their ability to cope with climate changes.
- *California Health Disadvantage Index* – This index uses census level data to map communities with health vulnerabilities based upon social determinants of health.

- *USDA Food Environment Atlas* – This interactive map tool displays socioeconomic and food security factors on a county level.
- *Heat and Social Inequity in the United States* – This series of maps assesses social and heat vulnerability on a county level. Expected changes to heat exposure by mid-century are estimated as well.
- *EPA EJSCREEN: Environmental Justice Screening and Mapping Tool* – This interactive map tool overlays demographic and environmental indicators on a localized level and can help identify particularly impacted communities.

Step 3- Potential Impacts: How will climate change affect the points of sensitivity

Steps 3 through 5 of the *APGPAC* are best conducted in tandem so that the full grasp of climate change impacts can be understood. Identifying potential impacts, how likely they are, and their time of onset all fit together well when using hazard identification tools (**Box 3**). As degree of exposure generally changes over time and is estimated, considering different scenarios will be beneficial when later determining the risk of impacts. For example, a hospital's functionality may hardly be impacted by two feet of sea level rise but could face a major interruption of services at three feet, a less likely but still very possible scenario. While the goal of this step is to identify the severity of interruptions to community function, these concurrent assessments of the impacts' severity, likelihood, and expected timing will later allow for better prioritization of adaptive needs.

In the context of the APGPAC, determining how severely potential impacts will affect aspects of a community is a qualitative exercise. Because of this, it is important to collaborate with individuals from different backgrounds with diverse understandings of regional needs. For example, it may take a transportation planner to realize that a freeway exit is sensitive to extreme rainfall events and the corresponding emergency response and economic impacts associated with its closure. This collaborative approach proves equally useful in identifying adaptive capacity in step 4. For guidance on the relationship between climate exposures and impacts, skip to the *Impact Sector Summary* near the end of the *APGPAC*.

Step 4- Adaptive Capacity: What is or can be currently done to address the impacts?

Similar to step 3, rating adaptive capacity is ultimately a qualitative exercise that stands to benefit from individuals familiar with the operations of various departments and sectors in the region. If this knowledge base is unavailable, an audit of the plans, standards, ordinances, and programs listed in the *APGPAC* is an alternative, albeit a time consuming one.

Step 5- Risk and Onset: How likely are the impacts and how quickly will they occur?

Determining risk, or the likelihood, of a climate impact will require identifying at what degree of exposure an impact will occur and then interpreting the likelihood of that exposure. For instance, in order to determine the risk of a certain crop no longer being suitable for a region, the likelihood of reaching the crop's thresholds for rainfall, mean temperature, and temperature variability must be analyzed.

Also important is understanding the likelihood of impacts occurring at different times. Crop failure may be viewed as unlikely in the near-term, but in the long-term there could be a high certainty of it occurring. Understanding the progression of climate impacts will improve the prioritization of adaptive measures. If this information was not gathered in step 1, the tools from **Box 3** can be used to do so.

Adaptation Strategy Development

San Luis Obispo County and each of the cities within have already developed general adaptation strategies. These are laid out in the Climate Action Plans, *ClimateWise*, and the vulnerability assessments listed in **Box 1**. However, most of these strategies are only general directives rather than specific actions on how to boost community resiliency. They are worth inspecting for building upon or for inspiring ideas.

California's climate adaptation strategy, *Safeguarding California*, is currently being drafted in its third iteration. It provides adaptation strategies across the spectrum of climate sensitivities along with supporting partners, funding opportunities, legislation, and next steps where applicable. *Safeguarding California* can be used to identify and inform on climate adaptation strategies but should *definitely* be referenced after strategies are prioritized. It is likely that prioritized strategies will align with those in *Safeguarding California* which can then be used to guide implementation.

Strategies that are capable of being enacted immediately should be prioritized. Uncertainty, potentially high implementation costs, and competing interests must be accounted for, but should not necessarily impede strategies that meet a community's most pressing needs. If a sensitivity is truly high priority, strategies that mitigate the impacts often benefit multiple groups and should be framed as such. Community outreach can be used to communicate these benefits and garner support from local government staff, stakeholders, and residents.

Public engagement should be conducted throughout the strategy development process in order to understand the needs of those facing impacts and to identify equitable solutions. Special

efforts should be taken to engage traditionally underserved populations as they are often the most sensitive.

IMAGE 2: Sensitive Populations

Components of Vulnerability	Climate Change Risks	Population Particularly at Risk
Exposure	Floods Heat	Floodplain residents Outdoor and migrant workers
Sensitivity	Heat, Air pollution	Infants, populations with asthma and other respiratory illnesses, elderly
Adaptive Capacity	Heat, Floods	Institutionalized populations (e.g., persons with mental disabilities, prisoners) Socially excluded and economically marginalized groups

Source: Koopman, Meis, and Corbett. 2010.

***Image 2:** Section two of **Developing Adaptation Strategies for San Luis Obispo County: Preliminary Climate Change Vulnerability Assessment for Social Systems** contains a detailed explanation of populations sensitive to climate change. This information is described in much less detail in the Vulnerability in Natural and Socioeconomic Systems section of ClimateWise.*

Step 6- Prioritize Adaptive Needs: Which impacts require actions to address them?

The example adaptive needs matrix in step 6 illustrates the consideration of previously developed factors in a simple manner. Alternative methods can be used or the matrix can be modified to allow for a greater scale (ex: 5x5 instead of 3x3)

The second example matrix for identifying the strategy timeline can also be modified or substituted for a similar exercise. If it is determined that multiple community needs should be considered, which is likely, then matrix exercises for each impact can be conducted with a point value that weighs stronger needs greater.

One thing to be kept in mind during these model exercises is that they may prioritize 'low hanging fruit.' In the default organization of the second example matrix, impacts with easily achievable funding, short implementation periods, and high political support are more likely to

be ranked for addressing in the near-term. While it is important to take immediate action, an impact with a high adaptive need and strategies that faces these obstacles should take early steps to overcome them so action can be taken further along.

IMAGE 3: Sample Alternate Matrix

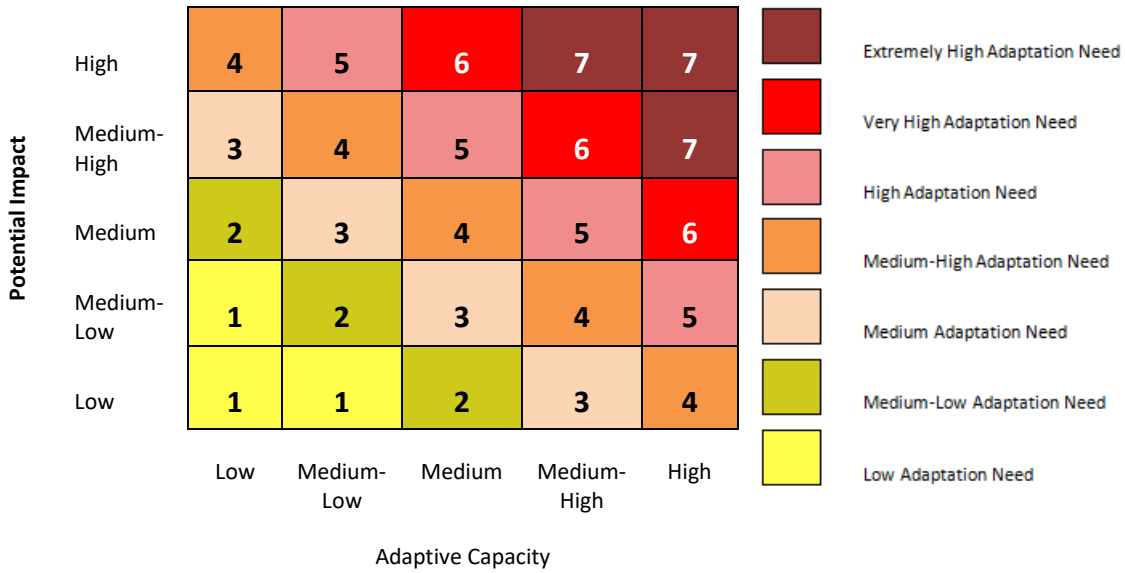

***Image 3:** By using point values, creating multiple matrices that rank various considerations such as adaptive capacity, risk, onset, potential impact, etc. can account for each of these factors. Point values can be altered according to community needs.*

Step 7- Identify Strategies: Which strategies should be pursued to address adaptation needs?

The *APG: Identifying Adaptation Strategies* document is one source of adaptation strategies worth considering. Case studies are another valuable source for adaptation strategies if they come from communities facing similar impact and needs. They can be used as roadmaps for implementation or proof of results which can be influential when planning in the face of uncertainty. **Box 5** lists adaptation strategy guides and **Box 6** displays databases containing case studies.

ClimateWise, the adaptation section of *EnergyWise*, a few vulnerability assessments previously mentioned contain adaptation strategies developed for the county, although many just provide general direction rather than specific action. The direction of these measures can be used to further develop adaptation strategies.

Box 5: Strategy Identification Guides

- *Safeguarding California Plan* – California's climate adaptation strategy, the 2017 plan which is in draft form.
- *Adapting to Climate Change: A Planning Guide for State Coastal Managers* – NOAA's coastal adaptation planning guide that includes specific strategies.
- *Center for Climate Strategies Adaptation Guidebook: Comprehensive Climate Action* – Lists a variety of approaches to climate adaptation.
- *Climate Ready Estuaries: Synthesis of Adaptation Options for Coastal Areas* – An EPA resource to coastal climate adaptation, particularly estuaries.
- *Getting Climate Smart: A Water Preparedness Guide for State Action* – A guide to management of water resources. Includes adaptation strategies in agriculture, infrastructure, coastal resources, public health, and tourism industries among others.
- *Green Works for Climate Resiliency* – Lists nature-based approaches to manage certain impacts of climate change.
- *Adaptation Strategies Guide for Water Utilities* – Lists strategies for building water delivery resilience with classifications of the strategies' cost.

Box 6: Case Study Databases

- *U.S. Climate Resilience Toolkit –* This link to the NOAA hosted database is directly to case studies searchable by location.
- *Climate Adaptation Knowledge Exchange –* This link is directly to a list of case studies hosted in the Climate Adaptation Knowledge Exchange, which also 1contains assessment tools.
- *Georgetown Climate Center Adaptation Clearinghouse –* The Georgetown Adaptation Clearinghouse contains a multitude of resources for climate adaptation planning, this database of case studies being one.
- *100 Resilient Cities: City Strategies –* The 100 Resilient Cities program highlights cities from around the world that have undergone a climate or non-climate resiliency building process.

Step 8- Evaluate and Prioritize Strategies: Which strategies should be implemented first?

When rating the difficulties associated with funding and social acceptance, keep in mind that these are both dynamic. Funding opportunities come and go, so it is important to stay informed of these opportunities. State agencies such as the EPA, CAL FIRE, and CEC sometimes offer funding for projects which increase a community's adaptive capacity. Email lists can be a useful

tool for staying on top of new funding developments. **Box 7** contains some funding opportunities.

Box 7: Funding sources and Funding information resources (newsletters, ARCCA, 4C, GHG Stakeholders, etc)

- *Strategic Growth Council Grants* – The Strategic Growth Council offers California Climate Investments and the Sustainable Communities Implementation Program, both of which have funding available for adaptation related efforts.
- *FEMA Hazard Mitigation Assistance* – FEMA offers three financial assistance programs for reducing future disaster losses: the Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program.
- *Funding Wizard* – The Air Resources Board offers this extensive database of financial incentives for sustainable programs from utilities and federal, state, and local governments.
- *SB 1 Grant Funding* – These grants, issued by Caltrans, include one each for Sustainable Communities and Adaptation Planning.

Social acceptance can change as demographics and the political climate shift. Additionally, strategies may be viewed more favorably depending on how they are marketed. For example, using the word uncertainty to discuss the degree of expected impacts could create resistance to action. By instead stating that expected impacts will be within a range, connotations of inaccurate science are avoided.

Despite the imminent threats of climate change, climate science can still be a divisive topic (Kennedy 2016). The nonprofit ecoAmerica uses research driven marketing to grow support for climate solutions. Their report titled Let's Talk Communities and Climate states practices for successful climate communication including steps for delivering a personalized message on climate action.

Historic stressors, such as drought and wildfires, will be exacerbated by climate change (EPA. 2016). Communicating this can connect future projections to present day reality. For example, 2017 has been a very bad year for wildfires. As wildfires in San Luis Obispo County are expected to increase by 200-300% by the end of the century (Koopman, Meis, and Corbett. 2016), describing this year's experience as being representative of a new norm makes climate change relatable. When describing effects of climate change in this manner, be careful not to directly attribute current or historic weather events to climate change without definitive proof.

Step 9- Phase and Implement: How can the strategies be funded, staffed, and monitored?

At this point, *Safeguarding California* should be referenced to identify if strategies chosen in steps 7 and 8 align with those of California's greater climate adaptation strategy. Supporting partners, funding opportunities, legislation, and next steps are laid out for many of the measures in this document and can provide guidance for implementation. Each strategy is located in the table of contents and categorized by impact.

In addition to the funding sources listed in table 6, a number of more traditional funding mechanisms can be used. These include general funds, taxes, impact fees, and bonds. If a vote is needed to enable funding, make sure that the reduction of future losses/costs are well communicated to the public. For instance, on average, five dollars of future losses can be avoided for every dollar spent on reducing flood-risk (Zurich Insurance Group).

If considering a large project, there are many bond financing mechanisms available to adaptation projects that are increasingly attractive to investors and may incur lower costs for the agency issuing them. Some of these include green bonds, revenue bonds, catastrophe bonds, environmental impact bonds, and private activity bonds. Bonds that finance environmental projects perform better than conventional bonds and the market for them is expanding rapidly (Hirtenstein. 2017). Due to the size of these debt instruments, a collaborative approach or regional/state partner would likely need to be involved.

San Luis Obispo County and its seven incorporated cities recently contracted Rincon Consultants to develop a tracking tool to measure Climate Action Plan progress. This tool could also be used for tracking adaptation practices and progress on goals. Planning departments for each of the cities and county are in possession of this tool.

Conclusion

San Luis Obispo County is well positioned to implement climate adaptation through local planning processes. Multiple vulnerability assessments have been conducted, strategies developed, and tools specialized to regional conditions. Using those resources and this document in combination with the *APG* will lead to robust adaptive actions being implemented. However, this guide is not a living document. Planners should make an effort to stay on top of new science and tools in the field so decisions can be as informed as possible. Using clearing houses such as Georgetown's and ICARP's and joining the Central Coast Climate Collaborative can facilitate this dissemination of information.

Adaptation planning is not a one-time event but a recurring action that over time builds resilient communities. Ultimately, adaptive planning will just be an aspect of regular planning processes. In order to make this happen, decision makers must be aware of projected climate change

impacts, vulnerabilities to them, and potential responses. Some local governments address this by making every employee take a 'climate change 101' course (Bolstad. 2016). Simply involving new groups in the adaptation planning process will increase the capacity to address climate change issues.

Considering future climate conditions in city planning is a relatively new concept. Adaptive planning goals should be balanced with other city goals, but many of these objectives will overlap. Acting preemptively to these significant changes makes for resilient communities by turning risks into opportunities.

> *By integrating adaptation strategies into regional planning efforts, we can ensure that resources are invested wisely and that the region's critical infrastructure remains effective – not just in 10 years but for the next 60 years.* (Capital Region Climate Collaborative).
>
> *-Michael McKeever, former Chief Executive of the Sacramento Area Council of Governments*

References:

Bolstad, E. (2016). “Coastal Cities Look to Resilience Chiefs to Combat Climate Change.” Scientific American. https://www.scientificamerican.com/article/coastal-cities-look-to-resilience-chiefs-to-combat-climate-change/. Accessed on September 5, 2017.

California Natural Resources Agency (CNRA) (2009). “2009 California Climate Adaptation Strategy.” resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf

Capital Region Climate Collaborative, “Investing In Our Future: Resilient Infrastructure for a Stronger Capital Region.” http://climatereadiness.info/wp-content/uploads/2017/02/Resilient-Infrastructure-Fact-Sheet.pdf. Accessed on August 30, 2017.

ecoAmerica (2016). “Let’s Talk Communities and Climate: Communication Guidance for City and Community Leaders. Path to Positive Communities.” Washington, D.C. https://ecoamerica.org/wp-content/uploads/2017/03/ea-lets-talk-communities-and-climate-web.pdf

EPA (2016). “Climate Impacts in the Southwest.” https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-southwest_.html. Accessed on September 6, 2017.

Hirtenstein, A. (2017). “Evidence Mounts for Green Bonds Outperforming Conventional: HSBC.” Bloomberg. https://www.bloomberg.com/news/articles/2017-09-05/evidence-mounts-for-green-bonds-outperforming-conventional-hsbc. Accessed on September 6, 2017.

IPCC (2013). “Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change” [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

Koopman, Meis, and Corbett. (2010). “ClimateWise: Integrated Climate Adaptation Planning in San Luis Obispo County.” http://www.lgc.org/wordpress/docs/adaptation/slo/SLOClimateWiseFinal.pdf

Kennedy, B. (2016). “Clinton, Trump Supporters Worlds Apart on Views of Climate Change and Its Scientists.” Pew Research Center. www.pewresearch.org/fact-tank/2016/10/10/clinton-trump-supporters-worlds-apart-on-views-of-climate-change-and-its-scientists/. Accessed on September 5, 2017.

Moser, S. and J. Ekstrom (2012). “Developing Adaptation Strategies for San Luis Obispo County: Preliminary Climate Change Vulnerability Assessment for Social Systems.” Susanne Moser Research & Consulting, Santa Cruz, CA. http://www.energy.ca.gov/2012publications/CEC-500-2012-054/CEC-500-2012-054.pdf

Zurich Insurance Group. “Beyond response and recovery: an introduction to the Zurich flood resilience program.” http://opim.wharton.upenn.edu/risk/library/zurichfloodresilience_intro.pdf