



# PROCESS GUIDE

## LOCAL ADAPTATION PLANNING

### SUMMARY

- United States cities face challenges from climate change due to impacts on communities, infrastructure, and other assets and resources. Integrating climate risks into cities' planning efforts can be difficult but is an important way to build resilience to climate variability and change, while satisfying policy requirements.
- Effective climate adaptation planning includes both a hazard assessment to determine vulnerability and an identification of potential adaptation actions.
- City staff engagement, localized climate data, comprehensive asset data, compelling and accurate visualization tools, and a framework for measuring and analyzing risk, are instrumental for informative exposure assessments.
- Valuable resources for identifying appropriate adaptation actions include climate hazard exposure or vulnerability assessments, policy guidance, existing city and regional plans, and community engagement processes.

### INTRODUCTION

#### The Challenge

Cities and counties across the U.S. face a variety of challenges from climate variability and change as well as non-climate stressors that changing climate conditions threaten to exacerbate. Local jurisdictions that repair infrastructure, make land use decisions, and engage communities in a way that accounts for future change can help make their cities more resilient. However, many cities and counties lack the capacity, resources, and funding to assess climate risks, integrate climate adaptation into existing plans, and implement adaptation actions in the face of competing or more immediate needs.

Even so, a growing number of local jurisdictions are engaging in voluntary commitments to mitigate and adapt to climate change. A wide range of available resources makes this possible, and climate legislation increasingly requires it, but both can also make implementing a cohesive, streamlined adaptation strategy difficult. Several federal agencies ([FEMA](#) and [NOAA](#)), state agencies ([California Adaptation Planning Guide](#)), international institutions ([GIZ](#)), and NGOs ([National Wildlife Federation](#)) have developed guidance and methods for climate hazard or vulnerability assessments and adaptation planning. Industry and sector-specific tools and literature are also available from a multitude of sources. No single option can meet the diverse adaptation planning needs of cities and counties across the U.S., and the range of sources also presents local jurisdictions with the challenges of selecting a methodology, building climate literacy, and using their assessments to inform multiple goals, plans, and projects.

#### The Requirements

In California, legislation exists that actively seeks to promote the integration of adaptation and resilience into local planning processes. *Senate Bill No. 379 Land Use: general plan: safety element (Jackson)* (SB

379) calls on local governments in California to incorporate adaptation and resilience strategies into the Safety Elements of their General Plans as well as their local hazard mitigation plans starting in 2017. *Assembly Bill No. 2140 General plans: safety element (Hancock)* enables local jurisdictions to adopt a local hazard mitigation plan as their safety element, facilitating integration of hazard mitigation into General Plans.

To support local governments' implementation of SB 379, the Governor's Office of Planning and Research recently issued guidelines for integrating climate considerations into Safety Elements as part of the update to the [General Plan Guidelines](#). The guidelines build on the State's [Adaptation Planning Guide \(2012\)](#) and emphasize the need for communities to adopt a longer-term perspective in preparing for climate risks. They also highlight the importance of identifying linkages and complementarity across different elements of the General Plan and other relevant plans. Thus, there is a need to unify and streamline efforts to boost resilience and integrate adaptation comprehensively into city and county planning in a way that leverages local capacity and resources, uses the best available science and data, and meets local needs as well as relevant requirements.

It is important to note that these requirements are in addition to local commitments and planning processes that each come with their own timelines and demands. Cities that commit to voluntary agreements, such as the Global Covenant of Mayors, are required both to reduce greenhouse gas emissions and address the impacts of climate change by identifying climate hazards, assessing vulnerabilities, and developing adaptation plans. Cities may have adopted several plans that integrate or overlap with climate planning, such as climate action plans, local hazard mitigation plans, adaptation plans, resilience strategies, transit oriented development strategies, and more. Adaptation has a crosscutting role to play across all of these forms of city planning. So comprehensive integration of vulnerability assessment and adaptation action is essential.

### **Towards a Solution**

In support of implementation of integrated climate adaptation planning, Four Twenty Seven has developed a streamlined process to support local governments in their efforts to integrate climate risks into key planning efforts, such as local hazard mitigation plans, general plans, and climate action plans. [Through our work for eight cities in Alameda County](#), on behalf of the County waste authority, StopWaste, we designed an assessment process and report to help cities meet the requirements of SB 379. This work responds to these requirements by providing a climate hazard exposure analysis and proposing a set of adaptation options to help each city plan for future conditions.

The assessment and report are designed to be applicable to multiple cities and useful for multiple planning processes. The objective was to develop one hazard assessment and set of adaptation actions that can inform multiple city demands and decision-making processes. In this case, the hazard assessment focused on asset-specific exposure. However, the methodology could be expanded to include the other components of vulnerability – adaptive capacity and sensitivity – to meet the needs of other jurisdictions and planning processes while promoting an accessible and streamlined approach to climate hazard assessment and adaptation planning. This guide will outline our process of assisting the

cities in Alameda County with adaptation planning, first describing climate hazard assessment and then discussing adaptation planning.

## CLIMATE HAZARD ASSESSMENT

To conduct an exposure assessment that provides valuable and actionable information, we found these five elements to be instrumental: city staff engagement, localized climate data, comprehensive asset data, compelling and accurate visualization tools, and a framework for measuring and analyzing risk.

### Key Elements of the Climate Hazard Assessment Methodology

#### *Engage Relevant City Staff*

The right data, tools, and assessment methodology are only useful if implemented in a way that addresses city needs and establishes buy-in from city staff. Throughout our work with cities in Alameda County, we obtained feedback and direction from city staff to ensure that each climate hazard assessment considered the specific assets, planning processes, and concerns of importance to them, so the information could be used in future planning. We engaged city staff to help us understand the status of relevant city planning processes and city needs, review and fill gaps in asset data to ensure coverage of critical assets, and provide feedback on all documents, which was then integrated into the final assessment.

Within a city, ensuring cross-agency engagement in hazard assessment development, implementation, and review can help promote the overall success and usability of a final assessment.

#### *Use Locally-Relevant Climate Data*

Every place is subject to location-specific climate conditions. Using the highest quality and most localized data enables understanding of the potential impacts of these climate conditions within a specific context and at a scale that can inform local planning. For each climate hazard, a careful evaluation of the best available data was conducted to understand what level of information would be sufficient and practical to inform an accurate assessment of risk.

In Alameda County's case, we were able to leverage the publicly available sea level rise data generated for the County as part of the San Francisco Bay Conservation and Development Commission's (BCDC) [Adapting to Rising Tides Program](#), and local temperature and precipitation data available through the State resource, [Cal-Adapt](#). Four Twenty Seven used the temperature and rainfall data to produce projections through 2100 at the city level for each of the Alameda cities.<sup>1</sup> The use of the localized data enabled a place-specific understanding of changing climate conditions and an exposure assessment based on the specific conditions in the East Bay rather than on outputs of models that employ assumptions that apply nationally.

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<sup>1</sup> Before the most recent version of climate data was published through Cal-Adapt, Four Twenty Seven applied the same methodology using data from the U.S. Bureau of Reclamation.

In other cases, the best available local climate data was from state or federal resources – such as CalFIRE fire hazard severity zones, the United States Geological Survey landslide data, and FEMA Flood Insurance Rate Maps of 100 and 500-year floodplains. Where insufficient local data exists, regional or national data, such as that available in the [U.S. Climate Resilience Toolkit](#), may provide useful information about local or regional trends in hazards of concern.

### *Collect Comprehensive Asset Data*

We collected asset information from open data sources available through various federal agencies, OpenStreetMap, and local sources such as city staff and BCDC. Cities that have conducted an asset inventory may be better prepared to account for asset risk, but there is a significant amount of publicly available information that can inform hazard exposure assessments.

The evaluation of assets here can be expanded to include a wide range of city resources. In an exposure assessment, assets are considered specific structures or properties that serve a valuable function for the city or community. However, in a wider vulnerability assessment, it will also be critical to have information regarding social and community resources, and the factors that contribute to adaptive capacity and sensitivity. In the context of this project, the climate hazard analyses thoroughly examined the cities’ potential spatial exposure to a variety of climate hazards and were meant to complement further analyses of overall vulnerability and appropriate adaptive responses.

### *Leverage Visualization Tools*

The city-specific climate hazard analyses were conducted using an online mapping tool called the [Vizonomy Climate Risk Platform](#) (Vizonomy). This platform overlays geographical representations of sea level rise, rainfall-induced inland flooding, wildfires, and landslides with the location of citywide assets, creating a visual representation of the spatial extent of each hazard and the specific assets that could be affected by those hazards throughout the city. (See Figure 1 for an example.)

Whether a publicly available resource like Cal-Adapt, a customizable resource such as Vizonomy, or static but detailed GIS maps, visualization tools can inform planning by making complicated and disparate data sets more approachable and informative. In many cases, dynamic platforms and resources can also act as assessment and engagement tools because they are both interactive and informative.

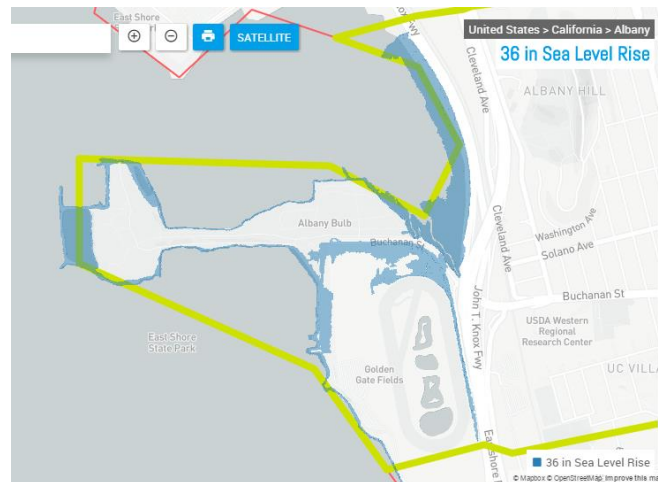


Figure 1. Projected sea level rise in Albany by the end of the century (36 Inches) as represented on Vizonomy

### *Apply a Framework for Analyzing Risk*

Once the data is collected and processed, it is important to have an effective method for evaluating varying levels of risk. While there are ways to quantify dollars at risk, financial considerations are only part of a larger picture of risk. In an effort to use the data we acquired to measure levels of risk for each hazard in a city, we used a modified version of FEMA's Calculated Priority Risk Index. This allowed for a classification of the severity of risk posed by each hazard based on the types of assets exposed and the magnitude of potential impacts.

The benefit of this approach is that it is fully customizable to the needs of the city and the quality of information available for analysis. The most important consideration is consistency in the evaluation of risk to enable the relative comparison of risks posed by different hazards. This is also true of evaluation of risk across regional and local initiatives. In our case, it was most pertinent to build consistency between the evaluation of risk across the cities in Alameda County. When done internally within a city, consistency between the evaluation of risk in other city plans may inform the definition of this framework.

### **Outcomes**

In Alameda County, this process allowed us to prepare hazard assessments that provide cities with information to evaluate future climate impacts in their jurisdictions and inform the development of appropriate response strategies. The intent of these analyses was to identify exposed assets so that cities can determine which areas and assets are most at risk, who will be most invested in becoming engaged in the response, and where the city needs to pay the most attention in other analyses and plans.

Participating cities plan to use the hazard assessments to inform or complement local hazard mitigation plans, climate action plans, general plan safety elements, and Global Covenant of Mayors requirements. Beyond planning, in Emeryville, the information is supporting project evaluation and development for shoreline projects, as well as assessment of granted lands for the State Lands Commission for legislative compliance with *Assembly Bill 691 State Lands: granted trust lands: sea level rise (Muratsuchi)*. By leveraging regional participation and maintaining the flexible nature of the reports, the information gained from this project is already demonstrating the ability to help build momentum for adaptation in multiple facets of city planning and project development.

## **CLIMATE ADAPTATION PLANNING**

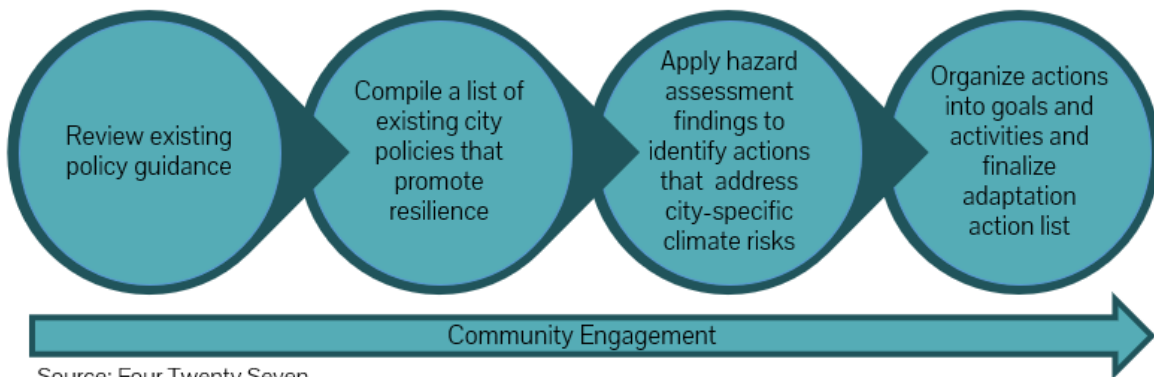
Identifying adaptation actions and defining key considerations such as feasibility, timeframe, and potential partners and funding are critical steps for local governments to build out a strategic framework for responding to climate change. It takes the process of climate adaptation planning from assessment to action. This is not easy – in addition to appropriately targeting and addressing city-specific climate risks, actions must be practical, feasible, and aligned with other city and regional efforts and priorities. Since each city is unique in its climate hazard, socioeconomic and geographic characteristics, actions will need to be customized to the specific city characteristics and hazard profile. However, local

governments do not need to start from scratch. Many options tested by other cities may also be relevant, and the most promising actions are likely to be those that build upon existing city policies, plans, or projects. Here we present a framework for how to develop a set of adaptation actions.

### Methodology

The approach to developing policies, goals, and actions for adaptation will depend on the resources available to inform and implement appropriate actions and, more critically, the types of decisions and planning processes the actions are tied to. Policy guidance, existing city and regional plans, climate change hazard exposure or vulnerability assessments, and community engagement processes are all valuable tools for identifying the most appropriate actions for a city. We will consider how each of these elements can inform the development of effective and practical actions.

### Sample Framework for Adaptation Action Development



Source: Four Twenty Seven

#### *Review existing policy guidance*

Compliance with existing legislative requirements and commitments will be an essential component of a successful climate adaptation strategy. A helpful way to start this effort is to review existing guidance from policies, agencies, and other groups that must inform action development in order to ensure compliance. For example, local hazard mitigation plans must meet federal requirements from FEMA to be eligible for federal disaster funding. Overlapping or combining adaptation and resilience with hazard mitigation planning can help promote consistency and cohesiveness in city planning. Existing state guidance should be reviewed as well, such as guidance from the California Office of Planning and Research on the implementation of SB 379, to meet local requirements and needs.

Voluntary commitments are also important components of climate change planning, so guidance and requirements from the Global Covenant of Mayors, C40 Cities, 100 Resilient Cities, and other initiatives can help inform what approach to take to adaptation action development for the city. Even as nonparticipants in these commitments, cities may find valuable guidance, resources, and information through the programs. Similarly, while many of these resources may not provide ideas for specific

actions, they may serve as helpful references to inform development and communication of adaptation actions from a strategic or topical perspective.

*Compile a list of existing city policies that promote resilience*

Next, it's valuable to do a thorough review of existing city plans for strategies that are adaptive or help to build resilience. By beginning with local policies and efforts, a new plan can help celebrate existing efforts and demonstrate how current priorities already build resilience while aligning with existing city priorities and plans. It is very unlikely that a city is starting from scratch in terms of resilience activities – infrastructure maintenance, community development, and emergency management efforts may already be advancing progress toward these goals.

In our work designing adaptation actions for cities in Alameda County, we reviewed city-specific plans by participants and regional leaders and collected existing resilient or adaptive actions that have already been identified as possible and actionable in the region. As a result, we were able to share regional strategies, lessons learned, and relevant actions between cities and highlight robust climate and/or adaptation planning practices. A list of the relevant city actions already in place and valuable examples from other jurisdictions will create a basis upon which to develop additional strategies that complement, expand, and move existing processes forward toward implementation (in addition to highlighting any gaps or maladaptive policies that exist within the city and can be addressed through adaptation planning).

*Apply hazard assessment findings to identify actions that address city-specific climate risks*

Once the existing efforts in the city have been identified, it will be important to ground the identification of additional adaptation actions in the results and findings of the hazard assessment to mitigate the city-specific risks posed by climate hazards. Knowledge of the specific geographic areas, assets, and populations that will be impacted provide vital information about what kinds of actions should be prioritized to address the critical climate risks affecting the city. Considering each climate hazard, and not only how it will impact the city individually but also in conjunction with other hazards, can guide an action development process that is responsive to relevant hazards and addresses multiple threats. Similarly, evaluating needs through the lens of cross-cutting themes such as public health and emergency management can highlight important areas of action that complement hazard-specific actions.

*Organize actions into goals and activities and finalize adaptation action list*

Through this process, cities can develop a set of potential actions that can be evaluated, consolidated, and prioritized for implementation based on the needs, hazard risks, and capabilities of the city. Sorting actions into categories by theme or hazard and then organizing the actions into high-level goals or strategies and corresponding support activities will help provide clear organization. The final set of goals and actions can inform or become part of city plans and policies.

In addition to the high-level articulation of goals and more targeted activities, articulating robust background information can enhance the usefulness of adaptation guidance – especially since many

adaptation initiatives will fall under the jurisdiction of various departments and agencies within the city due to the interdisciplinary nature of adaptation. Information on timeframes, funding, co-benefits, and equity considerations can provide the context needed to prioritize and build momentum for action implementation. Including this information up front while balancing the policy flexibility needed to implement a responsive adaptation strategy will allow a city to effectively implement adaptation strategies.

### *Engage the community*

This process is incomplete if it only includes insights from city staff. Community engagement is an essential element of a responsive and comprehensive adaptation strategy, and is required for regulatory and legislative compliance in many cases. Community workshops, events, and site visits of potential high-hazard areas are all opportunities to source ideas, solutions, and priorities from the community and interested stakeholders.

## CONCLUSION

Adaptation planning is a critical response to a changing climate and increasing legislative pressure. Breaking adaptation planning into a step-by-step process makes it both approachable and effective. By beginning with a climate hazard assessment, cities can identify the specific hazards that are most threatening to their assets. City staff engagement, localized climate data, comprehensive asset data, compelling and accurate visualization tools, and a framework for measuring and analyzing risk are essential components of developing hazard assessments. After applicable climate hazards are identified it is important to develop adaptation plans, considering how these can build from and be integrated into existing city policies.

## ABOUT THIS PUBLICATION

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At Four Twenty Seven, Kendall specializes in translating technical information and data into compelling and actionable reports and policy recommendations. Kendall has worked with utility, nonprofit, and local government clients to help visualize and action-orient their goals and strategies. Her graduate research, on how proven energy efficiency financing mechanisms can inform innovative financing models for voluntary green stormwater infrastructure projects, motivated her deep understanding of resilience finance.

### About Four Twenty Seven

Four Twenty Seven ([www.427mt.com](http://www.427mt.com)) is an award-winning market intelligence and research firm specialized in the economic risk of climate change. Four Twenty Seven's data analytics solutions bring climate intelligence to economic and financial decision-makers. Four Twenty Seven provides financial portfolio climate risk assessments, development of climate resilience strategies, quantification of metrics and indices for benchmarking, monitoring and evaluation, and training and stakeholder engagement to Fortune 500 corporations and governments worldwide.



Four Twenty Seven was a finalist for the prestigious Cartier Women's Initiative Award (2014), earned Climate Change Business Journal Awards for Climate Risk Management and Adaptation (2014 and 2015), took first prize in the ESRI Human Health and Climate Change Challenge 2015, and won the Verdantix Environment, Health and Safety Information Management Award (2016). Its founder, Emilie Mazzacurati, was awarded the Berkeley Visionary Awards in 2016. The company was founded in 2012 and is headquartered in Berkeley, California with offices in Washington, DC and Paris, France.

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