

# IMPROVING COMMUNITY RESILIENCE THROUGH RISK MODELING

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## INTEGRATION STRATEGY—FINAL

### Background

As identified through the course of this project, a wide range of models, tools, and methods exist for identifying and understanding flood risk at the local level. This *integration strategy* will help define how specific resources can be deployed at the local level, including specific discussion on how that information can be introduced to a local planning team and integrated into live community planning processes. This strategy is applicable to local planning organizations, planning consultants, model developers, Federal and State agencies, technical assistance providers, Digital Coast Partners, and others.

This strategy also serves to identify ways that the planning efforts required of local communities might be tailored to satisfy multiple requirements (e.g., FEMA-required mitigation planning efforts and HUD-required community planning efforts).

Note: this integration strategy was first drafted during the earlier phases of this project and has been finalized as part of Task 8 following the engagement of the local government partners in San Luis Obispo County, California and Brevard County, Florida.

### Introduction

The integration of risk assessment and mitigation planning resources into community planning efforts is vital to ensuring the long term well-being of communities nationwide. However, the uncertainty of future risk and the relative complexity of data, tools, and models complicate this process. Within existing planning processes, there are a number of planning opportunities and points of intervention where risk-focused data, models, or methods can help to produce better plans. This guidance is centered on the premise that the integration of risk as standard criteria within the planning process is vital to community resilience. The following will outline a strategy for planners, model developers, federal agencies, community organizations, and assistance providers to integrate specific risk-focused data, methods, tools, and models into a generalized community planning process.

#### *General Guidance for Integrating Data Into the Planning Process*

While planning processes are generally similar across the wide array of plan-types, plans and their associated goals and timeframes differ considerably. Some, like a hazard mitigation or evacuation plan, consider hazard risk explicitly. Here, risk is foundational to the creation of the plan. For other plan types, such as comprehensive plans or zoning and land use ordinance revisions, hazard risk may only be considered tangentially, if at all. Yet hazards and their associated risks will likely play a major role in the future of communities nationwide. Natural hazard risk cuts across many of the elements making up a typical plan, impacting land use goals, the accommodation of growth, economic development, and environmental health. For plans such as these, accurate, accessible, and comprehensible risk-focused

data, methods, and models are critical to the consideration of hazard risk within the planning process. Here, planning agencies and consultants, modellers, Federal and State agencies, community organizations and assistance providers all have a role to play.

The following general guidance introduces and summarizes how the various actors within a planning process may achieve this integration.

### Planners, Planning Organizations, and Planning Consultants

The early introduction of risk-related information and resources is critical to the integration of risk within community planning processes. For planners, planning organizations, and planning consultants, this may most obviously manifest in the early scoping or initial public outreach phases. The risk and community data presented at this stage can be general, accessible, and relatively easy to present. The use of information that both the public and the planning organization are already familiar with may help to normalize and further embed the concept of risk within the planning process. For planners in coastal or riverine areas, FEMA's flood maps are vital in assessing the general risk of coastal flooding, and may be broadly useful in determining those lowest lying areas that may be susceptible to future sea level rise. This information can be presented in its most basic form at a project scoping open house or in a presentation during a town hall-style kickoff meeting. If charrette-style table discussion is part of the outreach process, a general assessment of community strengths, weaknesses, opportunities, and threats is likely. This discussion is extremely well suited to the further integration of community risks (considered a threat or weakness), and options for mitigation (a potential opportunity). The public outreach process has tremendous potential to engage a wide variety of stakeholders and community organizations. Engaging the public with standard, familiar hazard data at this juncture is critical.

The availability of the resource(s) utilized, and the ability to understand and interpret them, are important considerations for planners. FEMA flood maps and NOAA Digital Coast resources require little in the way of planner or agency expertise in order to develop a generalized picture of current or future risk. This information can be used to assess and potentially map vulnerabilities throughout a community, informing various elements of a comprehensive plan. A planning consultant leading a comprehensive planning exercise may want to research any statewide or regional resiliency initiatives before engaging with the public. These resources are often publicly available and relatively easy to find. The FEMA-sponsored Oregon Risk MAP and the Florida Sea Level Scenario Sketch Planning Tool are two such resources. An agency or consultant may find that what internal expertise they lack can be compensated for through powerful specialist-developed tools.

As the plan develops (or necessary plan maintenance is performed), more detailed risk-related information is likely. In a zoning map revision of a largely residential area, a planning agency may begin by consulting a map of the local 100- and 500-year floodplains. This may provide not only a basic assessment of those areas most at risk of coastal or riverine flooding, but in the absence of detailed ground elevation data, may also offer a clue of the most low-lying neighborhoods. A further, more detailed study of the area may assess the possible impacts of sea level rise on the area under revision. The community may then weigh future risk along with other considerations such as accommodating growth, environmental preservation, preserving neighborhood character, etc. before engaging in a zoning change.

## Model Developers

A variety of online resources exist that are beneficial for the community planning process. These range from simple viewers and tools to data repositories. While these resources are continuously improving, limitations exist.

The data viewer may identify and display a specific hazard to the community, but the risk may not be discernable due to limitations of the viewer. For example, an online tool that displays future sea level rise conditions may show a large portion of a community inundated, but without the ability to export or download the raw data, it may not be possible to analyze the data and determine the specific populations and facilities at risk. However, when there are data available for the user, other issues can arise. Additional formatting of the data may be required before it can be used, and the data may require technical expertise from additional staff and resources to perform pertinent risk analyses.

Ideally, resources used for risk assessment and analysis will provide users with the ability to both view and download data. This allows a multitude of users to benefit from the site, from stakeholders to the public. Planners can use the viewer to identify areas of risk and direct their technical GIS staff to acquire and analyze the data to their needs. Future improvements may include the ability for the viewers to incorporate tools that can analyze the data internally and then generate reports that identify various risks.

## Federal Agencies

During many types of planning activities, there are specific opportunities established for stakeholder involvement. During these windows of opportunity, representatives from key federal agencies should be invited to participate in meetings. These federal agencies may include, but should not be limited to, the following:

- NOAA: representatives from the NOAA Office for Coastal Management should be invited to stakeholder involvement meetings to discuss coastal management issues and datasets, resources, etc. available through Digital Coast and other partner sources. Other NOAA staff should be considered as well—from the National Weather Service or the Geospatial Information Officer, for example. Regional staff who are familiar with local issues are an especially valuable asset.
- HUD: HUD provides funding for resilient housing and infrastructure projects to states and communities impacted by major disasters.
- FEMA: representatives from the FEMA regional office should be invited to stakeholder involvement meetings to discuss mitigation planning requirements, risk analysis techniques, NFIP requirements, available resources, and other relevant programmatic details.
- EPA: EPA and FEMA partnered in 2010 to collaboratively assist communities that have been hit by disasters to recover and mitigate in ways that “protect the environment, create long-term economic prosperity, and enhance neighborhoods.” The EPA/FEMA partnership also helps communities incorporate smart growth and climate adaptation strategies to improve quality of life and direct development away from vulnerable areas.

- USGS: representatives from USGS should be invited to stakeholder involvement meetings to discuss hazards that fall under USGS science programs: Coastal & Marine Geology, Earthquake Hazards, Geomagnetism, Global Seismographic Network, Landslide Hazards, and Volcano Hazards, as well as the USGS Water Science Center. Through these programs, USGS provides alerts and warnings of geologic hazards and supports the warning responsibilities of NOAA for geomagnetic storms and tsunamis. The Coastal & Marine Geology program supports all missions of USGS, characterizing and assessing coastal and marine processes, conditions, change, and vulnerability. The aforementioned Water Science Center, located in many states, includes surface and groundwater data and modeling staff, monitors stream gages, and typically collects field-based high water marks after events.
- USDA: representatives from USDA should be invited to stakeholder involvement meetings to discuss issues related to drought, wildfire prevention, agricultural research, agricultural statistics, and other areas relevant to community resilience.

### Community Organizations and Assistance Providers

Community organizations and assistance providers have a special perspective within their communities, often serving as a bridge between the public and the planning organization. Their unique position sometimes affords them a privileged role in the planning process, where they are empowered to act on behalf of segments of the wider public. Within a mitigation or adaptation planning process, they may also represent underserved or at-risk communities that are particularly susceptible to natural hazards. However, direct analysis or research of hazard risks may be institutionally out of reach for these organizations. Considerations such as staff expertise, the accessibility of data, tools, or resources, the sheer volume of available information, or the comprehensibility of the data to the organization's primary audience, all complicate the degree to which community organizations can participate in or lead a risk assessment within the planning process.

However, these organizations are likely to have a much higher level of expertise and social perspectives within their respective focus areas. A merchants group may be intimately familiar with the impacts of street flooding on downtown businesses. A homeless advocacy organization may be vital to providing outreach to persons displaced by coastal flooding. The input and participation of these groups is vital at all stages of the planning process, particularly if any local data they can provide (for instance, the population of seniors requiring home assistance within a specific geography) can be joined with risk-focused data developed or deployed by a planning organization. For a discussion on risk at a community meeting, these groups can provide valuable feedback and expertise on vulnerable populations in the event of a disaster, the importance of a functioning downtown after coastal flooding, or the environmental value in protecting a wetland in danger of development.

For those organizations that may lack expertise on the intricacies of hazard risk adaptation and mitigation, they may choose to lean heavily on the considerable volume of publicly available hazard data and resources. The Nature Conservancy's Climate Wizard tool or NOAA's Sea Level Rise Viewer may be extremely useful to an environmental organization championing local buyouts and a return to nature of an area susceptible to future sea level rise. Suggestions based on basic maps generated by the organization can be highlighted early in a planning process during the initial scoping phases, allowing planners, GIS analysts, or consultants to perform a more detailed analysis in later stages. It is also worth noting that larger, regional planning organizations, such as Councils of Governments (COGs), university extensions, and county planning departments can assist local municipalities. Most of these organizations often have technical staff or maintain data on numerous topics that may have relevance.

## Integration Strategy

Because it is intended to be a comprehensive, holistic approach to risk management, the strategy for integrating risk management and hazard mitigation into the planning process requires not only some explanation, but also adequate opportunity for the community to “kick the tires” and ask questions. This is particularly true with regard to the need to apply some relatively general concepts to the particular circumstances and challenges they face. It is important to understand that this integration is almost always an iterative, interactive process that demands a good deal of buy-in from the most relevant stakeholders. At the same time, the payoff in terms of improved community risk awareness is often substantial.

With that in mind, it makes the most sense to launch the process with an in-person presentation to city staff and any invited stakeholders with enough time both to present the approach and to allow interaction between presenters and participants. Given many of the typical constraints on municipal staff time, the optimal approach is probably a four-hour, or half-day, workshop, with compartmentalized segments in which one or more members of the consulting team present distinct portions of the strategy and then allow time for questions and discussion before moving on.

The ideal segmentation would probably involve either three or four presentation sections in order to achieve adequate depth in the material without overtaxing the attention span of the audience. Information beyond what can be feasibly presented in this time frame is probably best reserved for online materials or handouts.

At the same time, the workshops for the pilot communities involved in this project were viewed as learning opportunities for the consultants themselves, with an evaluation process built in to allow feedback that has been used to refine the concept and overall design of the workshop for use beyond the initial project.

### *Identify the Planning Process*

For effective integration of resilience into the planning process to occur, it is important to identify what that planning process is. There can be significant variations in the way in which communities manage that process, and in the elements that comprise that process. It is also important to understand that the planning process is not simply the plan itself, but the entire set of activities that lead from a community vision for the comprehensive plan and other relevant plans to plan development to implementation.

With this in mind, it may be worth reviewing a framework developed by the American Planning Association (APA) that it refers to as five “strategic points of intervention” for planners seeking to induce change in policy:

1. *Community visioning and goal setting.* Prior to any actual plan making, this is the (ideally participatory) process through which a community develops consensus on the overall direction for future policy and planning, identifying in a visionary sense what the community wishes to be or become.
2. *Plan making.* Take an inventory of the various types of plans extant in the community. While the comprehensive plan may be the centerpiece of the process, it is seldom the only plan. Resilience certainly would include consideration of the local hazard mitigation plan, but could also include

a climate adaptation plan, or some merger of the two. Plan-making also encompasses both functional and area plans. The former focus on particular issues, such as a housing plan, parks and open space plan, or a plan focused on some utility or public service, such as wastewater or transit. The latter includes plans for specific areas within the community, such as central business districts, corridors, or neighborhoods. Two important points with regard to integration include:

- How these plans relate to or reference each other, so that they are not done in total isolation or even contradict each other;
  - How the elements of a comprehensive plan, in particular, are linked so that, for instance, opportunities for hazard mitigation identified in a hazard element are also cited in the transportation, housing, or land-use elements as appropriate. This sort of linkage is the essence of functional integration.
3. *Implementation.* How do the policies established in those plans get reflected in the provisions of implementation tools like zoning or subdivision ordinances, among other possibilities (such as floodplain management)? Does the process maintain a consistent focus at this level on implementing resilience and hazard mitigation goals, or does, for example, the zoning ordinance subtly undermine that focus by allowing some unwise development?
  4. *Development work.* Many communities have redevelopment plans for specific areas or districts that provide opportunities to improve resilience by including appropriate measures and standards. In addition, planners are responsible for reviewing site plans for new subdivisions and planned unit developments. In that process, there are numerous opportunities to discuss and even insist on more resilient approaches to certain problems with developers. Reviewing how these responsibilities are carried out with an eye toward resilience can yield significant dividends in risk reduction.
  5. *Capital improvements.* The most significant investments a community is likely to make often emerge from the process of planning for capital improvements, which typically involves a multi-year calendar of intended expenditures for long-term infrastructure, such as roads, bridges, sewage treatment plants, and public facilities of various sorts. Particularly because of the long-term nature of such investments (most often decades), it is important to consider how they will save energy, reduce risk, and account for potential changes in local climate.

It is recommended that the planning department or city manager's office develop a map or flow chart of this entire process, inventorying all the relevant plans, in order to gain a comprehensive understanding of the interrelationships (or lack thereof) built into the process and the opportunities for improvements through better integration. It is not unusual for communities to see some plans, particularly those related to emergency management and hazard mitigation, developed in nearly total isolation from other plans despite the manifold implications each has for the integrity of the entire process.

In addition, APA, as part of its Planning Advisory Service Report No. 560, *Hazard Mitigation: Integrating Best Practices into Planning*, developed a Safe Growth Audit that may provide a useful tool for many communities in assessing the strengths and weaknesses of municipal policies and ordinance provisions with regard to hazard mitigation.

## Identify the Impetus for the Plan

In the United States, communities do not develop plans in the absence of any larger statutory context. Ours may be a federal system, in which the federal role is limited, but federal influence is nonetheless significant in the realm of hazards and resilience. More importantly, every state has both planning and zoning enabling legislation that spells out, to varying degrees, what counties and municipalities are either permitted or required to do with regard to planning and land-use regulation.

## Federal Requirements

While federal law seldom has much direct bearing on local comprehensive plans, it does influence other forms of local plan making. Most significant with regard to risk assessment and risk reduction are the following provisions:

- *Disaster Mitigation Act*. This 2000 law basically says that States and communities lose eligibility for federal hazard mitigation grants if they do not have a current FEMA-approved and adopted hazard mitigation plan in place. This applies not only to the Hazard Mitigation Grant Program (HMGP) for post-disaster mitigation projects, but also to Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) programs. FEMA, along with some States like Colorado and California, have placed increased emphasis in recent years on how communities can integrate local hazard mitigation plans into their comprehensive plan elements. Communities looking to the future may note that this emphasis is likely to grow over time.
- *Healthy Forest Restoration Act*. This 2003 law provided for the development of Community Wildfire Protection Plans (CWPPs) to address wildfire risks in the wildland-urban interface. This is a nationwide, not a regional, problem. While CWPPs are obviously hazard-specific, the planning process behind these plans can clearly provide a community with some valuable assessments of its overall resilience.
- *National Flood Insurance Program (NFIP)*. It is important to recognize that the NFIP is not merely about flood insurance but also about risk reduction. It requires participating communities to adopt a floodplain management ordinance and to comply with certain federal requirements in order to maintain participation in the NFIP. Those compliance provisions can become important tools in the local and regional planning process. In addition, the NFIP's Community Rating System (CRS) provides incentives for the community to take numerous steps toward the reduction of flood risk by offering reduced flood insurance premiums. Communities earn points toward 5% increments in rate reductions through a series of steps in various categories of mitigation activities. It is fair to say that communities that earn those rate reductions are also making significant strides toward resilience, and many of those measures involve changes in plans, policies, and ordinances.

## State Requirements

Because States enact the planning and zoning enabling legislation that provides communities with the authority to engage in planning and land-use regulation, they are in a position to establish the basic framework for most local plan making. For instance, States typically spell out the types of elements that must or should comprise a comprehensive plan. This in turn provides guidance to courts on what the State expects in a plan and what constitutes an adequate plan, as well as standards for consistency between plans and development ordinances. State law can and often does make quite clear what is expected in comprehensive plans with regard to hazard mitigation and risk reduction, although many

State laws remain silent on this point. But others specify the inclusion of a safety element (e.g., California) or some sort of coastal element that addresses coastal hazards (e.g., Florida), or some more general all-hazards element (e.g., Idaho). There may also be state guidance on how that element relates to other elements of the comprehensive plan.

For the purposes of an effective integration strategy, it is important to outline and understand what requirements exist in this regard. It is equally important to know whether State law requires any other specific types of plans and how they can or should relate to each other.

### Expiration/Revision of Old Plan

In a few states, such as Florida and South Carolina, there are specific requirements for the frequency with which local plans should or must be updated. At the federal level, local hazard mitigation plans are valid for five years, after which the community must submit an updated plan for approval in order to remain in compliance. As a result of city charter provisions, voter referenda, or other measures, communities may have their own internally imposed timetables for plan updates and revisions. These timelines (whatever their origins and legal status) should figure into an integration strategy because they dictate the pace and timing of important planning activities.

## *Identify the Baseline Risks and Hazards That May Impact the Community*

### Social, Economic, and Physical Vulnerabilities

It is almost axiomatic that no two communities will be exactly alike, and thus they will not experience the same hazards and vulnerabilities, except perhaps in the most generic sense. It is thus incumbent upon any community taking this process seriously to undertake its own analysis. However, many smaller communities find it advantageous to work in a larger, multi-jurisdictional context by participating in a regional local hazard mitigation plan (LHMP), as permitted under the Disaster Mitigation Act. The LHMP provides a well-structured opportunity for hazard identification and for close examination of the vulnerabilities within the community connected with those hazards. That information can then be imported into comprehensive plans to avoid duplicate work. It is important to understand that risk and vulnerability are not identical concepts. Vulnerability specifically identifies those aspects of the built and natural environment that are likely to be less resilient in the face of natural hazards. Examples could include soft-story apartment construction in seismically active areas, poorly constructed housing in areas subject to flooding and/or high winds from tropical storms, and poor or nonexistent Firewise landscaping around housing in the wildland-urban interface. Good planning efforts document and inventory these vulnerabilities with an eye to developing remedies to make the community more resilient.

From a social standpoint, vulnerabilities can exist where elderly, disabled, or very young people live, attend school, or work in areas or facilities in vulnerable locations. Examples would include nursing homes or schools near floodplains, schools in tornado-prone areas that lack safe rooms, and similar situations. Communities can use tools like GIS to map the locations of vulnerable populations as a means of making well-informed decisions on how better to protect them.

Economic vulnerabilities exist where businesses can be destroyed or closed, or jobs lost, as a result of disasters. For instance, in 2008, most of downtown Cedar Rapids, including numerous manufacturing and retail facilities, was flooded, posing a challenge for a large work force that depended on the jobs those companies provided. Areas dependent on coastal tourism are often equally vulnerable when coastal storms force closures.



Physical vulnerabilities involve weaknesses in infrastructure and the built environment that can compromise the continued functioning of a community after disaster. This can include bridges that cannot withstand seismic shaking, lack of adequate means of egress from wildfire-prone subdivisions, or the collapse or overtopping of levees.

### Policy Implications for Future Development

In all of the above examples, there are well-established remedies. The challenges in implementing those remedies commonly fall into fairly predictable categories:

- Lack of *political will* by local leadership to say no to unwise proposed development;
- The *cost* of investing in new or upgraded infrastructure capable of withstanding whatever hazards or pressures are involved;
- Lack of pre-disaster *resources* to finance buyouts of vulnerable properties *before* disaster strikes;
- Lack of adequate *understanding* of the nature and scope of the risks in question, resulting in an inability to fashion policies and plans appropriate to the task.

Nonetheless, the fact remains that it is usually far cheaper in the long run to prevent unwise development from occurring than to fix the problem once it has occurred. Property values rise, property acquisition becomes more expensive, and teardowns and repairs of existing infrastructure cost more. As a result, establishing clear policies on when and where the community will prohibit or restrict development in vulnerable locations is invariably the more far-sighted approach. This should be clearly linked throughout the five strategic points of intervention outlined above in order to ensure both widespread community awareness of the need for resilience to drive and support such policies and to undergird enforcement of and compliance with those policies once they are established.

### Community Capacities and Resources

Finally, a good integration strategy can include what is sometimes called an institutional analysis, which is basically an examination of the staff and other capacities available to the community to address the identified hazards and vulnerabilities, as well as the financial and technical resources they can employ. This is important because hazard mitigation often requires specific types of technical knowledge in order to make the best decisions about mitigation strategy. For instance, an area prone to landslides may need geotechnical experts who can establish the precise nature and location of the threat. In a few communities, this may mean retaining a geologist or engineer on staff, but in many others, it may mean retaining a consultant. Many communities also have certified floodplain managers (CFMs) on staff, often housed in the building or planning department. Certain state and federal agencies, as well as universities, can provide technical assistance as well. The essential point is to identify where and how the community can access the technical knowledge it needs. The same idea applies with regard to enforcement of land-use and building regulations: Does the community have adequate staff, or can it access outside assistance, sufficient to accomplish its resilience goals? If not, what alternatives are available? Financial resources will likely be more important with regard to needed public investments that will enhance resilience than to enacting regulations that prevent undesirable development, an action that largely relies on the expertise of planning staff. However, an important consideration for any community is how it can develop adequate financial reserves to withstand disasters and be in a position to rebuild wisely. The Government Finance Officers Association has been developing resources for communities on this very question and should be regarded as a valuable source of information.

## *Identify the Audience for the Plan*

### **Community Planners**

Community planners typically oversee the development and implementation of a community's comprehensive plans, future land use plans, small area plans, and zoning ordinances. These responsibilities, especially with regards to the comprehensive plans, often involve multiple stakeholders that represent various areas, such as parks and recreation, land conservation, transportation, etc. The relationship with these various stakeholders can be beneficial to developing more detailed risk assessments.

### **Emergency Managers**

Emergency managers, particularly county level emergency managers, are typically in a unique position to coordinate and facilitate local officials, stakeholders, and resources. A large part of their duties is to create and maintain relationships that are beneficial during response and recovery activities, but also during prevention, preparedness, and mitigation activities as well. Emergency managers should be involved in the integrated planning process and should perhaps be called upon to facilitate, host, and/or lead certain meetings or activities.

### **GIS Managers**

A GIS manager, administrator, or other senior technical staff member familiar with GIS data, analysis, and processing should be involved in the integrated planning process. These representatives need to be familiar with what GIS resources are required for supporting the planning process and have the ability to assign staff with necessary tasks.

### **Elected Officials**

Local elected officials and their designees are often important decision makers in the local planning process. Their input, buy-in, and political will-power is often essential to effective risk reduction activities and successful integration of planning goals and priorities.

## *Identify the Timeframe of the Plan*

The planning process executed as part of this demonstration project was relatively short, lasting for approximately 6 months. This allowed sufficient time to hold a series of meetings in each pilot community, provide some level of technical assistance, and work with the communities to identify any plans for implementation. Because this was a fairly short planning window, the project team focused on data, methods, and tools that are readily available and that require minimal in-depth training. One of the team's goals was also to leave the local planning team with knowledge of longer-range resources that can be utilized beyond the lifespan of this project.

## *Identify the Steps In the Planning Process*

The steps in this demonstration planning process began with a virtual project kickoff meeting between the project team, community planners, local emergency managers, and GIS managers. This meeting was used to bring the team together, discuss the roles and responsibilities of the team, and set the tone for the overall project development process. Future steps included regular team meetings and emails to discuss project development, major milestones, and any issues that arose during the development process, stakeholder outreach, release of draft materials, a response to comments received, and the completion of final materials.

### *Incorporate Strategies for Risk Communication*

Some of the elements that inform risk assessment and mitigation planning efforts (particularly those related to climate change) may be considered politically or socially controversial in some communities. Additionally, the inherently uncertain nature of future risks often leads individuals to underestimate the importance of integrating resilience into their community planning or decision-making processes. Utilizing science-backed risk communication strategies can help build consensus on the importance and validity of the many data, tools, and models available to support the goal of integration.

The risk communication strategy identified through this project is based on research by Dr. Ed Maibach, Director of George Mason University's Center for Climate Change Communication. This approach is often summarized as "Simple, clear messages, repeated often, by a variety of trusted sources." As described throughout this report, building a broad coalition of stakeholders throughout the community is critical to this approach. Collaborating with stakeholder representatives during the message development process, and empowering those stakeholders to communicate risk information to their communities, is critical to building support for this process. Coalition-building is also valuable because it allows planners to identify which hazards and which assets are considered the highest priority for members of the community.

### *Identify the Approval Process*

Upon completion of the planning process, the local planning team members will need to submit the results to their local elected boards following their standard policies and procedures. It is expected that the local board members will be briefed on the progress throughout the planning process so that when it comes time for approval, they have already bought into the goals, objectives, and results of the plan.

### *Identify the Necessary Maintenance and Process for Realizing the Plan*

One important consideration is whether or not the planning process will need to be replicated and/or updated by the community down the road. If so, will the same hazard data be used with new local asset data? Will all new hazard data *and* local asset data be used? Will the same or new hazard and asset data be used with new methodologies and approaches? How will the models, tools, inputs, and process documentation be preserved for replication and to jumpstart the process in future planning cycles? All of these are important questions for establishing a plan maintenance process and expectations for future updates to the plan.

## Successful Integration Cases

### *Identify Two or Three Case Studies of Effective Plan Integration*

Berkeley, California and Lee County, Florida are considered models for similarly-sized jurisdictions seeking to incorporate hazard mitigation into their planning efforts. In furthering their mitigation efforts, both jurisdictions utilize considerable amounts of risk information, data, and models in their planning processes. The following pre-existing case studies discuss methods and lessons learned that will likely be of use to jurisdictions seeking to better incorporate risk into their own planning efforts.

## Berkeley, California

Berkeley, California, is a city located in the eastern region of the San Francisco Bay Area. The city is home to approximately 100,000 residents and is situated in a metropolitan region with a population of over 7 million. Berkeley has long been one of the region's intellectual hubs, primarily due to local educational institutions such as University of California, Berkeley. The city has recently become a model for the integration of risk information into the community planning process for mid-sized jurisdictions.

### *Hazards and Risks*

Earthquakes and wildfires are the primary hazards facing the city of Berkeley. According to the 2014 update of the Berkeley Disaster Mitigation plan, coastal flooding, rainwater flooding, and drought are secondary hazards. Berkeley has also identified climate change as having the potential to heighten the severity of many existing hazards.

### *Integrating Risk into Community Planning*

Berkeley has benefited greatly from the integration of risk information into the community planning process. This work was largely a result of significant recent natural disasters, especially the Loma Prieta Earthquake of 1989 and the Oakland Hills Fire of 1991. Berkeley's culture of preparedness is due to both top-down pressure (from federal and state legislation and initiatives) and bottom up engagement of local citizens and stakeholders. The direct integration of risk-focused data, information, and models manifests in a number of complementary local planning reports and processes.

The availability of local risk data is largely due to state action, funding, and legislation. The Earthquake Fault Zone Mapping Act (1972) and the Seismic Hazards Mapping Act (1990) were instrumental in assessing earthquake and liquefaction vulnerability in Berkeley. Future plans, including the 2001 revision of the Berkeley General Plan and the 2014 update of the Berkeley Hazard Mitigation Plan expanded on this work, outlining policies and a regulatory framework for dealing with risk and natural hazards. Both plans benefitted from significant public and stakeholder outreach.

Risk assessment and hazard mitigation are integrated directly into the *Berkeley General Plan* as one of seven primary planning goals. The General Plan explicitly identifies the identification, mapping, and surveying of hazard risk, and the regulation of land uses based on this risk assessment, as a vehicle for long-term risk reduction. The 2014 update of the Berkeley Hazard Mitigation Plan directly references (and is included as an appendix to) the General Plan and lays out specific, prioritized, and ranked policies for realizing the goal of hazard risk reduction. These policies include: extensive surveys to map structures vulnerable to earthquakes, the publication and sharing of updated hazard maps with the general public, and the direct integration of climate change research into the general and capital planning processes. In 2014 Berkeley hired a Chief Resilience Officer to realize the policies outlined in the Mitigation Strategy. The April 2016 Berkeley Resilience Strategy recommends prioritizing the incorporation of climate science into standard planning and regulatory practice. The strategy further recommends significant coordination on risk assessment and plan integration with regional partners.

## Lee County, Florida

Lee County, Florida is a large coastal jurisdiction composed of Fort Myers, Fort Myers Beach, Sanibel, Cape Coral, and Bonita Springs. The county population is 618,754 as of the 2010 census, with many county residents living in particularly low-lying and hazard-prone areas. The regional coordination model practiced by Lee County is a model for similarly sized jurisdictions dealing with severe natural hazards. Both the comprehensive and hazard mitigation planning processes utilize risk information, models, and data as standard elements of the planning process.

### *Hazards and Risks*

Given Lee County's geographic position facing the Gulf Coast and its particularly low-lying topography (composed of existing and developed wetlands), the region is extremely vulnerable to hurricanes and tropical events, storm surge, tornadoes, severe thunderstorms, and inland rain flooding. The county is also at risk of drought and wildfires.

### *Integrating Risk into Community Planning*

The Lee County-led Joint Unified Local Mitigation Strategy, prepared by the Lee County Disaster Advisory Council, has led to significant steps toward regional hazard mitigation and risk assessment. The Joint Unified Local Mitigation Strategy assesses hazard risk for the five municipalities making up Lee County and prioritizes a list of regulations, initiatives, and policies to achieve large-scale risk reduction. This work ties directly into both the Lee Plan, the local comprehensive planning document that guides development and future land use to 2030, and the Lee County Comprehensive Emergency Management Plan.

Risk assessment and the integration of data into the planning process are central to the county's hazard mitigation efforts. The Lee County Joint Unified Local Mitigation Strategy identifies the presence of hazard mitigation initiatives within existing planning processes, plans, and programs as a primary goal. Specific areas of concern are identified in the strategy as in considerable need of risk assessment including: the primary employer base, target high-poverty neighborhoods, critical facilities and infrastructure, historic structures, and evacuation route linkages into and out of Lee County. The strategy includes a regularly updated list of funding priorities based upon existing and future assessed risk. As of October 2015, some of these initiatives include drainage improvements, land acquisition, wetland restoration, the purchase of repetitive loss properties, and structure elevation.

Florida state law requires all local governments to adopt comprehensive plans. The Lee Plan guides local land use and development for its five constituent municipalities, outlining a strategy that seeks to accommodate growth while minimizing risk. Of the 128 identified goals that make up the Lee Plan, seven directly address hazard mitigation. These goals rely upon the Lee County Hazard Vulnerability Analysis and the Joint Unified Local Mitigation strategy to identify areas of vulnerability. The plan further recommends explicit steps to address and mitigate risk over the long term, including density reductions in repetitive loss areas, limiting development on critical barrier islands, and prioritizing capital improvement funds toward critical infrastructure such as evacuation routes.

## *Identify Lessons Learned Across the Case Studies*

Berkeley, California and Lee County, Florida are excellent pre-existing examples of successful integration of risk and hazard information in the community planning process. The following lessons learned may be useful in guiding similarly sized jurisdictions in integrating risk information into their planning processes.

- Sustained engagement with the community, including the wider public and key stakeholders
  - Berkeley, California developed a civic culture of preparedness through long term engagement with community stakeholders. This work has utilized considerable amounts of data derived from state legislative action and local vulnerability assessments. Working with private property owners and developers with this information in hand has allowed Berkeley to make significant progress retrofitting buildings in high risk areas.
- Integrating hazard mitigation planning with comprehensive planning efforts
  - Both Lee County and Berkeley have both hazard mitigation and comprehensive plans. Rather than being separate documents, both jurisdictions incorporate the local hazard mitigation plan (and accompanying data) within the plan elements of the comprehensive plan. Similarly, the hazard mitigation plan outlines discrete policies, regulations, and actions that will be taken to realize the goals outlined in the comprehensive plan. For instance, the long term land use map outlined in a comprehensive plan can show the highest risk areas, while the mitigation plan can state the policies the jurisdiction will undertake to reduce risk in these areas.
- The use of state and regional data as a starting off point
  - Lee County develops the hazard mitigation and comprehensive plans for its five constituent municipalities. The risk assessments developed by the Lee County Joint Unified Local Mitigation Strategy are enormously useful in both large scale comprehensive planning and small scale plan review activities. Proper setbacks, siting, and development rights all reference the information developed by the county.
  - Berkeley relies heavily upon state legislation and mapping activities in developing and refining local recommendations. The Earthquake Fault Zone Mapping Act and the Seismic Hazards Mapping Act were instrumental in outlining the location and nature of probable hazards. This information was gradually built upon by the city of Berkeley over the following decades. Berkeley plans to continue working with other jurisdictions in the Bay Area (particularly San Francisco), as they attempt to integrate risk assessment data into the capital planning process.
- The importance of local champions
  - Local champions are instrumental to integrating risk-focused data and methods into the community planning process. One of the primary roles of Berkeley's new Chief Resilience Officer is to oversee the incorporation of mitigation efforts across city agencies. The Lee County Local Mitigation Strategy Workgroup provides a similar function, prioritizing mitigation and risk assessment efforts to be carried out within the county.

These local case studies can be used as-is, modified, or replaced with more appropriate case studies. Many case studies are available from APA, ASFP, NACo, NOAA, FEMA, and other partner organizations and are readily available for use.