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Abstract

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Global Changes, Local Impacts: California's Adaptation Tools Help its Cities Address Climate Change

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The State of California has been changing state-level policies and legislation to prepare for and minimize the impacts of climate change. But how can local governments integrate climate adaptation planning into local policy and practice? Through three-case studies, Boswell and Read discuss how state agencies and the robust set of tools and guidance in the California Adaptation Planning Guide have been helping California communities in climate action planning.

When the city of Laguna Woods — a small southern California community with no history of climate change planning — decided to prepare a climate adaptation plan, it was overwhelmed with questions and uncertainty. Where could it find information about anticipated climate change impacts? How should it conduct a vulnerability assessment and policy development process? And how could it integrate climate adaptation planning into local planning and policy? Help was needed to address the challenges ahead.

State agencies recognized that local governments like Laguna Woods faced a twofold problem. First, information about the local impacts of climate change was difficult to find and of uncertain quality. Although there have been many efforts to downscale global climate models for regional and local use, local officials were presented with myriad options. Second, the information available was often in a form not useful to local planners. The information generally came from scientific sources that made little mention of policy — guidance that would help planners to develop a climate adaptation plan.

California communities now have a robust set of tools and guidance to help them plan for climate change impacts. The California Adaptation Planning Guide, issued in July 2012, provides local and regional governments with a process and tools for assessing vulnerability to climate change and developing strategies for adaptation and resilience. Associated with the guide is the web-based Cal-Adapt tool that allows users to define spatial areas and view climate change exposures such as wildfire, sea-level rise, and extreme heat. For local planners, Cal-Adapt is a single source of downscaled climate data that has been vetted by scientists working with the state.

In 2010 the California Climate Action Team, a state interagency committee, produced official guidance for incorporating sea-level rise into planning. The guidance includes projections along the California coast for three future time periods. It is based on the most recent science and is intended to reduce the confusion arising from different sea-level rise projections and scenarios coming from scientific, national, and international organizations.

Now many state agencies are providing climate change guidance for the planning processes they oversee. For example, the California Coastal Commission is in the process of finalizing guidance for integrating sea-level rise into local coastal planning. Similarly, the California Department of Water Resources, in cooperation with the U.S. Environmental Protection Agency, provides the Climate Change Handbook for Regional Water Planning.

On a more local level, several regional data programs supplement or build on the state data. In the San Francisco Bay Area, the Our Coast Our Future collaboration provides users with detailed sea-level rise data that can be combined with coastal storm data to assess the impact of extreme events. In Los Angeles, the C-CHANGE.LA collaboration shows projections for extreme temperature changes down to the neighborhood level.

Many California communities are at the forefront of putting these tools and data to use. Laguna Woods is assessing how its vulnerable population can adapt to extreme heat. The Western Riverside Council of Governments is helping the communities in its subregion to be resilient despite heat, drought, wildfire, and flooding risks. And the coastal city of Benicia is preparing for sea-level rise and the impacts of coastal flooding. All of them offer lessons in the value and shortcomings of tools and guidance provided by the state and other entities.

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Laguna Woods

Laguna Woods (pop. 16,415) is an incorporated city in Orange County with a predominantly older population. The median age in the city is 77; the 2010 Census reported that half of Laguna Woods residents are 75 or older and roughly one-quarter are 85-plus. Cognitive impairment, dependence on medications and medical apparatuses, limited access to lifelines, the likelihood of social isolation, and fixed incomes are among the major concerns in a community of older adults. These factors are predictors of vulnerability to climate change exposures such as extreme heat and severe weather.

The city used leftover funding from a Community Development Block Grant Component Award for the 2008 Disaster Recovery Initiative Program to develop a resilience plan. Its main tools were the California Adaptation Planning Guide and the Cal-Adapt web portal, which helped the city develop a thorough adaptation plan despite slim resources.

In particular, the city used the guide to define technical climate change terms in common language used by its consultant, the community, and its elected leaders. It also followed the suggested planning process and referred to the document for guidance when it encountered the need for third-party data.

The city downloaded extreme heat and wildfire data from Cal-Adapt, as well as regional climate change profiles from the guide to develop its vulnerability assessment. In 2014, the Laguna Woods city council unanimously adopted the plan. Through the adaptation planning process, the city identified increases in extreme heat as the most certain and severe impact to its older residents. As a result, the city developed policies focused on extreme heat emergency preparation and response to increase public safety, and energy efficiency and renewable energy to reduce the ever-increasing cost burden of cooling residents' older homes.

Western Riverside Council of Governments

The WRCOG subregion — the western part of Riverside County, located about 50 miles east of Los Angeles — consists of 18 jurisdictions and is home to nearly two million people. Western Riverside County is a diverse area, with a variety of socioeconomic conditions, infrastructure types, neighborhoods, geographies, and character. It is an arid region with cool winters and hot summers.

In 2014, WRCOG adopted the Subregional Climate Action Plan, with strategies for achieving 1990 emissions levels by 2020. WRCOG believes that for the subregion to flourish amid unprecedented growth, local decision makers must explore how the climate could change and begin to implement strategies that could help communities thrive in a variety of conditions. With that aim, WRCOG this year conducted a climate change adaptation study that became a stand-alone report for local government use and an integrated chapter of the Subregional Climate Action Plan.

WRCOG obtained grant funding from the Southern California Association of Governments to complete the adaptation report, but did not have the money or personnel to develop climate change projections from scratch. WRCOG used a combination of the California Adaptation Planning Guide, Cal-Adapt for extreme heat projections, and reports and hazards mapping data released by the California Energy Commission for wildfire projections.

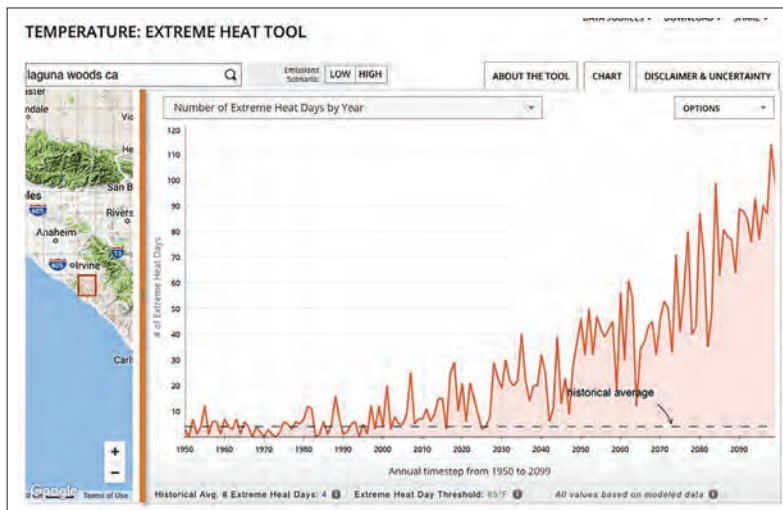
The WRCOG example illustrates a shortcoming of statewide data. The hydrology of the subregion is complicated, and the plan would have benefited from projections on flooding as a result of precipitation change. However, the data was not available, so WRCOG settled on using 100-year and 500-year Federal Emergency Management Agency floodplain maps as a proxy.

What does this mean?

This chart displays a count of the number of days (along the "y" axis) that the selected area on the map is projected to exceed the area's calculated "extreme heat threshold" for each year 1950–2099. This threshold can be found labeled in green at the bottom of the chart.

For most areas around the state, the models project a significant rise in the number of days exceeding what is now considered extremely hot for the given area. In combination with extreme daytime heat, extremely warm nights are an important factor to consider.

Source: Cal-Adapt.org/temperature/heat/#



Although not perfect, the tools empower the subregion to begin planning for the long-term effects of climate change using available resources. While WRCOG may not know exactly how flooding could change as a result of climate change, it can now share with local policy makers and transportation agencies the importance of considering these changes when making long-term infrastructure investments.

Benicia

Benicia (pop. 28,000) is a waterfront community east of San Francisco. The city is home to an arts community, scenic vistas, a vibrant downtown, a port, and an industrial park with more than 400 businesses. However, much of this is threatened by the impacts of future climate change. Sea-level rise, storm surge, and extreme temperatures are projected to increase significantly over the coming decades.

To maintain its high quality of life, Benicia is proactively planning for the challenges that a changing climate may bring. The city is conducting a Climate Change Vulnerability Assessment and creating an Adaptation Plan that identifies adaptation measures emphasizing sustainability, social equity, economic vitality, and cost effectiveness; where feasible, these will be integrated into existing or future city plans.

With funding from the California State Coastal Conservancy Climate Ready grant program, the city is in the process of testing the application of the San Francisco Bay Conservation and Development Commission's Adapting to Rising Tides vulnerability and adaptation model, which relies heavily on strong stakeholder engagement.

The city has a number of tools at its disposal to project sea-level rise impacts. Most importantly, the California Ocean Protection Council released updated sea-level rise planning guidance in 2013, which includes the scientific findings of the National Research Council study *Sea-Level Rise for the Coasts of California, Oregon, and Washington*. The OPC guidance recommends preparing for five to 24 inches of sea-level rise by mid-century and 17 to 66 inches by the end of the century for most of coastal California.

In order to use publicly available sea-level rise mapping tools to determine the effect of storms on coastal flooding, a FEMA study of average water level depths during storm events of various return intervals was used in conjunction with three other tools: the National Oceanic and Atmospheric Administration's DigitalCoast Sea Level Rise Viewer, Climate Central's Surging Seas maps, and the Future San Francisco Bay Tidal Marshes tool (from Point Blue Conservation Science). With these tools, the city could develop the best available understanding of how sea-level rise could affect the shoreline.

The tools helped the city identify and determine which local areas will be most vulnerable to changing water levels and what risks need to be addressed now and in the future. This

information and a broad list of adaptation strategies was supplied to city department heads, who selected priority measures by evaluating the time frame for implementation, available internal and external funding, consistency with existing city priorities, and other factors. These priority strategies and a comprehensive matrix of all adaptation measures, searchable by vulnerability, risk, time frame, location, and cost, will be presented to the city council by next spring.

Although each of these communities made a significant leap forward in creating resilience to climate change, some challenges remain. The tools and guides are user friendly, but all of the communities needed consultant expertise to complete their planning efforts. That could be a potential problem in communities lacking the funds to hire consultants.

What was learned

Projections have existed for as long as planners have been planning. Most planners are comfortable thinking about how populations and economies might change through a planning period, yet no one expects planners to be technically trained demographers or economists. Rather, most agencies depend on experts to develop projections based on the most likely outcomes given what is presently known. As the climate changes, planners will also need to get comfortable using climate projections. But, just as we don't expect all planners to be economists or demographers, we shouldn't expect planners to be climatologists.

The tools discussed in this article represent the first generation of attempts to provide local planners with the projections they need to make informed long-term planning decisions. Although not perfect, the tools empower local governments and agencies to begin incorporating climate change into their planning tools.

Several challenges remain. First, although the tools in question simplify the complicated world of climate projections, the embedded assumptions and scenarios can still present an overwhelming set of choices to communities venturing into adaptation planning. These tools need to include more "expert system" features that assist with confusing decisions.

Second, downscaling global climate change impacts to the local level continues to have a high degree of spatial and temporal uncertainty. State guidance generally does a good job explaining this uncertainty, but local governments could benefit from additional guidance on how to communicate the uncertainty and additional explanation of how the uncertainty should factor into local planning decisions.

Finally, many communities continue to struggle to map community assets, hazards, and climate change impacts. In particular, small, resource-constrained communities may not be able to maintain their own GIS. Additional evolution of web-based mapping tools such as Cal-Adapt and the NOAA DigitalCoast

suite will be of great benefit to these communities and have the added benefit of being accessible by the general public.¹

As communities begin to see and feel the significant effects of climate change, it is clear that in most cases inaction is no longer a prudent long-term option. Although the uncertainty inherent in climate change projections will continue to be a challenge, accessible data tools make local actions more feasible and effective. With these tools in hand, local governments and agencies can continue their good, long-term planning work in the face of a changing climate.

Resources

California Climate Adaptation Planning Guide: http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide

Cal-Adapt: <http://cal-adapt.org/tools>

California Climate Action Team: http://climatechange.ca.gov/climate_action_team

Our Coast Our Future: <http://data.prbo.org/apps/ocof>

C-CHANGE.LA: <http://climateresolve.org/c-change.la>

NOAA DigitalCoast: <http://coast.noaa.gov/digitalcoast>

¹ For more information on DigitalCoast resources, see “Coastal Data, Visualized” in the October 2012 issue of *Planning*.