



What the FLUP? Future Land Use Planning for Safe, Smart and Sustainable Communities

APA California Conference
October 3, 2015
8:45 am - 2:45 pm



What the FLUP?

Future Land Use Planning for Safe, Smart and Sustainable Communities

Binder Contents

1. Setting the context
2. Laying the groundwork
 - Ground rules handout
 - Building your planning team handout + worksheet
 - Engaging CBOs handout
 - ART Stakeholder engagement good planning guide
3. Identify and assess hazards and assets
 - Set community goals
 - Identifying community goals worksheet
 - Headline visioning exercise
 - ART Functions & values mapping exercise
 - Describe hazards
 - Hazards summary worksheet
 - Hazards summary example handout
 - Hazard impact statements handout
 - Determine your assessment methods
 - Community asset identification worksheet
 - Risk assessment scoping worksheet
 - Conduct the assessment
 - Risk assessment questions worksheet
 - Rapid risk assessment exercise
 - ART Assessment questions how-to guide
 - Summarize vulnerability
 - Issue statement exercise
 - ART Issue statements how-to guide
4. Develop and evaluate strategies
 - Strategy development and implementation worksheet
 - Strategy development and implementation exercise
 - Example mitigation and adaptation strategies handout
 - Evaluation criteria worksheet
 - Strategy idea sources handout
 - ART Adaptation response open house engagement exercise

What the FLUP? Future Land Use Planning for safe, smart, sustainable communities

*Association of Bay Area Governments
Bay Conservation and Development Commission
October 3, 2015*



This workshop was sponsored by the Federal
Emergency Management Agency, Region IX

THANKS FEMA!!!



Agenda

8:45	Welcome and Agenda
8:55	Introductions
9:15	What does planning for safe, smart, sustainable communities mean?
9:25	State initiatives to encourage or require resilience planning
9:45	Setting up the planning process for current and future hazards
10:25	Break
10:40	Conducting the assessment
11:55	Lunch
12:40	Mitigation + adaptation strategy development
1:25	Break
1:40	Strategy evaluation and implementation
2:35	Wrap up and questions
2:45	Adjourn



Our Objectives for Today

- Define resilience to natural hazards
- Explain how and why to include natural hazards in different types of planning and decision making processes
- Share road-tested tools and resources that can help assess risk to natural hazards
- Discuss the different types of risk reduction measures - land use planning, code adoption, smart safe growth - that can build resilience to natural hazards
- Help you learn how make the case for taking action to reduce the risk from natural hazards
- Model good meeting and planning processes



Your turn...introduce yourself and share with the group:

What is your experience with resilience, adaptation or hazards planning?



Ground Rules



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Sample Ground Rules

- Everyone gets to be heard.
- Seek first to understand, then to be understood.
- Share "air time."
- If you are offended or uncomfortable, say so, and say why.
- It's OK to disagree, but don't personalize it; stick to the issue.
- Speak for yourself, not for others.
- One person speaks at a time.
- We share responsibility for making the conversation productive.
- Be willing to reach consensus
- Respect the agenda
- Manage your own input – no longer speeches



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www.adaptingtorisingtides.org

resilience.abag.ca.gov



Setting the Context

Planning for Safe, Smart and Sustainable Communities

- What does it mean to be resilient? Who has a role in building community resilience? How do sustainability, resilience and equity fit together?
- Land use planning as a powerful tool for building resilience
- Benefits of and barriers to building smart, safe and sustainable communities



Community resilience is strongly correlated with social equity, affecting both the ability of the individual and the community to cope with the impacts of earthquakes, economic down turns, and climate change

Equity is one of the sustainability frames integrated into each step of the ART planning process

<p>SOCIETY & EQUITY</p> <p>Effects on communities and services on which they rely, with specific attention to disproportionate impacts due to existing inequalities.</p> <p>ENVIRONMENT</p> <p>Environmental values that may be affected, including ecosystem functions and services, and species biodiversity.</p>	<p>ECONOMY</p> <p>Economic values that may be affected such as costs of physical/infrastructure damages or lost revenues during periods of recovery.</p> <p>GOVERNANCE</p> <p>Factors such as organizational structure, ownership, management responsibilities, jurisdiction, mandates, and mechanisms of participation that affect vulnerability and risk.</p>
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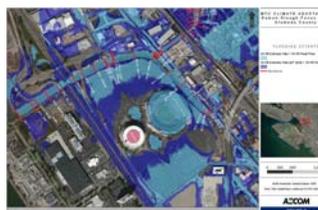
The collage includes three documents:

- Climate Change Vulnerability in Contra Costa County: A Focus on Heat Equity and Climate Change** (2015): A report with a photo of a town and a map of Contra Costa County.
- Adapting to Rising Tides**: A report with a map of the San Francisco Bay Area and a photo of a coastal area.
- STRONGER HOUSING, SAFER COMMUNITIES**: A report with a map of the San Francisco Bay Area.



Land Use Planning Strategies to Address Current and Future Hazards

- Planning process that build understanding and capacity to address hazards
- Land use plans that consider current and future hazards
- Zoning, general plans and specific plans that place critical facilities and sensitive land uses out of areas at greatest risk
- Building codes that retrofit and strengthen existing development
- Buffers and setbacks that protect and enhance natural areas
- Requiring public spaces and community buildings that build community capacity



bcdc



Benefits of Hazard Mitigation Planning

- Mitigation grants (California Office of Emergency Services) to complete a Local Hazard Mitigation Plan
- Flood insurance premium reductions under the Community Rating System
- 6.25% local match for Public Assistance money waived *if hazard plan is aligned with general plan safety element*
- Communicates local priorities to state and federal officials
- Provides ready to implement strategies making it easier to seek funding

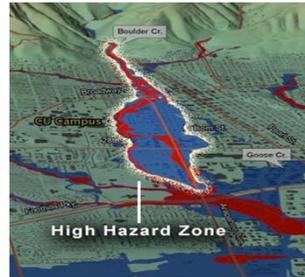


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So, Why Don't We Do It?

- Lack of funding, staff and agency capacity
- Political considerations
- Uncertainty and perception that hazards are everywhere
- Economic development limitations and considerations
- Other priorities- what about the drought? Crime?
- Data, science and the challenge of making the case to decision makers and elected officials
- Silos and the lack of cross agency, division and jurisdiction planning
- Perceptions of legal and regulatory challenges



bcdc



Where to start in building your community's resilience?

- Assess your communities starting point or existing conditions and stressors
- Define the functions and values that are important to the environment, society and equity, economy and governance within your community
- Determine the possible shocks and stressors that could impact your community
- Every community will define resilience differently

bcdc



Exercise: Wake up your Brain

Take a few minutes and write on a notecard:

What does resilience mean in
your community?



Resilience Planning: State Initiatives

General Plan Guidelines

- Climate change, resiliency, adaptation, and GHG reduction laced throughout guidelines
- Diagrams and linkage charts demonstrating relationship between elements and climate change
- Model policies, resources, and tools linked throughout



Resilience Planning: State Initiatives

General Plan Guidelines

- Encourages incorporation of Local Hazard Mitigation Plans in to safety element of General Plans
 - AB 2140 creates post disaster financial incentive which authorizes state to use California Disaster Assistance Act funds to cover local shares of 25% non-federal match for post disaster projects
- Demonstrates benefits of aligning multiple planning activities with general plan



Resilience Planning: State Initiatives

General Plan Guidelines

- New chapter on Climate Change
 - Links to Cal Adapt, AB 32 Scoping Plan, Safeguarding California Plan, Adaptation Planning Guide, MyPlan, and the State Hazard Mitigation Plan
 - Points to Adaptation Planning Process
 - Discusses GHG reduction





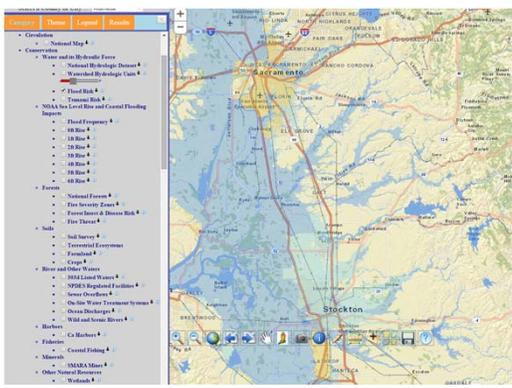
Resilience Planning for California

Topics, Elements	Land Use	Circulation	Housing	Conservation	Open Space	Noise	Safety
<i>Agriculture</i>	●		●	■	●		
<i>Air Quality</i>	●	●	●		●		
<i>Airports</i>	●	●	■		■	●	
<i>Bicycle and Pedestrian Routes</i>	●	●	■		■		■
<i>Climate Change (Adaptation)</i>	■	■	■	■	■		■
<i>Climate Change (GHG Emissions)</i>	■	■	■	■	■		■
<i>Density</i>							



Resilience Planning: State Initiatives

- Resources and tools listed and linked in GPG
- New GIS tool that pulls in data layers from across state and national resources, including flood risks, sea level rise, and fire hazard





Resilience Planning: State Initiatives

What will the future bring?

- Executive Order
 - 40% reduction in GHG of 1990 levels by 2030
- Collaborative action
 - Across scale, sector, federal programs, and other silos
 - Challenging but necessary
- Integrated planning
 - Land use, housing, transportation, environment, health, economy, and equity must all be considered
- Forward thinking
 - Issuing emergency permits that do not create future issues
 - Building better, not just replacing poorly planned infrastructure

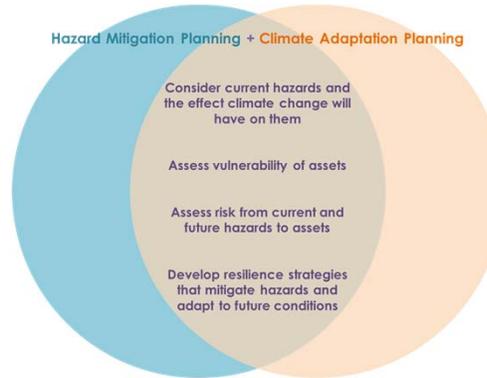
Laying the Groundwork

Resilience Planning Processes

Adapting to Rising Tides



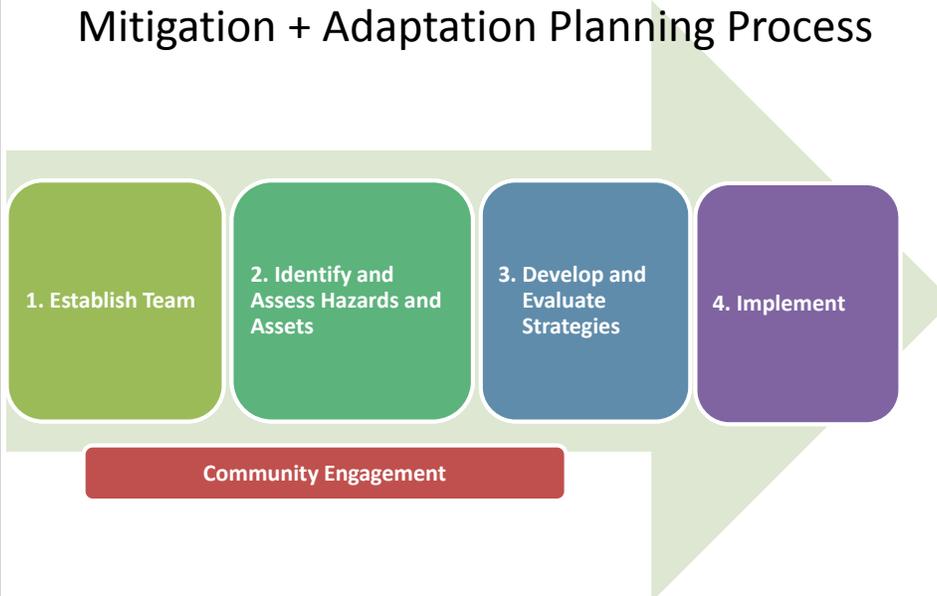
Hazard Mitigation Planning + Climate Adaptation Planning



- Moved goal setting from the end to the beginning
- Heavy emphasis on governance and who participates
- Key planning issue identification and evaluation criteria
- Four frames considered in every step of the process



Mitigation + Adaptation Planning Process



Who Needs to be Involved?

Governance includes **all of us**:

- Public agencies including planning, parks, transportation, fire, police, emergency services, public works, public health, economic development and others **working together**
- Non-governmental and community-based organizations
- Community members
- Private entities and groups or organizations representing the private sector

HANDOUT

Building Your Safe, Smart Growth Planning Team

1. Identify Planning Team Members

To build your planning team, start with existing committees and community organizations, if possible. If this is an update, reconvene the team from the previous planning process, if possible. Then, select members from each of the following columns:

Planning team base	Agencies involved in hazard mitigation activities	Agencies with the authority to regulate development	Other agencies and offices that may be affected
<ul style="list-style-type: none"> • Comprehensive Planning • Land Use • Transportation • Public Facilities • Local Emergency Planning Committee 	<ul style="list-style-type: none"> • Building Code Enforcement • Emergency Management • Fire Departments/ Districts • Floodplain Administration • Geographic Information Systems • Parks and Recreation • Public Information Office • Public Works • Stormwater Management • Transportation (Roads/Highways) • CDBGs • ABAS 	<ul style="list-style-type: none"> • City Council/ Board of Commissioners • Planning Commission • Planning/Community Development • Special Districts 	<ul style="list-style-type: none"> • Economic Development • Housing • Health and Social Services • Infrastructure • Natural and Cultural Resources

2. Engage Local Leadership

Solicit leadership from local elected officials to provide visibility for the planning process and to encourage stakeholder participation. Also select a team leader or chairperson to oversee and help manage the planning process and to act as a strong advocate or local champion for mitigation and adaptation.

3. Promote Participation And Buy-In

Communities which planning team members are expected to contribute throughout the process. Recruiting potential team members, who have competing priorities for their time and energy, may be





Working Together on Resilience

Close collaboration among stakeholders develops a shared understanding of issues, building trust and achieving buy-in for collaborative problem solving

ABAG SUPPLY: GORDON RAINWATER GROUP
Design Two-Project Step 1: Scope & Organize

Stakeholder Engagement

This guide helps with...

Developing an approach to engaging stakeholders as part of a working group in an adaptation planning process to ensure that the necessary expertise, ideas and resources are included at stages of the assessment and adaptation process to build resilience to climate change.

Starting points...

In setting your working group and its selection process, ABAG developed good practices for stakeholder engagement to support existing knowledge on leading and engaging stakeholders in planning and policy efforts. To ensure you are best suited with stakeholder engagement best practices, recommended resources include:

- Introduction to Stakeholder Participation. Available at: www.nrc.gov/docs/2009/04/20090401.pdf
- Introduction to Good Practice for Community and Stakeholder Engagement in the Development and Management of Climate Resilience Plans. Available at: www.abag.org/abag/ClimateResiliencePlans/IntroductiontoGoodPracticeforCommunityandStakeholderEngagementintheDevelopmentandManagementofClimateResiliencePlans.pdf

An online resource provides guidance for the ABAG Climate Planning Guide to understand the role of an interagency working group in the ABAG approach to analyzing and conducting an adaptation planning project. As the climate science evolves, the ABAG approach will continue to evolve to keep you up to date. The team works with a group of stakeholders who actively participate throughout the project in both a number of project meetings. The working group members provide their local knowledge, expertise and perspectives of the agencies, organizations, communities, public and private resources in the project area that may be affected by climate change and actions that will likely be taken to address it. The working group then meets on a regular basis for coordination, feedback and guidance on the next projects for the team to pursue. Additionally, the working group helps the project participants with a broader group of stakeholders to coordinate within the working group member organizations, local offices, community groups and individuals, etc.

The stakeholder engagement process described in this guide can be applied in a project that is regional in nature to the ABAG approach.





Sample Ground Rules

- **Everyone gets to be heard.**
- **Seek first to understand, then to be understood.**
- **Share "air time."**
- **If you are offended or uncomfortable, say so, and say why.**
- **It's OK to disagree, but don't personalize it; stick to the issue.**
- **Speak for yourself, not for others.**
- **One person speaks at a time.**
- **We share responsibility for making the conversation productive.**
- **Be willing to reach consensus**
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- **Manage your own input – no longer speeches**

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Building Your Safe, Smart Growth Planning Team

1. Identify Planning Team Members

To build your planning team, start with existing committees and community organizations, if possible. If this is an update, reconvene the team from the previous planning process, if possible. Then, select members from each of the following columns:

Planning team base	Agencies involved in hazard mitigation activities	Agencies with the authority to regulate development	Other agencies and offices that may be affected
<ul style="list-style-type: none"> • Comprehensive Planning • Land Use • Transportation • Public Facilities • Local Emergency Planning Committee 	<ul style="list-style-type: none"> • Building Code Enforcement • Emergency Management • Fire Departments/ Districts • Floodplain Administration • Geographic Information Systems • Parks And Recreation • Public Information Office • Public Works • Stormwater Management • Transportation (Roads/Bridges) • CalOES • ABAG 	<ul style="list-style-type: none"> • City Council/ Board Of Commissioners • Planning Commission • Planning/ Community Development • Special Districts 	<ul style="list-style-type: none"> • Economic Development • Housing • Health and Social Services • Infrastructure • Natural and Cultural Resources

2. Engage Local Leadership

Solicit leadership from local elected officials to provide visibility for the planning process and to encourage stakeholder participation. Also select a team leader or chairperson to oversee and help manage the planning process and to act as a strong advocate or local champion for mitigation and adaptation.

3. Promote Participation And Buy-In

Determine what planning team members are expected to contribute throughout the process. Recruiting potential team members, who have competing priorities for their time and energy, may be

difficult. Provide personal attention to potential team members to explain the importance of the process and to answer questions, send invitation letters signed by the mayor, an elected official, or a department head, and ensure that the initial meeting is at a convenient time and location and that you provide food and beverages for participants.

4. Plan Kickoff Meeting For Planning Team

Once your team is assembled, plan the initial meeting. The initial kickoff meeting should:

- Confirm the planning purpose and establishing outcomes
- Develop a planning process scope and schedule
- Review current hazard mitigation plans and other planning documents to identify ideas for improvement and areas that may require more time and resources
- Establish team roles and responsibilities, and identify potential gaps or shortfalls in resources
- Develop an outreach strategy to identify stakeholder groups and how to engage them

Multi-Jurisdictional Planning Teams

If you're working with neighboring jurisdictions, you need a team structure that allows for coordination and accountability among and within jurisdictions. This includes:

- A multi-jurisdictional planning team, comprised of representatives from each jurisdiction
- A jurisdictional sub-team, led by the representative that participates in the multi-jurisdictional team

For more information on building your planning team, refer to FEMA's *Local Mitigation Planning Handbook*, Chapter 2 – Building the Planning Team

Download the Handbook at http://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf



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Engaging Community Based Organizations Worksheet

Type of organization/agency	Do you have a contact? Who might have a contact?	Which community members do they represent? Whose perspective to they bring to the table?	What is the benefit of having them at the table?
Emergency preparedness			
Environmental Justice			
Neighborhood groups			
Vulnerable communities			



Impact Assessment, Inc.

Type of organization/agency	Do you have a contact? Who might have a contact?	Which community members do they represent? Whose perspective to they bring to the table?	What is the benefit of having them at the table?
Business community			
Education			
Faith based organizations			
Healthcare			

Stakeholder Engagement

This guide helps with...

Developing an approach for engaging stakeholders as part of a working group in an adaptation planning project to ensure that the necessary expertise, values and viewpoints are included in all stages of the assessment and adaptation process to build resilience to climate change.

Starting points...

In testing and refining approaches to adaptation planning, ART developed good practices for stakeholder engagement to augment existing knowledge on leading and engaging stakeholders in planning and policy efforts. For readers who are less familiar with stakeholder engagement best practices, recommended resources include:

Introduction to Stakeholder Participation. Available at NOAA Office for Coastal Management Digital Coast website:

coast.noaa.gov/digitalcoast/publications/social-science-series

Guidance for Good Practice for Communicating with Stakeholders on the Establishment & Management of Marine Protected Areas. Available at OSPAR website under Programmes and Measures, Agreements, Ref. No. 2008-02. www.ospar.org

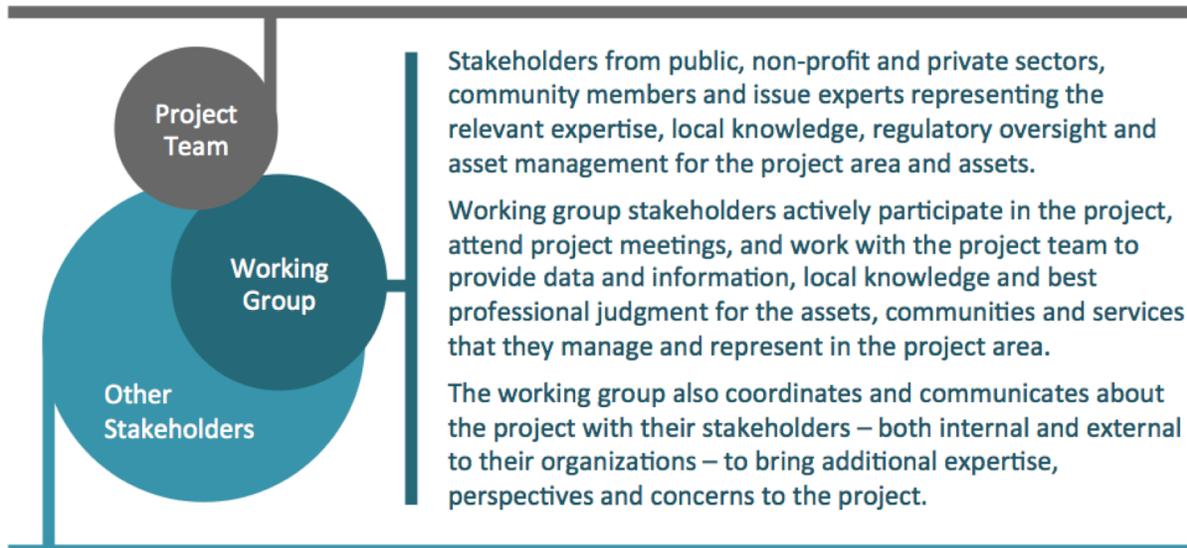


Another important starting point for this ART Good Planning Guide is to understand the role of a stakeholder working group in the ART approach to designing and conducting an adaptation planning project. As the figure below shows, the ART approach relies on having a project team to lead and staff the project. The team works with a group of stakeholders who actively participate throughout the project – both in and outside of project meetings. The working group members provide the local knowledge, expertise and perspectives of the agencies, organizations, communities, public and private interests in the project area that own, manage and/or are affected by assets and services that are being addressed by the project. The project team will rely on this group for information, feedback and guidance on the work products that the team prepares. Additionally, the working group helps the project communicate with a broader group of stakeholders (e.g., colleagues within the working group members' organizations, elected officials, community groups and members, etc).

The stakeholder engagement practices recommended in this guide are best applied in a project that is organized similarly to this ART approach.

PROJECT ROLES AND RESPONSIBILITIES IN THE ART APPROACH

The team that leads and manages the project, engages the stakeholder working group, and completes work products including the assessment and development of adaptation responses for the project.



A wide range of organizations and individuals that have interests and perspectives that are related to the project scope, follow the progress of the project, provide feedback on draft materials, and comment on project components and outcome, but are not responsible for providing data and information. These stakeholders are not participating actively in the project.

1. The Long View

A key benefit of good stakeholder engagement is the development of strong inter-organizational relationships that can serve as the foundation for collaborative problem solving. This type of collaboration is essential for resolving the complex planning issues raised in adapting to climate change. Specifically, new and strengthened relationships can lead to successful knowledge sharing, coordination and cooperation among organizations that can support issue identification, prioritization, expanded funding opportunities and adaptation implementation.

Conducting a collaborative stakeholder adaptation project can also have other long-term benefits, including building capacity of the project team to lead and support a stakeholder working group in shared issue investigation and decision-making. This benefit should be weighed against potential ease of having a consultant in charge of project stakeholder engagement. A consultant might do an excellent job engaging a stakeholder working group during the project, but unless project team members are heavily involved and directly working with these stakeholders, it will be difficult for the team to gain experience and build the trust and relationships that will provide benefits for future work, including the funding and implementation of projects.

Although a less inclusive or collaborative process may be faster and easier to lead, ultimately this will limit the ability of project participants to reach a comprehensive understanding of the complex issues that extend beyond a single jurisdiction, agency or sector, and to build adaptation responses that take into account all aspects of sustainability, geographic scale, jurisdiction, and timing. If project resources are too limited for a collaborative planning effort, there may still be value to conducting a single sector or single-issue assessment with the intention of using this to build towards more complex and integrated assessments.

TAKING ACTION

Valuing the Collaborative Process

In developing a plan to engage a stakeholder working group in the project, consider the following:

- In scoping the project dedicate time and resources for the project team to actively engage the working group.
- If team members are not familiar with meeting planning and facilitation, seek training or assistance to build their capacity before starting the project.
- Use consultant support strategically, for example to conduct specific shoreline or economic analyses that are beyond the expertise of the project team or the working group.
- In a collaborative project, the project team will often need to develop and present content, lead interactive engagement activities, and incorporate the stakeholder working group feedback into resulting products. Plan appropriately so that the team has the time and resources to do this well.
- The project team should openly recognize and acknowledge mistakes or missteps, and learn from these by making adjustments, thereby earning the trust of the working group.

2. Not Just the Usual Suspects

The scale of climate impacts means there are a number of complex, inter-related issues that need to be evaluated and addressed in adaptation planning. These issues require the expertise and perspectives of stakeholders from different interests and backgrounds, many of whom have not had an opportunity to work together or understand each other's perspectives in the past.

Project staff team should, at the start of the project and on an ongoing basis, identify and involve stakeholders as part of the project working group who can responsibly represent the relevant areas of expertise, asset management responsibilities, and regulatory oversight, as well as the perspectives and concerns of the communities and organizations within the project area. The result of this is the convening of a working group of “unfamiliar” faces, which is one of the biggest benefits realized by participants and can result in moving more quickly on adaptation approaches. Other benefits include:

- Providing a setting for diverse stakeholders to coordinate, and develop a more comprehensive understanding of the issues (climate-related and otherwise) contributing to vulnerability and risk.
- Preparing working group members to implement adaptation responses – particularly those that address information gaps and management challenges – that require new coordination among diverse groups.

TAKING ACTION

Stakeholder Identification

Questions¹ to help identify stakeholders throughout the planning process.

- What assets, services and facilities exist in, cross through or are near to the project area?
- Who are the primary stakeholders that own/manage/have responsibility for these assets?
- In general, what are the consequences of the climate impacts on these stakeholders and their assets? For example would there be consequences within and/or outside the project area on:
 - public health and safety
 - people where they live, work, commute and recreate
 - the environment, e.g., services provided such as habitat or flood risk reduction
 - the economy at any number of scales (local to national)
 - current management, regulatory or funding practices

¹Modified from *Guidance for Good Practice for Communicating with Stakeholders on the Establishment & Management of Marine Protected Areas*. Available at OSPAR website under Programmes and Measures, Agreements, Ref. No. 2008-02. www.ospar.org

3. Building Trust

Stakeholders' participation in any planning process outside their usual scope of work is challenging for many reasons, including a lack of resources, commitment from decision makers or managers, and differences in institutional processes, cultures, and regulations. Participating in adaptation planning can create additional, and sometimes unique, challenges for stakeholders. Ensuring that trust is built and maintained throughout the project is essential to keeping stakeholder interest and involvement. This trust is built by:

- Developing a clear and transparent process from the beginning
- Delivering promised work products and responding to and incorporating feedback
- Respecting the time and energy spent by the working group members
- Doing the homework necessary to understand the issues and the perspectives.

Communications – both internal and external to an adaptation planning effort – can play a significant role in building, or if poorly done, eroding stakeholder trust. Working with the stakeholder working group early on to agree on communications practices that specifically address their concerns can set a project on good footing. Determining to whom, when and how information about the project findings will be released is critical to ensuring that your working group members have time to communicate to their audiences before you do. Stakeholders involved in a project have their own stakeholders, and because many complex issues, such as climate adaptation can be sensitive, it is important not to “get out ahead” of project participants by publicizing information and outcomes prior to determining how to communicate the information most effectively. Often a better approach is to assist stakeholders in taking the lead in communicating about the project by providing translated materials, presentations, or issue statements that they can use and share. Additionally, having working group members help to shape the way information is communicated ensures that diverse perspectives and values are incorporated into the project along the way.

TAKING ACTION

Communicating about Communications

Form a Communications Subcommittee

Ask a subset of stakeholders to form a Communications Subcommittee that will provide additional support, feedback and guidance to the project team throughout. Begin the work of this subcommittee by developing a plan for communications practices (see below) for the project that can be shared with the larger stakeholder group.

Agree on Communications Practices

A set of communications practices and guidelines *for the project* developed jointly by the project team and stakeholders could address the following:

- Communication goals, including whether a primary focus of the project is as a communication effort
- Audiences the project may need to communicate with beyond project stakeholders
- How potentially sensitive information or project outcomes will be communicated
- Key project milestones and opportunities for information sharing with a broader audience

The trust that builds as the project team and working group adhere to the agreed upon communications practices will help the project navigate challenging steps later in the process, such as identifying priority adaptation responses for implementation.

Lastly, following through on integrating stakeholder input and feedback after it is solicited is a key contributor to building and maintaining trust. In most cases, mistakes or stumbles in the planning process are far less damaging to stakeholder trust than if the project team fails to respond to stakeholder input and ideas, even if they are framed as concerns and critiques about the project.

TAKING ACTION

Stakeholders as Communicators

Support stakeholders in effectively communicating about the project to their own stakeholders by providing them with materials that clearly frame the project goals, objectives and outcomes. Examples communication materials include:

- Clear project description (A project “Elevator Speech”)
- An overview slideshow or video about the project to share
- Nice handouts in easy-to-share formats
- Graphics and/or slides to add to their presentations
- Concise easy to understand summaries of assessment findings

Project staff will also need to make themselves available to respond to requests for assistance from stakeholders to help them develop customized communication materials or to make presentations to stakeholders agencies and organizations.



4. Good Meetings

Adaptation planning involves new issues, unusual complexities (e.g., long timeframes and multiple scales of analysis) as well as unfamiliar terminology. To help a stakeholders meaningfully contribute to an adaptation planning project it is important to give them multiple and diverse opportunities to hear about and ask questions concerning the content and approach to each step in the process.

Good practices that make efficient use of the working group’s time before, during and after project meetings do the following:

- Preview the approach and expected outcomes of each planning process step early on in the process to reduce stakeholder unease about the outcomes and value of participating.
- Demystify unfamiliar adaptation planning process steps by providing stakeholders mini-trainings before the project initiates these steps. In particular, ensure that the approach being used for the vulnerability assessment is accurately characterized for the project. For example, will data and information be qualitative, quantitative or both? It can also help to translate adaptation terms into those that are used within their organizations, agencies and communities.
- Prepare information and work products that are as complete as possible and ask the working group to fill in gaps, provide corrections, and offer feedback.
- Do your “due diligence” between meetings. Review available resources and examples from other planning efforts and look for other events that have created local or regional disruptions or disasters such as economic downturns, hazards and strikes. Because there is so much information that can be leveraged for an adaptation planning process, new studies are often unnecessary. Documents such as Housing Elements, General Plans, Hazard Mitigation Plans, environmental analyses, implementation and operations plans and capital improvement plans can be used to develop draft work products, and mean that there is rarely a need to start efforts from scratch. Follow-up individually with working group members to discuss and gather specific information or input that might be needed.
- Mix in a wide variety of approaches to present information and obtain input and feedback, such as engagement exercises, discussions, shorter presentations, poster sessions and guest speakers. This keeps the project dynamic.



TAKING ACTION

Carrying Over Topics

Rather than trying to complete an adaptation planning step from start-to-finish at a single meeting, carry-over topics and tasks from meeting to meeting. For example:

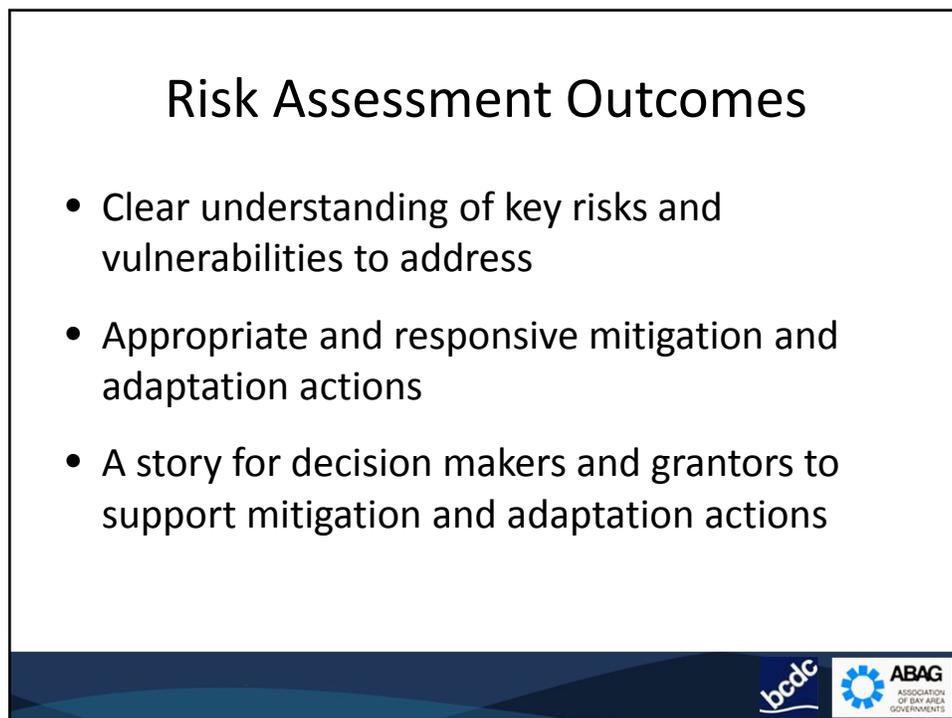
First meeting – Introduce a step in the planning process along with draft content (e.g., information about existing conditions and stressors at the start of the Assess step) developed by the project team – perhaps in an interactive format, such as a presentation followed by an exercise or discussion in small groups.

Between meetings – Write up and send out detailed meeting notes ASAP. Revise content and analyses based upon stakeholders' responses, critiques and questions during the meeting, as well as follow-up conversations with individual stakeholders. Send out revised work products to stakeholders at least a week in advance of the next meeting.

Second meeting – Walk stakeholders through the revised content (because most will not have had time to review these materials on their own) and then facilitate discussion and feedback. Set a deadline (usually a week or two later) for providing additional feedback by phone or email.

After second meeting – Write and send out detailed meeting notes ASAP and remind about the feedback deadline. Integrate additional feedback into a more finalized work product (e.g., climate impacts list, summary of existing conditions, asset vulnerability and risk profile sheets, etc) and share with stakeholders.

Identify and Assess Hazards and Assets



Step 1: Set Community Goals

Key points of this step:

- Identify community goals to help frame and guide the assessment. These goals can be based on existing community goals or developed specifically for the purpose of the risk assessment



What is a Goal?

- General guidelines that explain what the community wants to achieve with the plan
- Broad, long-term policy-type statements that represent visions for your community through reducing or avoiding losses from hazards



Why Develop Good Goals?

Community goals help guide the project

- Make decisions about scoping your risk assessment
- Get stakeholders and the public on board
- Use to develop and evaluate mitigation and adaptation actions



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Start with Existing Community Goals

- Helps engage diverse stakeholders
- Furthers already agreed-upon community goals
- Your mitigation goals can build upon or support existing goals
- Where to find existing goals:
 - ✓ General Plan
 - ✓ Housing Element
 - ✓ Community Safety Element
 - ✓ Sustainability Plan
 - ✓ Climate Action Plan
 - ✓ Climate Adaptation Plan
 - ✓ Past Hazard Mitigation Plans

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Creating Good Goals

- Frame using asset classes or hazards
- Ask yourself:
 - ✓ Is the goal achievable?
 - ✓ Will the community support it?
 - ✓ Is it outcome-oriented?
 - ✓ Do you have the resources to achieve it?
 - ✓ How will you measure whether you've achieved it?
- It's ok to have reach goals!
- Each community will achieve their goals differently



Goal Development Process

- Identify existing community goals
- Draft goals with project team and stakeholders
- Review with project team and public
- Revise after Risk Assessment
- Finalize prior to strategy development



Engage your project team, working group, stakeholders or the public in developing good resilience goals

Headlines Exercise

Headlines Exercise

The goal of this exercise is to envision how you would like your jurisdiction to perform in a disaster to identify your goals for resilience.

Scenario:

Your jurisdiction has just experienced a major disaster:

- Magnitude 8.5 earthquake, epicenter within 50 miles
- 1 to 100 year flood throughout or around, with water rising 6 feet above normal levels
- Major wildfire along the urban-rural interface, consuming thousands of acres of land

There has been significant damage and impacts to your community. How would you like your jurisdiction to perform following a disaster? What do you want and what don't you?

It may be helpful to think about success in terms of asset classes. How do each of these asset classes perform?

- People
- Housing stock
- Critical response facilities
- Critical infrastructure
- Transportation infrastructure
- Communication infrastructure
- Recreation, open space, and working lands
- Hazardous material sites, and contaminated lands

Instructions:

You will be asked to write headlines for your local newspaper that you would like to see two weeks following the disaster that describe what goals of your jurisdiction performed well during the disaster.

1. Your title will be assigned a disaster scenario (earthquake, flooding, or wildfire). If this disaster isn't applicable to your jurisdiction, send another headline.
2. Choose an asset class you'd like to highlight in your headline.
3. Imagine a person familiar about how your jurisdiction performed.
4. Share with your table.
5. Choose one headline from each table to share with the larger group.

Example:

"Two weeks after 8.5 earthquake, City of Mendocino residents receiving program to avoid potentially thousands of acres from significant damage. 80% of population is able to shelter in place!"

"Mayor of City of Single Island, Florida, city services remain intact. 90% of population receiving power, water and sewer services. Residents able to find shelter in local school."



Functions and Values Mapping

FUNCTIONS & VALUES MAPPING

MIT SUPPLY CHAIN MANAGEMENT EXERCISE
Developed by Prof. Dr. Jayaraman V. Srinivasan & Dr. Prabhakar Raghuram

Functions & Values Mapping

Purpose

One of the main objectives of this exercise is to identify what you think should be the focus of the resilience program in your community. This exercise is designed to help you identify the most important functions and values of your community and to map them to the functions and values of your community. This exercise is designed to help you identify the most important functions and values of your community and to map them to the functions and values of your community.

Approach

In a small group of 4-6 people, identify the most important functions and values of your community. Then, identify the most important functions and values of your community. Then, identify the most important functions and values of your community.

Outcomes

Each group will identify the most important functions and values of their community. Then, identify the most important functions and values of your community. Then, identify the most important functions and values of your community.




Exercise: Resilience Goals

1. Individually, write a resilience goal on an index card using the answers to “what does resilience mean in your community”
 2. Consider:
 - Existing community goals that consider resilience, sustainability, natural hazards or climate change
 - The functions and values of your community that are important to protect and maintain
 - The unique characteristics of your community that influence your resilience
- 
- 

Step 2: Describe Hazards

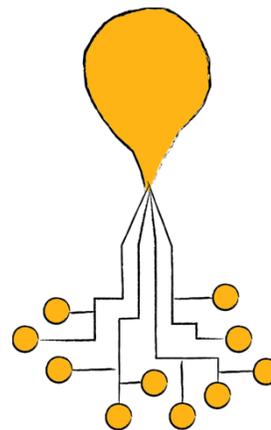
Key points in this step:

- Identify and describe current and future hazards in your community
- Document past disasters
- Determine which hazards will impact your community the most



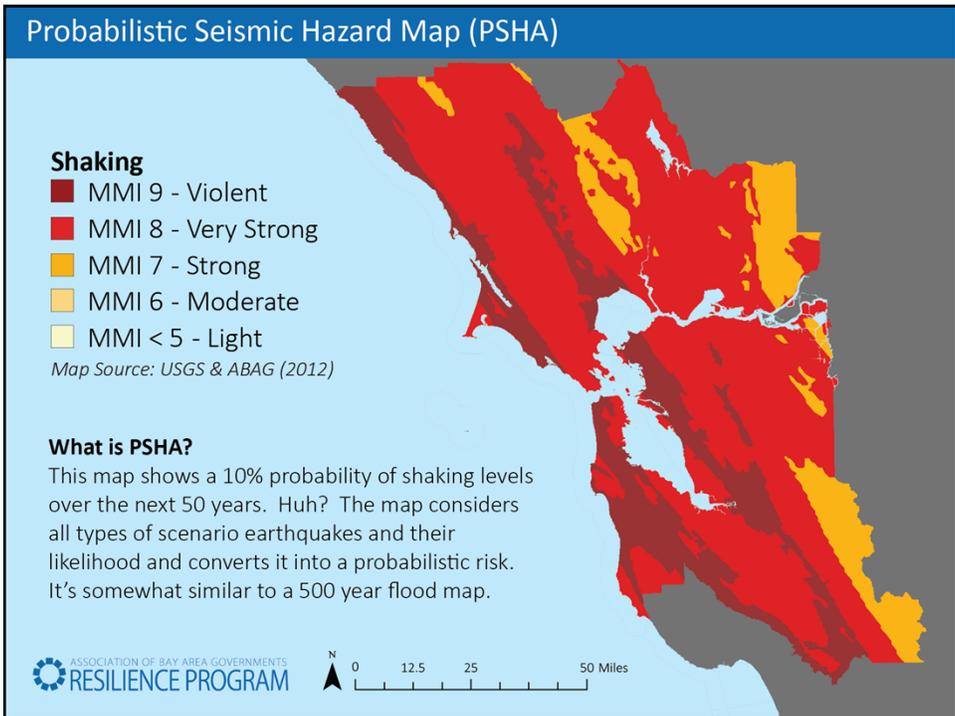
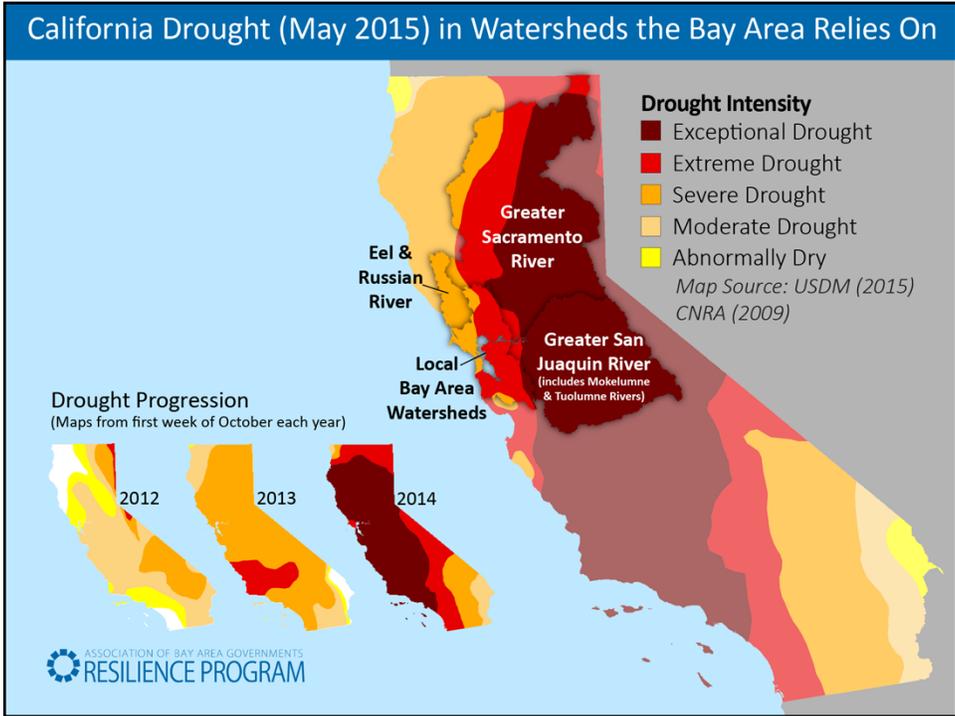
Natural hazards

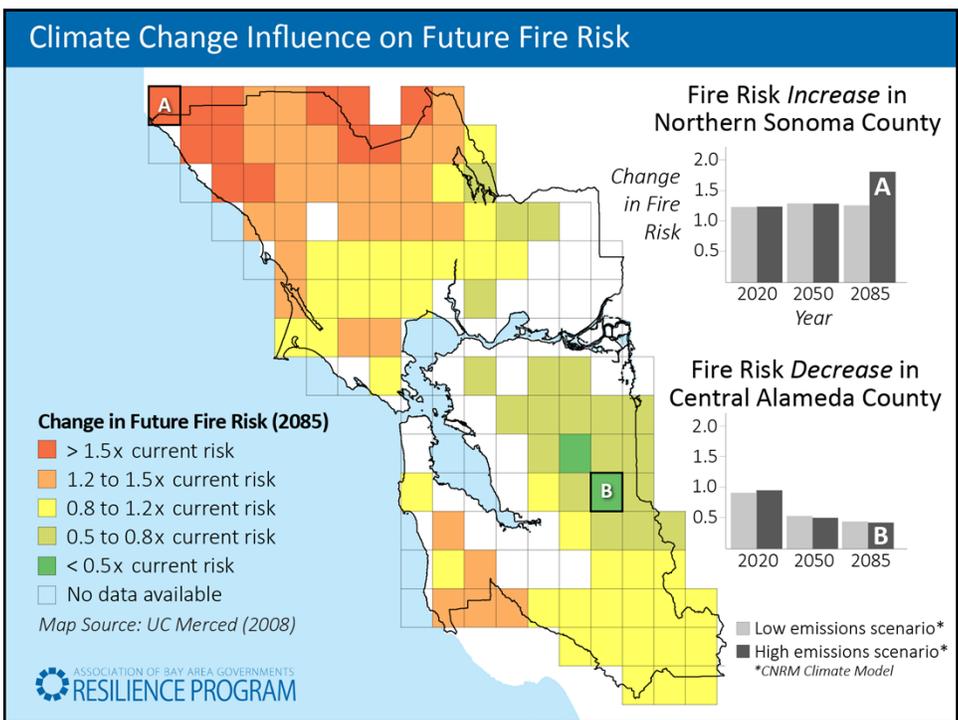
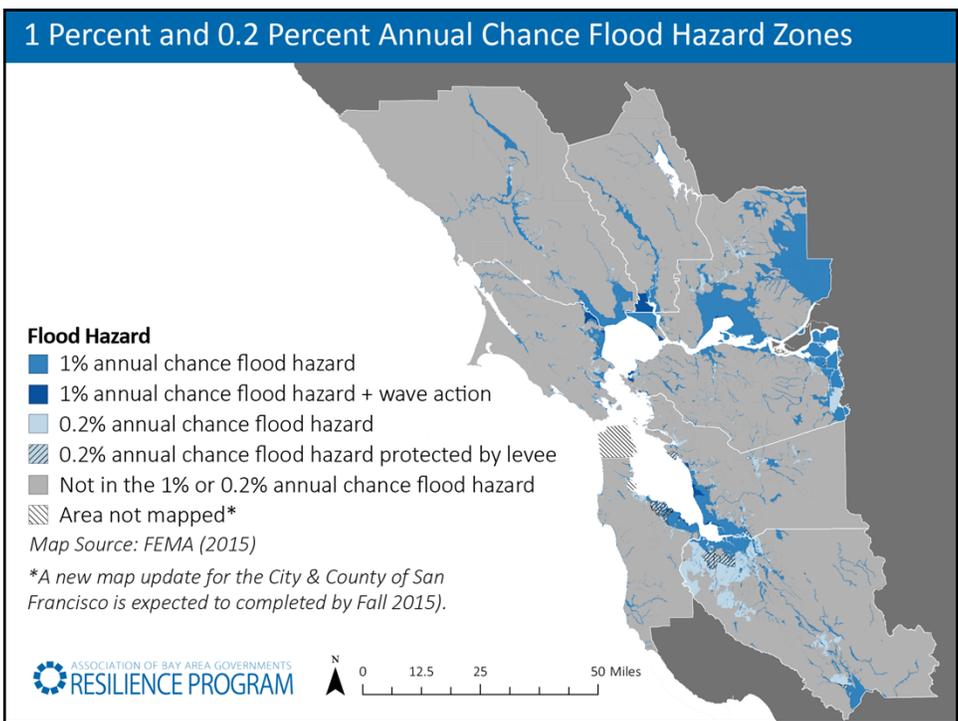
- Earthquakes (ground shaking, liquefaction)
 - USGS, California Geological Survey
- Flooding (current, future, sea level rise)
 - FEMA, NOAA, CalAdapt
- Landslide (earthquake induced, water induced)
 - USGS, CGS
- Tsunami
 - USGS, NOAA, CaIOES
- Fire (wildland, WUI, urban)
 - CalFire
- Drought
 - US Drought Monitor
- Extreme heat
 - CalAdapt



<http://resilience.abag.ca.gov/open-data/>







Hazards identified and described in the CA State Hazard Mitigation Plan

- Earthquakes
- Floods
- Wildfires
- Levee Failure
- Landslides
- Tsunami Hazards
- Climate Related
 - Air Pollution
 - Avalanches
 - Sea Level Rise
 - Drought
 - Energy Shortage
 - Extreme Heat
 - Freeze
 - Inset Pests & Diseases
 - Severe Weather & Storms
- Volcanoes
- Other Hazards
 - Agriculture Pests & Diseases
 - Dam Failure
 - Epidemic
 - Hazardous Material Release
 - Oil Spills
 - Radiological Accidents
 - Terrorism
 - Cyber Threats
- Additional Hazards
 - Airline Crashes
 - Civil Disturbances
 - Metal Theft
 - Train Accidents
 - Hydraulic Fracturing



There are a number of resources to help identify and describe the hazards that might affect your community

- Risk Landscapes (Bay Area Hazards)
- ABAG Open Data Page (Bay Area Hazard Maps)
- 2013 State Hazard Mitigation Plan (More extensive list of hazards)
- CalAdapt (cal-adapt.org)
- NOAA SLR Viewer (coast.noaa.gov/digitalcoast/tools/slr)
- Local knowledge and resources (i.e., past plans, institutional memory, etc)



Hazards Impact Statements

- **Impacts** are the potential affects that current or future natural hazards could have on society and equity, the economy, environment, and governance
- **Hazard impact statements** are a tool to help communicate the effect a hazard may have, and helps frame the hazard in terms of what communities value
- When initiating mitigation and/or adaptation planning, one of the first steps is to identify the hazards and impacts to be addresses - project partners, stakeholders, topical or subject area experts can help – this will increase buy-in for the process



Example Flooding Impacts

- Disruption of transportation resulting in lost access to jobs, schools, goods and services
- More frequent flooding in existing flood-prone areas that strains emergency response and recovery resources
- Flooding in low-lying areas that currently do not flood, causing damage and loss of buildings and structures including residences of all kinds
- Shoreline erosion and overtopping leading to damage or failure of shoreline protection
- Elevated groundwater and increased salinity intrusion that damages utility and communications infrastructure



Example Earthquake Impacts

- Ground shaking can cause wood-frame buildings to shift off of their foundations, damage overhead power lines and underground pipelines, possibly causing fires to ignite
- Liquefaction of saturated, loose or sandy soils can damage underground pipelines, airport runways, roads and highways, flood protection levees and building foundations
- Ground failure on slopes during an earthquake can trigger landslides that can close roads, damage buildings, disrupt utilities, and cause loss of life
- Large displacements from major underwater earthquake fault ruptures or landslides can lead to tsunamis that have high velocities causing flooding that is much greater than storm driven flood events



Conducting the Assessment

Key points of this step:

- Select the asset classes you will analyze and decide which will be assessed as a class or individually
- Gather maps and data and conduct an exposure analysis for selected hazard impacts
- Answer assessment questions to understand hazard vulnerability and consequences



Risk Assessments Include:

- An **exposure analysis** that identifies which **assets** will be exposed to a **specific hazard**
- **Assessment questions** that include existing conditions, types of vulnerabilities and potential consequences
- **Review** and **validation of assessment outcomes** by project team members, other stakeholders, asset managers, local or topical experts
- Outcomes to **support decision-making** and **funding requests**



Example Asset Classes

- People
- Buildings
- Critical Response Facilities
- Community Services
- Utilities Infrastructure
- Transportation Infrastructure
- Communication Infrastructure
- Recreation, Open Space, and Working Lands
- Hazardous Materials Sites and Contaminated Lands

Community Asset Identification Worksheet	
<p>Having a general sense of the types of assets you have in your community can help to guide your risk assessment and allow you to focus your resources in areas with the most impact. Gathering information on your assets now can also help you identify where data gaps exist.</p>	
Asset: People <input type="checkbox"/> Total population – current and future	Data Sources <input type="checkbox"/> U.S. Census <input type="checkbox"/> American Community Survey <input type="checkbox"/> Plan Bay Area <input type="checkbox"/> Priority Development Areas <input type="checkbox"/> Regional Housing Needs Assessment <input type="checkbox"/> ABAG Projections Series 2013 <input type="checkbox"/> County Quick Facts <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Zoning Code
Population with access or functional needs, including: <input type="checkbox"/> Age dependent, children and seniors <input type="checkbox"/> Medically or mobility dependent <input type="checkbox"/> Language constraints <input type="checkbox"/> Low income <input type="checkbox"/> Lack of education <input type="checkbox"/> Culture or ethnicity <input type="checkbox"/> Cost burdened (housing and/or transportation) <input type="checkbox"/> Transit dependent (no car) <input type="checkbox"/> Housing tenure (renters)	Data Sources <input type="checkbox"/> U.S. Census <input type="checkbox"/> American Community Survey <input type="checkbox"/> County Health Department Status Reports <input type="checkbox"/> Bay Area Regional Health Inequities Initiative <input type="checkbox"/> East Bay Indicators-East Bay Economic Development Alliance <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local studies <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Hazard Mitigation Plan <input type="checkbox"/> Non-Profit and Community Based Organizations
Asset: Building Stock <input type="checkbox"/> Publicly-owned buildings Privately-owned buildings: <input type="checkbox"/> Residential buildings, e.g., single and multi-family, mobile homes, senior and dependent housing <input type="checkbox"/> Nonresidential buildings, e.g., industrial, commercial or institutional structures	Data Sources <input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> U.S. Census <input type="checkbox"/> American Community Survey <input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Zoning Code <input type="checkbox"/> Google



Select a list of assets that is “right-sized” for your assessment

- Community goals
- Availability of data and information
- Resources to conduct the assessment
- Interest of the jurisdiction and its residents
- Desired outcome of the assessment
- Assets selected should inform consequences to people where they live, work, access key services and conduct day-to-day activities



Assessment scales

Asset class assessments provide broad, high-level information that can identify areas for further assessment

Individual asset assessments require more resources and information

Supplement **representative assets** that:

- Are similar to others
- Provide unique or important services
- Serve a large number of residents or those with access or resource needs
- High consequences if disrupted or damaged

Asset Class



Individual Asset



Representative Asset



Including multiple asset classes in your assessment will help:

Identify complexities in regulatory and other decision making processes that **cut across asset classes**

Reveal important **functional vulnerabilities** due to physical or organizational relationships among assets or agencies

Starting with a broad-scale assessment of multiple asset classes can provide a foundation for further focused assessments of specific geographies or individual assets

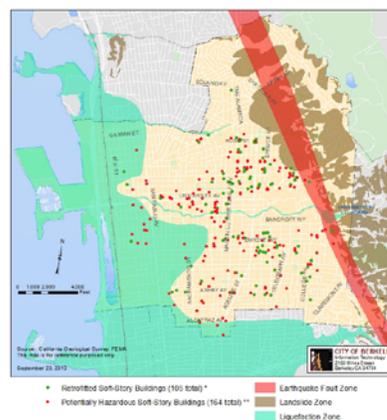


What is an exposure analysis?

A study to understand the extent to which assets may experience current or future hazards

Before starting an exposure analysis you need to select the hazard scenarios describing current or projected future conditions that facilities, infrastructure and communities may face

Map 3.3 Retrofitted and Unretrofitted Soft-Story Buildings

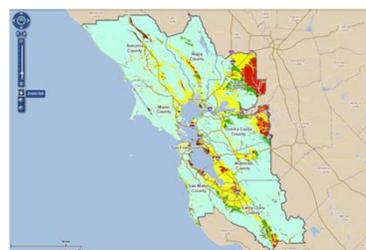
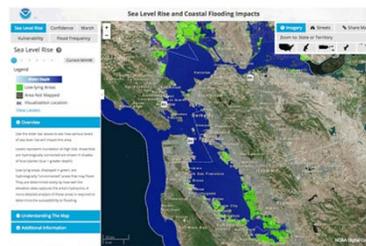


Exposure to current and future hazards

First: start with list of prioritized hazards and hazard impacts

Second: gather hazards and assets spatial data

Third: analyze the overlap between asset and hazard location using a geographic information system (GIS)



Conduct a step-wise analysis

Determine if data, maps or studies are available for the selected climate impact scenarios

YES

Gather available data and analyze exposure using:

- Print/paper maps
- On-line mapping tools
- ABAG's Open Data website

Ground truth exposure maps and findings with local experts

Flag areas where further investigation may be needed

Investigate trouble spots, cross-reference with assessment outcomes, and conduct refined analysis and mapping if necessary

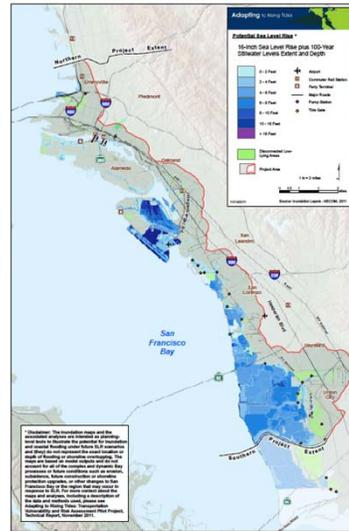
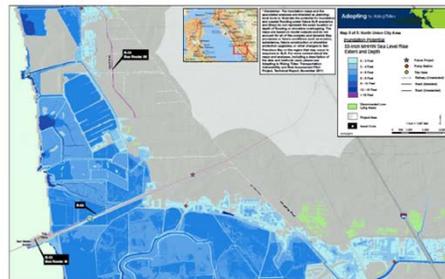
NO

- Use a scenario planning approach
- Re-purpose or re-analyze existing data
- Conduct new studies or analyses



Example from the Adapting to Rising Tides Alameda project

Available future flooding maps were too coarse and out of date, so ART developed project specific inundation maps using available topographic and water level data



Maps and exposure analysis was reviewed by asset managers and local experts



Flooding with 12 inches of sea level rise???



Trouble spots ground-truthed

Locations identified as low spots were field verified to make sure they truly were problem areas



Shoreline maps were refined and exposure re-analyzed



Flooding could occur with 36 inches of sea level rise

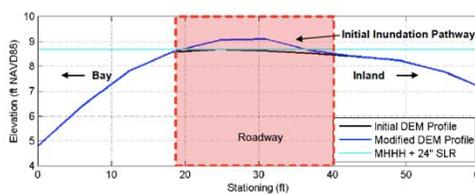


Figure 8. Roadway Cross Section of Intersection at Doolittle Drive and Harbor Bay Parkway



Figure 10. LIDAR Elevations at Site D

Assessment questions describe the existing conditions, different types of vulnerabilities, and consequences

- The questions focus on the types of information needed to understand the vulnerabilities and consequences often observed
- Depending on the scope and scale of the project, the assessment questions can be answered for individual or assets or the asset class as a whole

Risk Assessment Questions

Assessment questions help you understand the underlying causes and components of vulnerability and the potential consequences of those vulnerabilities. You can answer assessment questions in a very detailed way for individual assets that either a visual map inspection or a geospatial analysis has identified as being exposed to a hazard. Assessment questions can also be answered in a more general way for an entire asset class (e.g., residential housing) although this type of assessment is best supplemented by evaluating one or more representative assets.

Many of the assessment questions are broad and apply to all types of assets, while some are specific to a particular hazard or type of asset, so you will not need to answer all of the questions for all assets. In addition, some questions can easily be answered with readily available information, while others will require research or external input. It can be difficult to know how much effort to expend when answering assessment questions. Instead of spending a lot of effort to uncover hard-to-find or in some cases nonexistent information, flag critical data needs and knowledge gaps that require further consideration and come back to these when developing your mitigation and adaptation actions.

Existing Conditions

Describe the asset and highlight current conditions or stresses that could affect vulnerability.

1. Who owns and manages the asset? Note if the owner and manager are different entities.
2. What year was the asset built? What is the remaining service life?
3. Has there been an effort to extend the service life (e.g., improvements, seismic retrofit, mitigation actions)? If so, describe what was done and when.

Physical Vulnerabilities

Identify conditions or design aspects that make an asset particularly vulnerable to impacts

4. Does the asset have characteristics that make it vulnerable to flooding?
 - a. Are there water or soil sensitive components of the asset are at grade or below-grade, e.g., mechanical or electrical equipment, pumps, utilities, building base, ventilation, power systems, or finished basements?
 - b. Does the asset have openings are at grade or below-grade that are entry points for flooding, e.g., entrances, tubes, tunnels, ventilation grates?



First: Compile preliminary assessment answers

- Get familiar with the questions and develop an approach before diving in
- Gather answers using readily available reports, documents, plans, studies and maps

ART Assessment Questions: Flood control/stormwater
Asset name: Novato Creek (confluence reach in downtown Novato)

Questions	Answers (include data sources)
1. Is the asset managed to achieve multiple goals or objectives e.g., habitat, water quality, flood control, recreation, shoreline access, etc.? If yes, are there conflicts among them?	Novato Creek is managed for flood protection and wildlife habitat, including water quality and threatened and endangered species, and conflicts primarily arise when maintenance dredging permits are required (see FC 2.8 for more detail).
2. If the asset owner and manager are different, what is the relationship between them, e.g., a legal agreement such as a lease, right-of-way, access easement, MOU or MOA?	NA
3. Describe any plans that are relevant to asset management or improvement, e.g., Master Plan, Capital Improvement Plan, and if/how they consider sea level rise.	As part of current planning effort, MCFCD is evaluating 18" and 36" SLR to design a resilient, geomorphic dredge template. Riverine flooding of downtown Novato is more of a concern than coastal flooding of undeveloped baylands.
4. If the asset is protected from flooding by land or assets owned or managed by others (e.g., natural areas, structural protection, levees/dikes), what is the relationship between the asset owner/manager and these entities? Do they coordinate information, funding or decision-making?	MCFCD is working with the City of Novato, Novato Sanitary District, and North Marin Water District to improve channel conveyance of flow and sediment. SLR will increase backwater flooding and SMART and Hwy 37 bridges are significant constraints, yet these stakeholders are not actively involved in stakeholder process.
5. What types of permits (and from which agencies) are necessary to maintain, repair or improve the asset? Are there special processes for emergency repairs?	Permits from local, state, and federal agencies are required, e.g., BCDC, RWQCB, CDFW, NMFS, USFWS and USACE, both to complete maintenance dredging and capital projects.
6. What funding sources currently exist that can be used to assess hazard risk vulnerability to climate change? To improve asset resilience?	As a whole, MCFCD has no source of funds - flood zone annual revenues come from property tax and in some cases special taxes or fees (varies widely depending on property tax base of the zone and pre-proposition 13 tax rates). The Board of Supervisors approved using general funds to plan Novato Creek improvements. No funding sources currently exist for capital projects - a ballot measure, grant funding such as MWBM, partnerships, etc. would be needed to implement preferred alternative.



Second: Validate the assessment findings

- Provide asset managers, owners, and topic experts with the preliminary assessment answers
- Ask for them to review the answers and provide additional information to help fill gaps
- Share the exposure analysis findings along with the assessment answers



- ✓ Individual meetings
- ✓ Small group meetings
- ✓ Phone interviews
- ✓ Email
- ✓ Field visits



Existing conditions questions describe the asset or asset category and highlight any current conditions or stressors that could affect its vulnerability

Example: Power Substations

Q: Who owns and manages the asset?

A: PG&E owns and manages 19 of the 33 substations in the Contra Costa ART project area.



Physical questions identify conditions or design aspects that make an asset particular vulnerable

Example: Wastewater Infrastructure

Q: Are their barriers (temporary or permanent) that can protect sensitive components or at- or below-grade entry points?

A: The agency can cope with minor, infrequent flooding using sandbags, on-site pumping, and portable power supplies. However, these measures will not adequately address frequent or long duration flooding.



Functional questions consider the function of the assets and their relationship to or dependence on other assets

Example: Waste Transfer Stations

Q: What external services, such as power, communications, food or fuel supplies does the asset rely on?

- Transfer stations rely on trucks that use local streets and roads for waste pick-up, drop-off and transport. Many stations are served by a single point of access.



Governance questions identify challenges with management, regulatory authority, or funding options for mitigating or adapting to hazard impacts

Example: Flood Control Channels

Q: What funding sources currently exist that can be used to improve asset resilience?

A: Very little as Prop 13 resulted in frozen/limited funding which inhibits the ability to manage for current, let alone future, conditions.



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Consequences questions informs how current and future hazards may impact society and equity, the economy and environment

Example: Public Health Infrastructure

Q: How would the community, particularly sensitive populations, be affected by damage, disruption, or loss of asset function?

A: There are a limited number of public facilities to serve those with special medical needs. Damage or disruption of any of these facilities would further limit access or require travel to facilities farther away.



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Exercise: Rapid Risk Assessment

STEP #1 (10 minutes)

1. Work in a team of 2-3, select a resilience goal to use in this and the following exercises
2. Select an asset or class of assets to be assessed
3. Determine if the hazard of concern is flooding and/or earthquakes
4. Identify the impact of the hazard(s)

Risk Assessment Exercise

Resilience Goal:

Asset (pick one): <input type="checkbox"/> City Hall <input type="checkbox"/> Wastewater Treatment Plant <input type="checkbox"/> Senior Housing Complex <input type="checkbox"/> Hospital <input type="checkbox"/> Power Substation <input type="checkbox"/> Other:	Hazard (one or both) <input type="checkbox"/> Earthquake <input type="checkbox"/> Flooding	Hazard impact statement (see example hazard impacts):
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Exercise: Rapid Risk Assessment

STEP #2 (30 minutes)

1. Answer the assessment questions to the best of your ability. Think about how and why the asset you selected would be vulnerable to the hazard(s), and the consequences of its damage or disruption
2. Check the boxes, circle answers, or write responses
3. If you are unsure of the answer make a note as it might be an information gap that needs to be filled

Assessment Questions (see Risk Assessment Questions Handout)

Existing Conditions		
Describe the asset and highlight current conditions or stressors that could affect vulnerability		
Asset functions (e.g., type of land use, community served, services provided):	Land Use <input type="checkbox"/> Residential <input type="checkbox"/> Institutional <input type="checkbox"/> Industrial <input type="checkbox"/> Commercial <input type="checkbox"/> Other:	Community Served: <input type="checkbox"/> Elderly <input type="checkbox"/> Youth <input type="checkbox"/> Low income <input type="checkbox"/> Mobility challenged <input type="checkbox"/> Other:
Who owns the asset? Are owner and manager different?	Owner: <input type="checkbox"/> Public <input type="checkbox"/> Private	Manager: <input type="checkbox"/> Public <input type="checkbox"/> Private <input type="checkbox"/> Different than owner? If so, explain:
Has the asset been retrofit for earthquakes or flooding?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, explain when and to what standard:	



Morning Recap

1. Set Community Goals

- Identify community goals to frame and guide the assessment

2. Describe Hazards

- Identify and describe current & future hazards
- Document past disasters
- Prioritize hazards and hazard scenarios to assess

3. Determine Assessment Methods

- Select the assets and asset scale
- Determine approach to exposure, vulnerability and consequences

4. Conduct the Assessment

- Conduct an exposure analysis
- Gather information on your assets
- Identify further data needs

5. Summarize Vulnerability

- Summarize assessment information into clear, outcome-oriented problem statements

Step 5: Summarizing Vulnerability

Key points of this step:

- Summarize assessment information into clear, outcome-oriented problem statements
- Use the exposure analysis and validated assessment answers to write brief statements describing the vulnerabilities and consequences identified
- Use hazard, asset class, or individual asset to frame issue statements

CALPINE RUSSELL CITY ENERGY CENTER



Asset Description: The Russell City Energy Center (Energy Center) is a natural gas-fired power plant that provides 619 megawatts (MW) of electricity to the Bay Area. The plant went online in August 2013 and has an expected lifespan of 40 years. The plant is owned and operated by CalPine, which sells the majority of its power to PG&E through operating agreements. The plant generates enough electricity for 600,000 residents and pays \$5 million in taxes to the City of Hayward annually.

Key Issue Statement: The Energy Center is vulnerable to sea level rise impacts because of its reliance on water, access roads, and other utilities that are vulnerable to storm surge and sea level rise. Information about plant operations are not publicly available, which makes it difficult to adequately consider the plant in sea level rise adaptation planning. While the plant may not be vulnerable to more serious flooding impacts since it has an expected lifespan of only 40 years, the site will need to be cleaned up and/or protected as sea level rises.

Vulnerabilities

INFO: CalPine, a private entity, owns and operates the Energy Center, and management and operations plans are not publicly available, making it difficult to adequately assess the plant's vulnerability and risk.

FUNC: The Russell City Energy Center requires 2 million gallons per day of cooling water from Hayward Water Pollution Control Facility (HWPCF) and also discharges wastewater to the HWPCF. In addition, it relies on streets, roads, and highways for employee access. The dependence of the plant on potentially vulnerable utilities may cause the plant to be vulnerable before the plant itself is exposed to flooding, since the plant requires the cooling water and the road access to operate.

Consequences

Society and Equity: If the plant is shut down or moved due to sea level rise, 30 jobs may leave the area or disappear entirely.

Benefits of issue statements

- Highlight critical planning issues that have emerged in your assessment
- Prioritize and focus on areas in greatest need of mitigation
- Bring stakeholders together on issues that require collaborative decision making, shared funding, or changes in laws, regulations, policies or other processes
- Lead directly to mitigation strategies

• *Old City Hall, 2134 Martin Luther King, Jr. Way*

This building, used for offices and assemblies, including City Council meetings, is a potential collapse hazard that needs to be retrofitted. It is also a recognized historic building. The Berkeley Unified School District has moved its administrative offices to a new building.



• *Veterans' Memorial Building, 1931 Center Street*

This historically landmarked building, used for public assembly, as a homeless shelter, and for daytime homeless services, is a potential collapse hazard that needs to be retrofitted.

The homeless shelter operating in the building currently houses about 50 people per night. During the day, the Dorothy Day House, Berkeley Food and Housing Project, Options Recovery, and Building Opportunities for Self Sufficiency (BOSS) use the building for their homeless service programs.



Key Considerations

- Produce broad or wide ranging effects on society
- Affect the environment
- Affect the economy at multiple scales
- Are urgent because impacts will occur in a shorter timeframe than it takes to address the vulnerabilities identified
- Could cause cascading effects on other assets, services, or communities



Example Statements

“The North Creek Sewage Treatment Plant is located in the 100-year floodplain and has been damaged by past flood events. It is also in the sea level rise inundation zone and could experience up to 24” of permanent inundation. It serves 10,000 residential and commercial properties and it is the primary treatment plant for this area.”



Example Statements

“Five of the eight public elementary schools in this city are in moderate or high ground shaking areas and one is located in both a liquefaction zone and in the 100-year floodplain. One middle school is not currently in any hazard zone but will likely experience future flooding with 36” of sea level rise. There is a data gap around the retrofit status of any of the schools; it is unknown if any have been seismically retrofitted.”



Example Statements

“The old warehouse district, which has been undergoing redevelopment to accommodate transit-oriented development, has a number of new lofts and condominiums that are built from concrete that is not properly reinforced (i.e., non-ductile concrete).”



Now it is your turn...time to write an issue statement!

ART SUPPLY: HOW TO GUIDE
Design Your Project Step 5: Start an Adaptation

Issue Statements

This guide helps with...

Summarizing the existing conditions, vulnerabilities and consequences for each of the project assets into issue statements.

These statements are included on the asset profile sheets, and are helpful in quickly communicating the issues identified for each asset. Additionally, the process of summarizing these asset-specific issues helps the project team begin to identify bigger, key planning issues that, together, the project team and working group will need to address in the Plan stage of the project.

Definitions: Issue Statements

To enable the project team and working group to determine activities for developing adaptation responses, they need a clear picture of issues – the problems resulting from the climate impacts addressed in the project area. In the ART approach to adaptation planning, these issues derive from the existing conditions, vulnerabilities and consequences for the assets, systems of assets, sectors or services collectively referred to as assets in the rest of this guide considered. Asset-specific issue statements summarize the problems that need to be addressed, and help the project team and working group home in on the project’s key planning issues, the next task in the Define step. (See [How to Guide: Key Planning Issues](#).)

A Challenging Task

There is no getting around that these Define step tasks – identifying and summarizing issue statements, and identifying the key planning issues for the project – are a challenge. Despite taking multiple projects through the Define step, the ART team continues to struggle to land on a single approach that works across the range of project scales, asset types and stakeholder working group members involved. Yet rather than veer to listing or scoring vulnerabilities or assets (which would be faster in the short-term) we continue to take projects through the Define step because it is worth the benefit that it offers and provides to the project stakeholders, including the project team and funders.

Laid out here is an approach that reflects our lessons learned and current best practice, but your project team may find that it needs modification to work for your project. And, if you are struggling with this step, ask for help. Visit the [ART Portfolio Help Desk](#) and find an ART team member to contact.



Lightning Exercise: Issue Statement

1. Working in your small group write one or more issue (problem) statements that summarize your rapid risk assessment findings

EXERCISE		
Asset (tick one): <input type="checkbox"/> City Hall <input type="checkbox"/> Wastewater Treatment Plant <input type="checkbox"/> Senior Housing Complex <input type="checkbox"/> Hospital <input type="checkbox"/> Power Substation <input type="checkbox"/> Other:	Hazard (tick one or more): <input type="checkbox"/> Earthquake <input type="checkbox"/> Flooding	Hazard Impact Statement (see example hazard impacts):
Issue or Problem Statement		
Issue or Problem Statement		
Issue or Problem Statement		






Hazard Mitigation and Climate Adaptation Risk Assessment Overview

An in-depth risk assessment can provide a comprehensive understanding of vulnerabilities and consequences within a community, and can lead to the development and implementation of more appropriate and achievable mitigation and adaptation actions. The outcomes of the assessment can also help guide long-range planning and future land use decisions, spur important partnerships with utilities and the business community, and provide additional incentive to help protect vulnerable communities, small businesses, or unique community features such as historic structures or critical park and recreational facilities.

The assessment process described in this overview closely follows FEMA’s Local Mitigation Planning Handbook. We do suggest one additional step, Step 1, which has you select community goals before the assessment rather than when wait until you are developing mitigation or adaptation actions. In addition, we broaden Step 3 from solely identifying community assets to taking the time to determine the overall assessment approach including how you will gather the information about risk. These changes were made to help ensure that your assessment is locally meaningful and actionable.

The assessment process presented below is broken into the following steps:

- Step 1: Set Community Goals**
- Step 2: Describe Hazards**
- Step 3: Determine your Assessment Methods**
- Step 4: Conduct the Assessment**
- Step 5: Summarize Vulnerability**

At the end of the assessment you will have the following outcomes:

- Goals to guide the assessment and development of mitigation actions
- Prioritized hazards, hazard scenarios, and maps to be used in your assessment
- An inventory of assets, by asset class and specific assets, to be used in your assessment
- Exposure analysis – maps and data describing which assets are exposed to which hazards
- Assessment information about vulnerability and consequences
- Vulnerability problem statements
- Fulfillment of Element B1 in FEMA’s Local Mitigation Plan Review Tool Checklist**
- Fulfillment of Element B2 in FEMA’s Local Mitigation Plan Review Tool Checklist**
- Fulfillment of Element B3 in FEMA’s Local Mitigation Plan Review Tool Checklist**
- Fulfillment of Element B4 in FEMA’s Local Mitigation Plan Review Tool Checklist**

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Step 1: Select Community Goals

Key points of this step:

- Identify community goals to help frame and guide the assessment. These goals can be based on existing community goals or developed specifically for the purpose of the risk assessment.

The Hazard Mitigation and Adaptation Plan can be a critical tool for advancing existing community goals and may provide an opportunity to establish new goals focused on resilience. For example, community goals to increase quality of life or maintain affordability can be achieved, in part, by protecting housing from earthquakes and flooding, or by keeping small businesses intact after a natural disaster. New goals may also emerge that focus on specific vulnerabilities present in your jurisdiction and identified through your risk assessment, such as a large elderly population that should be considered prior to a hazard event and will likely need extra support after a disaster.

Selecting community goals early in the planning process helps scope the assessment and prioritize which community assets should be analyzed. Later in the assessment process, community goals help guide development of locally meaningful mitigation and adaptation actions. To develop locally relevant goals, start with existing community goals that can be found in General Plans, Specific Plans, Climate Mitigation Plans, Climate Adaptation Plans, Sustainability Plans, or other local planning documents. Use these goals to help determine what assets, and what degree of detail for each asset, is needed to conduct a meaningful risk assessment. Be aware that the process of scoping and conducting a risk assessment may also reveal additional goals. Through a better understanding of your community's specific hazard and vulnerability profile, you may uncover issues that are not fully addressed in existing community goals.

Since goals help explain what the community wants to achieve with the plan they are usually broad policy-type statements that are a vision for reducing or avoiding losses from hazards. Community and mitigation goals, and supporting mitigation actions, are developed in order to:

- Build transparency into the process at the outset so that all participants and others with an interest in the process know what will be included and what will likely be a priority.
- Engage the project team early in deciding what shared outcomes they will work cooperatively to achieve, and provide an opportunity for them to ask their stakeholders for input and feedback on the project direction.
- Provide a foundation upon which future project decisions can be made and help in evaluating how well mitigation actions will help meet established community values and expectations.

Outputs:

- Goals to guide the risk assessment and development of mitigation and adaptation actions

Resources:

- Community Goals Worksheet (attached)

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Identifying Community Goals

Existing community goals can help to rally stakeholders around the Hazard Mitigation and Adaptation planning process as well as assist with deciding where to focus time and resources during the risk assessment. The Hazard Mitigation and Adaptation Plan is a tool to help promote existing community goals as well as identify new community goals.

Goals that may be supported by your Hazard Mitigation and Adaptation Plan may be goals like the following:

- Example existing goal: Protect affordable housing for low-income residents.
- How your plan can support this: If housing is damaged after a disaster, low-income residents will likely be displaced. Additionally, housing that is currently low income may be rebuilt at current market rates. To protect affordable housing, you need to protect housing from significant damage in a disaster. In your risk assessment, you may wish to prioritize analyzing existing housing vulnerability. In your mitigation actions, you may include a mitigation strategy that requires the retrofit of vulnerable housing types.

You may find community goals in the following plans or plan elements:

- General Plan
- Housing Element
- Community Safety Element
- Sustainability Plan
- Climate Action Plan
- Climate Adaptation Plan
- Previous Hazard Mitigation Plan

Headline Visioning Exercise

The goal of this exercise is to envision how you would like your jurisdiction to perform in a disaster to identify your goals for mitigation.

Scenarios:

Your jurisdiction has just experienced a major disaster:

- Magnitude 6.9 earthquake, epicenter within 50 miles
- 1 in 500 year flood (shoreline or riverine), with water rising 6 feet above normal levels
- Major wildfire along the urban-rural interface, consuming thousands of acres of land

There has been significant damage and impacts to your community. How would you like your jurisdiction to perform during a disaster? What has gone well, and what hasn't?

It may be helpful to think about successes in terms of asset classes. How did each of these asset classes perform:

- People
- Building stock
- Critical response facilities
- Utilities infrastructure
- Transportation infrastructure
- Communication infrastructure
- Recreation, open space, and working lands
- Hazardous material sites and contaminated lands

Instructions:

Your job is to come up with headlines for your local newspaper that you would like see two weeks following the disaster that showcase what parts of your jurisdiction performed well during the disaster.

1. Your table will be assigned a disaster scenario (earthquake, flooding, or wildfire). If this disaster isn't applicable to your jurisdiction, select another hazard.
2. Choose an asset class you'd like to highlight in your headline
3. Develop a positive headline about how your jurisdiction performed
4. Share with your table
5. Choose one headline from each table to share with the larger group

Examples:

"Two weeks after a M 6.9 earthquake, City X reveals: Seismic retrofitting program saved potentially thousands of homes from significant damage. 85% of population is able to shelter in place"

"Mayor of City X: Despite record floods, city services remain intact. 90% of population receiving power, water and sewer services, remainder to be back in service by next week"

"Award-winning fire safety program ensures that evacuation routes stay open, despite massive wildfire that consumed several hundred acres of wildland-urban interface."

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Functions & Values Mapping

Purpose

Early on in your adaptation planning project, learn about what your stakeholder working group members care about and find to be critical for the economy, public health and safety, community and environment in the project area. Within the ART Program, these are called functions and values. The process of identifying these functions and values as a group can help to clarify the purpose and focus of the project for all participants.

The functions and values themselves serve as the basis for the project's resilience goals, which provide a way to obtain agreement on the main objectives of the project, and will help shape later project decisions about adaptation responses.

Approach

At an initial meeting of a project's working group, participants identify the functions and values within the project area (on a poster-sized map) that are important to consider when assessing current and future sea level rise and storm event impacts.

Outcomes

1. Early engagement of project working group members that helps build a shared understanding of the services, sectors and assets within the project area, and stakeholder's interests and concerns.
2. The confirmation of certain project elements, in particular, the project boundary and types of assets and services to be included, and other stakeholders, agencies, organizations or issue experts that should be represented in the project working group or subcommittees.

3. Information that can be used to draft resilience goals for the project that:

- Consider the four sustainability frames used in the ART Program:

Society & Equity

Effects on communities and services on which they rely, with specific attention to disproportionate impacts due to inequalities.

Economy

Economic values that may be affected such as costs of physical and infrastructure damages or lost revenues during periods of recovery.

Environment

Environmental values that may be affected, including ecosystem functions and services, and species biodiversity.

Governance

Factors such as organizational structure, ownership, management responsibilities, jurisdiction, mandates, and mechanisms of participation that affect vulnerability to impacts.

- Reflect a shared vision for the assets and services within the project area and an overall project approach while acknowledging differences among assets, services, agencies and organizations
- Reflect the goals and objectives, issues and priorities of the agencies, organizations, communities and others participating in the working group
- Inform the evaluation and selection of high priority adaptation responses for implementation and funding.

When to use this exercise...

This exercise is most appropriate during the project kick-off meeting, where the proposed project area, working group members and assets and issues are identified and confirmed by the attendees.

Logistics

This exercise requires at least 45 minutes:

- Allow 30 minutes for the introduction to the exercise and the participatory mapping. Another 15 to 20 minutes is needed for a quick, “lightning-round” debrief.

1. Prepare

This is a visual, hands-on exercise that requires a large format map of the proposed project area that stakeholders will use to identify the functions and values (important assets and services) within the project area by placing stickers or sticky notes on the map. Supplies for this exercise include:

- Simple map of the project area: using GIS or any digital mapping software, create a map that shows the project boundaries, labeling a few orienting features (roads, key assets, etc.). Plot or print a large format map (e.g., 36" wide). Alternatively, the map could be projected onto a wall at a large enough size for all participants to see.
- List of functions and values printed on stickers or written on sticky notes (good to use different colors for each if possible). The project team should think of different resilience building functions and values that address all aspects of sustainability. Other types of functions and values can be added that more specifically reflect the goals, objectives and priorities of the agencies, organizations and communities that participate in the exercise.

Examples of functions based on the four frames used in the ART Program

Society and Equity	Environment	Economy	Governance
▪ people where they live	▪ habitat	▪ goods movement	▪ multi-agency ownership or management
▪ public health and safety	▪ flood risk reduction	▪ commuter movement	
▪ people where they work	▪ water quality	▪ local jobs	▪ public/ private/ NGO partnerships
▪ people where they recreate	▪ biodiversity	▪ tax revenue	

- Blank stickers or sticky notes, pens and markers. Blank stickers allow for people to add their own functions and values or to make more of the ones listed above in case they run out.
- Participant guide that explains the purpose and expected outcomes of the exercise, and lists/describes the selected resilience building functions and values.

Prior to the meeting the project team should run through this exercise and make any adjustment or changes to customize it to the project goals, objectives, area or stakeholders.

2. Do

1st

Hand out participant guide and introduce the exercise

2nd

Explain the proposed functions and values selected by the project team and confirm these with the group. Add additional functions and values if necessary based on working group and stakeholder feedback and hand out stickers, also provide blank stickers for other “write-in” functions and values

3rd

Orient the group to the map and point out some of the key sectors, services, assets, e.g., homes and neighborhoods, schools, hospitals, fire and police stations, transit centers, commuter and goods movement corridors; employment sites, utility corridors, recreation areas, habitat and natural features, etc. Provide a quick example by placing a sticker in a location.

4th

Ask the group to place stickers on the map identifying where the different functions and values are provided. Have staff or a project team member at each station (if more than one) to provide assistance and answer questions during the exercise.

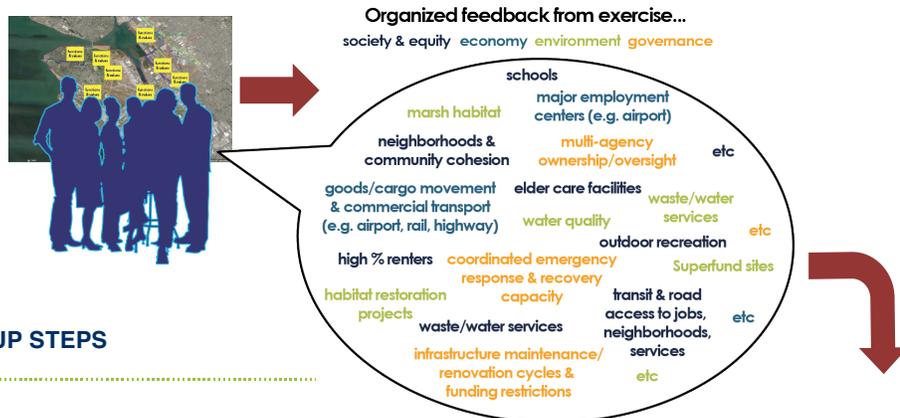
5th

Conduct a lightning-round debrief. Look at the maps and observe what functions and values are represented, ask for top-of-mind words, phrases or concepts that would be included in goals to either maintain or enhance resilience in the project area.



3. Follow-up

After the meeting, the project staff, using the mapped functions and values and the list of words, phrases and concepts from the lightning round, develops a set of draft resilience goals for the project area. See an example of draft resilience goals in Example Materials & Outcomes below.



FOLLOW-UP STEPS

This figure shows an example of the follow-up steps for the project staff.

Organizing the feedback from the mapping exercise according to the four sustainability frames used in the ART Program, *Society & Equity*, *Economy*, *Environment* and *Governance*, can help with identifying common themes or topics that form the basis for the project resilience goals.

Draft resilience goals for the project

Maintain neighborhood function by preserving access to roads and transit, goods & services, safe & affordable housing, and outdoor recreation opportunities.

Maintain the function of the airport as a regionally significant passenger, cargo and employment hub.

Build resilience in all phases of the disaster lifecycle - from mitigation & preparedness to response & recovery - by protecting critical community facilities, supporting community awareness, ensuring assistance through mutual aid agreements, and building capacity for an effective recovery.

Preserve environmental quality by protecting endangered species, ensuring good water quality, and providing appropriate wildlife habitat.

Protect local and regional economy by preserving major employment centers, airport services, regionally significant transportation and local infrastructure investments.

Either by email, a project share site or at the next meeting, share the draft resilience goals with the working group and other stakeholders to get their input and feedback. At this point, remind them of the purpose and importance of resilience goals (see above, under “Outcomes”). Give them time to reflect on their agency’s goals or mission in relation to the draft resilience goals. Each working group member should see a reflection of their priorities in the project resilience goals although not all the goals may be relevant to all stakeholders. The resilience goals may be revisited and revised later in the project during the development of adaptation responses.

Share the revised resilience goals with stakeholders to get agreement and confirmation.

Example Materials & Outcomes

Map



EXAMPLE PROJECT AREA MAP

A simple map of the project area that shows the project boundaries, a few orienting features. The map should be printed in a large format (e.g., 36" wide) or projected onto a wall at a large enough size for all participants to see.

Lightning round

Examples of words, phrases and concepts from the lightning round exercise. These have been categorized within the four frames that were used in the ART assessment.

- Neighborhoods and community cohesion (Society & Equity)
- High percentage of renters (Society & Equity)
- Access to neighborhoods, jobs and services via transit and roads (Society & Equity, Economy)
- Waste/water services (Society & Equity, Environment)
- Coordinated emergency response and recovery capacity (Society & Equity, Governance)
- Multi-agency ownership/oversight (Governance)
- Joint powers authority of shoreline managers (Governance)
- Superfund site (Society & Equity, Environment)
- Coalition of community organizations to improve environmental health (Society & Equity, Governance)
- Water quality (Society & Equity, Environment)
- Outdoor recreation (Society & Equity)
- Schools (Society & Equity)
- Elder care facilities (Society & Equity)
- Major employment centers (e.g., airport) (Economy)

- Goods/cargo movement and commercial transport (e.g., airport, rail, highway) (Economy)
- Marsh habitat (Environment)
- Habitat restoration projects (Environment)
- Infrastructure maintenance/renovation cycles and funding restrictions; etc. (Governance)

Draft resilience goals

ART program staff drafted resilience goals based on the functions map, key words and phrases suggested by stakeholders, and their current understanding of the project area. Each of the four frames is addressed in at least one goal. As seen in the draft goals below, larger concepts like regional economy and environment were tailored to fit the Oakland/Alameda project area. The airport provides critical economic and social benefits in this area so its functions create a standalone goal. Society and equity resilience in this area includes housing, transportation and recreation benefits. In order to draft locally-appropriate resilience goals, staff will need to synthesize stakeholder input from this activity with existing knowledge of the focus area and project partners. Keep in mind; stakeholders will have a chance to review and revise these draft resilience goals at the next meeting.

Example of draft project resilience goals developed from the exercise.

Maintain neighborhood function by preserving access to roads and transit, goods and services, safe and affordable housing, and outdoor recreational opportunities.

Maintain the function of the airport as a regionally significant passenger, cargo, and employment hub.

Build resilience in all phases of the disaster lifecycle - from mitigation and preparedness to response and recovery - by protecting critical community facilities, supporting community awareness, ensuring assistance through mutual aid agreements, and building capacity for an effective recovery.

Preserve environmental quality by protecting endangered species, ensuring good water quality, and providing appropriate wildlife habitat.

Protect local and regional economy by preserving major employment centers, airport services, regionally significant transportation, and local infrastructure investments.

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Step 2: Describe Hazards

Key points of this step:

- Identify and describe current and future hazards in your community
- Document past disasters
- Determine which hazards will impact your community the most

Before you develop your risk assessment, you must identify and describe the hazards that are present within your community. An important part of this step is identifying which hazards pose the greatest threat to your community, either through the extent of the hazard, the severity of the hazard, or the consequences of the hazard.

Within the Bay Area different communities are at risk from different hazards. One community may be located in a very high fire hazard severity zone, while another may have low wildfire risk but large flooding exposure. Fortunately, there are a number of resources that Bay Area communities can use to map and describe the natural hazards that will affect them. For example, the State Hazard Mitigation Plan and MyPlan website describes all of the natural hazards that can impact the State of California, while *Risk Landscapes*, produced by the Association of Bay Area Governments (ABAG), identifies the hazards that will impact the Bay Area. Both of these resources can be used in combination with local data and knowledge, such as local liquefaction assessments and knowledge of past disasters, to characterize the hazards your community may face.

The following describes a stepwise process that will help you describe your hazards as part of your risk assessment.

Describe and map current and future hazards

Explore the current and future hazards that are of greatest concern by downloading the *Risk Landscapes* hazard layers for use in your own GIS at ABAG's Open Data webpage, viewing maps online using the ABAG viewer at <http://gis.abag.ca.gov/website/Hazards>, and by reviewing local hazard maps your city, county, or district may keep. Using these resources, develop local-scale maps and written descriptions of the hazards from your community's perspective, including the location, expected frequency, and severity of the hazard, such as the strength (magnitude) of an earthquake or the geographic extent or duration of flooding.

As an example, your hazard description might read: "The western portion of the city has very high liquefaction susceptibility while the remainder of the city has low likelihood of liquefaction. Liquefaction may occur in earthquakes with very high levels of shaking, including one from the Hayward fault, which runs adjacent to the city and has a high probability of occurring in the next thirty years." When describing the probability of future events, it is important to take into consideration how hazards may change over time. For example, as the climate changes and sea level rises, flooding will become more frequent or severe and some areas that currently experience temporary flooding may become permanently inundated.

Create a list of past disasters

Past disasters can help your community understand where disasters may reoccur and can help to estimate the likelihood of a disaster in the future. Understanding past disasters can also help you estimate the scale of

impact if the disaster reoccurs, although if land uses and populations have changed the impacts and consequences will likely be different.

In addition to considering how land use change may affect the location, frequency or severity of disasters, you must also consider the potential effect climate change could have, including the intensification of disasters in areas already at risk, or the expansion of hazards into areas where they have not occurred in the past.

Risk Landscapes includes a table with all state and federally declared Bay Area disasters since 1950. You will also need to include information about local disasters that may not have been state or federally declared. When describing past disasters, include as much information as possible, including the extent and severity of the disaster as well as the impacts (i.e. “this portion of the city has flooding even in moderate rain events,” or “a fire in 2012 destroyed a transmission line interrupting power to 3,000 residents for 36 hours”).

In addition, you must also list National Flood Insurance Program (NFIP) insured structures in your community that have suffered repetitive damaged due to flooding (see box to the right)¹. To obtain this list, you will need to go through the following steps:

1. Obtain a sample request letter either from ABAG’s website or from your local NFIP Bureau & Statistical Agent
2. Adapt the sample letter with your jurisdiction’s information, letterhead, and signature from your department head
3. Mail the completed letter to your NFIP Bureau & Statistical Agent
4. The Bureau will send you a list of repetitive loss properties including property address, claim amounts, and date of claim for your jurisdiction
5. Use this information to map repetitive loss properties in relation to the floodplain and to aggregate loss information for your plan (though individual addresses and claim amounts for a specific property are private information, so do not include this in your plan)

The NFIP representative for the Bay Area is Adam Lizarraga, ALizarraga@nfip-iservice.com, (916) 375-0927.

Prioritize the hazards that are most important to your community

For your risk assessment, you will want to prioritize the hazards that could have the most impact on your community. You can estimate which hazards will have the most impact by considering the extent of exposure

¹ Sources: NFIP Flood Insurance Manual, FEMA. Revised October, 2012
44 CFR §79.2(g)

Repetitive and Severe Loss Properties

Repetitive loss property: an NFIP insured structure that has had at least two paid flood losses of more than \$1,000 each in any ten-year period since 1978.

Severe repetitive loss property: any NFIP insured single or multifamily residential properties that:

1. Have incurred flood-related damage for which 4 or more separate claims payments have been made, with the amount of each claim exceeding \$5,000 and the cumulative amount exceeding \$20,000; or
2. For which at least 2 separate claims payments have been made under such coverage, with the cumulative amount exceeding the market value of the building.
3. In both instances, at least two of the claims must be within 10 years of each other (claims made within 10 days of each other count as one claim).

(this can be measured by the number of people exposed, number of buildings exposed, or the value of assets exposed), the potential impacts of a hazard, and the likelihood of the hazard occurring. FEMA provides a worksheet for summarizing and prioritizing hazards in their *Local Mitigation Planning Handbook* (**Worksheet 5.1**, page A-29).

Once you have prioritized hazards it is a good time to consider if you need to refine the goals you previously outlined. In addition, now that you know where hazards may affect your community you can use that information to guide the remainder of the risk assessment, including which assets should be considered and what information needs to be gathered.

Outputs:

- Prioritized hazards, hazard scenarios, and maps to be used in the risk assessment
- Fulfillment of Element B1 in FEMA’s Local Mitigation Plan Review Tool Checklist**
- Fulfillment of Element B2 in FEMA’s Local Mitigation Plan Review Tool Checklist**
- Fulfillment of Element B4 in FEMA’s Local Mitigation Plan Review Tool Checklist**

Resources:

- FEMA *Local Mitigation Planning Handbook* Worksheet 5.1, Hazards Summary Worksheet (attached)
- ABAG *Risk Landscapes* document
<http://resilience.abag.ca.gov/projects/2016-mitigation-adaptation-plans/>
- ABAG Open Data webpage
<http://resilience.abag.ca.gov/opendata/>
- State NFIP coordinator or local floodplain administrator
Adam Lizarraga, ALizarraga@nfip-iservice.com, (916) 375-0927
- ART How-to Guide: Climate Scenarios and Climate Impacts Statements
http://resilience.abag.ca.gov/wp-content/documents/mitigation_adaptation/ART%20H2G-Climate%20Impact%20Statements_Vf1.pdf
- CalEMA’s MyPlan website
<http://myplan.calema.ca.gov/>
- California State Hazard Mitigation Plan
http://hazardmitigation.calema.ca.gov/docs/SHMP_Final_2013.pdf

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Hazards Summary Worksheet

Use this worksheet to summarize hazard description information and identify which hazards are most significant to the planning area. The definitions provided on the following page can be modified to meet local needs and methods.

Hazard	Location (Geographic Area Affected)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Avalanche				
Dam Failure				
Drought				
Earthquake				
Erosion				
Expansive Soils				
Extreme Cold				
Extreme Heat				
Flood				
Hail				
Hurricane				
Landslide				
Lightning				
Sea Level Rise				
Severe Wind				
Severe Winter Weather				
Storm Surge				
Subsidence				
Tornado				
Tsunami				
Wildfire				

Definitions for Classifications

Location (Geographic Area Affected)

- **Negligible:** Less than 10 percent of planning area or isolated single-point occurrences
- **Limited:** 10 to 25 percent of the planning area or limited single-point occurrences
- **Significant:** 25 to 75 percent of planning area or frequent single-point occurrences
- **Extensive:** 75 to 100 percent of planning area or consistent single-point occurrences

Maximum Probable Extent (Magnitude/Strength based on historic events or future probability)

- **Weak:** Limited classification on scientific scale, slow speed of onset or short duration of event, resulting in little to no damage
- **Moderate:** Moderate classification on scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days
- **Severe:** Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months
- **Extreme:** Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions

Hazard	Scale / Index	Weak	Moderate	Severe	Extreme
Drought	Palmer Drought Severity Index ³	-1.99 to +1.99	-2.00 to -2.99	-3.00 to -3.99	-4.00 and below
Earthquake	Modified Mercalli Scale ⁴	I to IV	V to VII	VII	IX to XII
	Richter Magnitude ⁵	2, 3	4, 5	6	7, 8
Hurricane Wind	Saffir-Simpson Hurricane Wind Scale ⁶	1	2	3	4, 5
Tornado	Fujita Tornado Damage Scale ⁷	F0	F1, F2	F3	F4, F5

Probability of Future Events

- **Unlikely:** Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.
- **Occasional:** 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
- **Likely:** 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years
- **Highly Likely:** 90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.

Overall Significance

- **Low:** Two or more criteria fall in lower classifications or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.
- **Medium:** The criteria fall mostly in the middle ranges of classifications and the event’s impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.
- **High:** The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

3 Cumulative meteorological drought and wet conditions: <http://ncdc.noaa.gov/>

4 Earthquake intensity and effect on population and structures: <http://earthquake.usgs.gov>

5 Earthquake magnitude as a logarithmic scale, measured by a seismograph: <http://earthquake.usgs.gov>

6 Hurricane rating based on sustained wind speed: <http://nhc.noaa.gov>

7 Tornado rating based on wind speed and associated damage: <http://spc.noaa.gov>

Table 4.2. Hazard Summary for Waveland

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Climate Change (storm surge, sea level rise)	Highly Likely	Extensive	Catastrophic	Medium
Coastal/Canal Bank Erosion	Highly Likely	Limited	Negligible	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Drought	Occasional	Significant	Negligible	Low
Earthquake	Occasional	Extensive	Critical	Low
Extreme Heat	Highly Likely	Extensive	Limited	Low
Extreme Winter Weather	Likely	Negligible	Limited	Low
Flood: 100/500 year	Occasional	Significant	Critical	High
Flood: Stormwater/Localized Flooding	Highly Likely	Significant	Critical	High
Hurricane and Tropical Storms (includes ocean surf events)	Likely	Extensive	Catastrophic	High
Thunderstorm (includes hail, lightning, high wind)	Highly Likely	Significant	Limited	High
Tornado	Likely	Limited	Negligible	Low
Wildfire	Likely	Limited	Negligible	Low
Railroad: Hazardous Materials Release	Occasional	Limited	Negligible	Medium
Guidelines: Frequency of Occurrence: Highly Likely: Nearly 100% probability in the next year. Likely: Between 10 and 100% probability in the next year Occasional: Between 1 and 10% probability in the next year Unlikely: Less than 1% probability in the next year Potential Magnitude: Catastrophic: More than 50% of the area affected Critical: 25 to 50% of the area affected Limited: 10 to 25% of the area affected Negligible: Less than 10% of the area affected			Spatial Extent: Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning Area Significance: Low Medium High	

Source: AMEC Data Collection Guide

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Hazard Impacts Statements

Impacts are the potential affects that current or future natural hazards could have on society and equity, the economy and the environment. When initiating hazard mitigation and adaptation planning projects one of the first steps is to identify the hazards and their impacts that will be addresses, and prepare hazard impacts statements. These statements are brief, written summaries of the selected impacts that clearly communicate what will be considered in the planning effort. Project partners, stakeholders, working groups, topical or subject area experts all can help the project team determine which hazard impacts should be considered. Below are example hazard impact statements for flooding and earthquakes.

Current and Future Flooding

Flooding

Flooding in riverine and coastal systems can disrupt access to transportation and transit systems, power and other utilities, goods and services, jobs, and emergency response and recovery resources.

Shoreline erosion and overtopping

High water levels can cause changes in tidal and wave energy, leading to increased shoreline erosion and the potential for shoreline protection, such as levees, berms and revetments to be damaged or fail. There is also the potential that as sea levels rise, shoreline protection will be overtopped during storm events when there are extreme tides levels and wind-driven waves, flooding inland areas that are currently protected.

Other potential consequences of inundation, shoreline erosion and overtopping include:

- Damage to shoreline protection structures creating the need for more frequent replacement, repair and/or maintenance
- Disproportionate burdens on community members with certain characteristics (e.g., low income renters and homeowners) caused by repair, retrofits or relocation, and higher insurance, goods, and services costs
- Loss of tidal wetlands that cannot keep up or migrate inland and reduced ecosystem service benefits (water quality, habitat, flood risk reduction)

More frequent, extensive, longer-duration flooding in the future

Higher sea levels especially during storm can lead to more frequent flooding in coastal flood-prone areas, including tidal creeks and flood channels, and flooding of larger areas for longer periods of time. Along with many other potential impacts this may result in the increased mobilization of pollutants if contaminated lands such as closed landfills are subjected to prolonged inundation.

Other potential consequences of flooding include:

- Increased cost to repair and maintain flood protection channels and storm drains that are overwhelmed during flood events
- Overwhelmed wastewater and stormwater treatment systems harming water quality, and environmental and public health
- Changes to sediment transport and deposition that affect the ability of tidal wetlands to keep up with sea level rise
- Lost wages and lower productivity during recovery, and disproportionate burden on individuals, households and neighborhoods with certain characteristics (e.g., income, housing tenure, age, ethnicity).

Elevated groundwater and increased salinity intrusion

As the sea level rises, groundwater levels and salinity intrusion will increase, affecting water supplies along the shoreline, damaging below or at-grade infrastructure, requiring additional pumping and costly maintenance and repairs of stormwater and flood control facilities, and increasing the risk of earthquake-induced liquefaction.

Other potential consequences of elevated groundwater and increased salinity intrusion include:

- Damage to below grade living spaces, finished basements, and below-grade electrical or mechanical equipment
- Mobilization of contaminants at contaminated sites, including those that have already been remediated or closed.
- Saltwater intrusion into fresh water coastal aquifer supplies

Permanent inundation due to sea level rise

Sea level rise will cause areas not currently exposed to the tide to be inundated, resulting in the need to either protect or move people and infrastructure, and the loss of trails, beaches, vistas, and other shoreline recreation areas.

Earthquake Impacts

Ground shaking

Ground shaking occurs in all earthquakes. In large magnitude earthquakes, a larger area of ground shakes, and it shakes harder and longer, than in small magnitude earthquakes. Ground shaking may cause wood-frame buildings to shift off of their foundations if not bolted. Shaking may damage older, non-retrofitted air control and terminal facilities at the airport, and will likely break underground pipes and damage overhead power lines. Ground cracks may appear, causing damage to airport runways, roads, or buried utilities.

Liquefaction

Saturated soils that are loose or sandy will exhibit the characteristics of a liquid when shaken long and hard enough. Liquefaction may result in ground sinking or pulling apart, ground displacement, or ground failure such as lateral spreads and sand boils, or sand “volcanoes.” Liquefaction is a significant threat for underground pipelines, airport runways, and road or highway surfaces, as it causes buckling of these features due to ground shifting. Liquefaction may also cause building damage due to foundation movement or cracking when the underlying soils shift, or when there is a loss of bearing capacity for foundation elements. Liquefaction can cause levee damage and failure, increasing the risk of flooding in low-lying areas.

Earthquake induced landslide

Ground shaking can lead to ground failure on slopes, triggering earthquake-induced landslides. Typically an earthquake-induced landslide occurs when seismic energy at the top of a slope gets concentrated and breaks off shallow portions of rock. Landslides tend to occur in weak soil and rock on sloping terrain. In the Loma Prieta earthquake, earthquake-induced landslides disrupted traffic for a month along Highway 17 in the Santa Cruz Mountains.

Fire Following Earthquake

Earthquakes are often responsible for igniting fires that can contribute to a considerable share of overall damage. Fires can start from a variety of sources: appliances with natural gas pilot lights may tip, damaged electrical equipment may spark, and gas line connections may break. Where building damage or collapse “seed” fires can impact undamaged neighboring structures. Areas of liquefaction are more vulnerable to fire because of the greater potential for underground gas mains to break due to the ground displacements, and because the

water lines in the area may also be damaged – preventing the ability to fight a fire with regular water resources. Areas that are largely wood frame or shingle roof may be less prone to earthquake damage, but are a heightened risk for the spread of fires. There is added concern in areas with hazardous materials with the potential for explosion, or with the potential to produce toxic smoke. Industrial facilities and labs are a high concern because of the hazardous and flammable materials they store at their facilities.

Tsunamis & Seiches

Large underwater displacements from major underwater earthquake fault ruptures or landslides can lead to ocean waves called “tsunamis.” Since tsunamis have high velocities, the damage from a particular level of inundation is far greater than in a normal flood event. Similarly, water sloshing in lakes during an earthquake, called “seiche,” is also capable of producing damage. Tsunami waves generated at far-off sites can travel across the ocean and can reach the California coast with several hours of warning time, while local tsunamis generated from offshore strike-slip faults would reach the coast with little warning time.

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Step 3: Determine your Assessment Methods

Key points of this step:

- Select the assets you will analyze and consider if they will be assessed as a group or individually
- Determine your approach to understanding exposure, vulnerability and consequences

Hazards become meaningful only when they interact with assets within your community, including people, structures, facilities, and services. In this step you will get prepared to conduct the assessment by identifying the community assets to include and determining the assessment method you will use for your risk assessment, which helps you decide what information you need to determine the ability of the asset to withstand the hazards as well as the consequences to the community if the asset is damaged in a disaster.

Select your assets

In deciding which assets to include in your assessment, you will need to determine if you will be assessing individual assets, representative assets for an asset class, or the asset class as a whole. For example, a community can choose to evaluate transportation infrastructure as an asset class or can assess individual transportation assets, such as bus yards, train stations, bridges, etc. You can begin by first identifying which asset classes are applicable and important to your assessment, and then decide if you need to do a deeper analysis for each asset class. In general, we group assets into the following classes:

- People
- Buildings
- Critical Response Facilities
- Community Services
- Utilities Infrastructure
- Transportation Infrastructure
- Communication Infrastructure
- Recreation, Open Space, and Working Lands
- Hazardous Materials Sites and Contaminated Lands

More detail about each asset class, including the specific assets included and where to find information on them, is included in the **Identifying Community Assets Worksheet**.

The type of assets to be included in your assessment should be broad enough to ensure that the consequences of hazards on people where they live, work, access key services and conduct other day-to-day activities will be fully considered. Focusing on a single asset class can provide a deep understanding of vulnerability and can lead to implementation of specific actions, but may overlook vulnerabilities due to physical or organizational relationships among assets or agencies. For example, publicly-owned buildings and critical response facilities rely on a variety of other assets to maintain function such as power, road access, and wastewater services. Starting with a broader assessment and focusing in on individual assets as necessary based on your community goals, hazards identified and the potential consequences of the hazards is a good balance between broad and detailed approaches.

Risk assessments that include multiple asset classes can reveal how seemingly dissimilar assets, such as nursing homes, single access roadways, trails used by those with limited mobility, and tidal marshes that support threatened or endangered species, have similar vulnerabilities due to their unique function. Multi-class

assessments can also identify complexities in regulatory and other decision-making processes that cut across asset categories; for example, actions to address the vulnerability of a roadway that crosses a tidal creek can have similar regulatory challenges as improving the utility or rail crossings.

Once you have identified critical asset classes for your assessment, you should determine if the class contains assets that should be evaluated individually. Some assets should be evaluated individually while others can be evaluated as a class. Scaling down to individual assets can help identify specific vulnerabilities that are often caused by particular physical and functional characteristics. An assessment of individual assets can identify specific components, critical functions, or management challenges that will increase vulnerability.

Individual assessments should be conducted for unique, critically important or high consequences assets. Individual assessments do require a greater level of effort and more detailed information than may be available. Asset class assessments should be conducted when there are many similar assets and can be supplemented by evaluating representative assets (see sidebar) that will provide similar benefits as assessing individual assets. The **Risk Assessment Scoping Worksheet** (attached) provides guidance for selecting asset categories and for determining if they are best assessed individually or as a group.

Determine your approach

Before you conduct your risk assessment you need to decide how much information you are going to collect, both on your hazards and on individual assets, representative assets, and asset classes to be included in your assessment. The depth and scope of a risk assessment can vary significantly, and will depend on your community goals, the availability of data and information, resources to conduct the assessment, and individual interests of the jurisdiction and its residents. The simplest assessment includes an exposure analysis, which simply maps hazards on top of locations of key assets, to identify the assets likely to experience a hazard. This approach is most appropriate if there are a large number of assets, for example single-family residences, or for privately-owned facilities with limited available information (e.g., power substations).

Risk assessments can be expanded or focused based on three different elements:

1. The number of asset classes you include in your assessment, and the number of representative assets or individual assets you assess within each class. At a minimum, you should assess your emergency response facilities and strongly consider assessing your public buildings. A more comprehensive assessment may include residential units, infrastructure systems, and/or recreational spaces.

Representative vs. Individual Asset Assessments

Representative Assets

Answering the assessment questions for representative assets works well for asset categories that have numerous, similar assets. For example, contaminated sites may be very similar in their vulnerability to specific hazards, therefore rather than assessing each site individually, answering the questions for a few examples that represent a cross-section of the types of contaminated sites can reveal the range of vulnerabilities and consequences that are likely.

Individual assets

Unique assets for which the findings from the assessment questions are unlikely to be similar between assets need to be assessed individually. Examples of these types of assets include wastewater treatment plants. Additionally, if there are only a small number of assets in the asset class the assessment questions can be answered for each.

2. Whether your assessment will evaluate assets as a class, as representative assets, or as individual assets. The most comprehensive approach would be to evaluate all assets individually, but this will likely require more resources than are available. This process can be simplified by choosing a representative asset to assess that may be similar to many others, house important services, or serve a large number of residents. If assessing a representative asset is not possible, asset classes can be assessed with far fewer resources, but can still provide information useful for your community.
3. The amount of information you collect on each asset. At a minimum, you need the location and use for each asset that you include in your assessment, but more information can make your assessment much more meaningful. Including more information about how the asset is vulnerable to a hazard, or what the consequences are if it is damaged can transform the assessment into something that tells a story and sets up actions.

Because it is important to understand what will happen to assets and the people and services that rely on them if they are exposed to a hazard it is important to go beyond the exposure analysis. Assessment questions can help simplify and facilitate the collection of information, either qualitative or quantitative, about asset conditions and characteristics that can either increase or reduce vulnerability and consequences.

The Adapting to Rising Tides (ART) Program has developed a robust list of assessment questions that provide a framework for collecting the data and information that lead directly to the identification of vulnerabilities and consequences. The ART assessment questions, which have been applied and refined based on a number of on-the-ground assessments, can be used for a wide variety of sectors at the individual, representative or asset class scale. Answers to the questions help build an understanding of the underlying causes and components of vulnerability and the potential consequences of those vulnerabilities on society and equity, environment and economy.

A reduced list of assessment questions based on the full list of ART assessment questions is attached. These represent the short-list of questions that if answered, will provide a fairly detailed understanding of vulnerability and consequences. The full set of questions is available here: http://resilience.abag.ca.gov/wp-content/documents/mitigation_adaptation/ART%20Assessment%20Questions%20Supplement%20V1.xlsx.

With an understanding of your hazards and the assets you would like to assess, you can map out your approach to your risk assessment using the **Risk Assessment Scoping Worksheet** before you begin to work through your assessment.

Outputs:

- Asset classes and specific assets to be assessed
- Assessment methodology and approach

Resources:

- Identifying Community Assets Worksheet (attached)
- Risk Assessment Scoping Worksheet (attached)
- ART Scope and Scale Issue Paper
http://resilience.abag.ca.gov/wp-content/documents/mitigation_adaptation/Scope&Scale_IssuePaper20140708.pdf

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Community Asset Identification Worksheet

Having a general sense of the types of assets you have in your community can help to guide your risk assessment and allow you to focus your resources in areas with the most impact. Gathering information on your assets now can also help you identify where data gaps exist.

Asset Class: People	Data Sources
<input type="checkbox"/> Total population – current and future	<input type="checkbox"/> U.S. Census <input type="checkbox"/> American Community Survey <input type="checkbox"/> Plan Bay Area <input type="checkbox"/> Priority Development Areas <input type="checkbox"/> Regional Housing Needs Assessment <input type="checkbox"/> ABAG Projections Series 2013 <input type="checkbox"/> County Quick Facts <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Zoning Code
Population with access or functional needs, including: <ul style="list-style-type: none"> <input type="checkbox"/> Age dependent, children and seniors <input type="checkbox"/> Medically or mobility dependent <input type="checkbox"/> Language constraints <input type="checkbox"/> Low income <input type="checkbox"/> Lack of education <input type="checkbox"/> Culture or ethnicity <input type="checkbox"/> Cost burdened (housing and/or transportation) <input type="checkbox"/> Transit dependent (no car) <input type="checkbox"/> Housing tenure (renters) 	<input type="checkbox"/> U.S. Census <input type="checkbox"/> American Community Survey <input type="checkbox"/> County Health Department Status Reports <input type="checkbox"/> Bay Area Regional Health Inequities Initiative <input type="checkbox"/> East Bay Indicators-East Bay Economic Development Alliance <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local studies <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Hazard Mitigation Plan <input type="checkbox"/> Non-Profit and Community Based Organizations

Asset Class: Building Stock	Data Sources
<input type="checkbox"/> Publically-owned buildings	<input type="checkbox"/> County Tax Assessor Parcel Data
Privately-owned buildings: <ul style="list-style-type: none"> <input type="checkbox"/> Residential buildings, e.g., single and multi-family, mobile homes, senior and dependent housing <input type="checkbox"/> Nonresidential buildings, e.g., industrial, commercial or institutional structures 	<input type="checkbox"/> U.S. Census <input type="checkbox"/> American Community Survey <input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Zoning Code <input type="checkbox"/> Google

<input type="checkbox"/> Future buildings, growth areas and infrastructure	<input type="checkbox"/> Plan Bay Area <input type="checkbox"/> Regional Housing Needs Assessment <input type="checkbox"/> Capitol Plans <input type="checkbox"/> City and County Budgets <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Local Housing Element <input type="checkbox"/> Local Zoning Code <input type="checkbox"/> Local Growth Boundaries or growth phasing ordinances
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Asset Class: Critical Response Facilities	Data Source:
<input type="checkbox"/> Public health infrastructure, e.g., hospitals and medical facilities	<input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> Local Safety Element <input type="checkbox"/> Local Emergency Operations Plans <input type="checkbox"/> Local Area Formation Commission Municipal Service Reviews
<input type="checkbox"/> Police stations	<input type="checkbox"/> County Tax Assessor Parcel Data
<input type="checkbox"/> Fire stations	<input type="checkbox"/> County Tax Assessor Parcel Data
<input type="checkbox"/> Public schools	<input type="checkbox"/> County Tax Assessor Parcel Data

Asset Class: Community Services	Data Sources
<input type="checkbox"/> Community facilities, e.g., day cares, food banks, senior centers, grocery stores	<input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> City licensing and regulating authorities <input type="checkbox"/> Local General and Specific Plans <input type="checkbox"/> Local Zoning <input type="checkbox"/> Google
<input type="checkbox"/> Places of worship	<input type="checkbox"/> County Tax Assessor Parcel Data (Same as above)
<input type="checkbox"/> Education and research institutions, e.g., schools, colleges, universities	<input type="checkbox"/> County Tax Assessor Parcel Data (Same as above)
<input type="checkbox"/> Waste transfer stations	<input type="checkbox"/> CalRecycle <input type="checkbox"/> County Environmental Health Departments
<input type="checkbox"/> Household hazardous waste collection sites	<input type="checkbox"/> CalRecycle <input type="checkbox"/> County Environmental Health Departments

Asset Class: Utilities Infrastructure	Data Sources
<input type="checkbox"/> Water systems, including reservoirs and dams	<input type="checkbox"/> Urban Water Management Plans <input type="checkbox"/> Bay Area Integrated Regional Management Plan
<input type="checkbox"/> Wastewater, e.g., industrial and sanitary sewer systems)	<input type="checkbox"/> Urban Water Management Plans <input type="checkbox"/> Bay Area Integrated Regional Management Plan

<input type="checkbox"/> Flood control infrastructure	<input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> City/county public works or flood control district <input type="checkbox"/> Local General Plan or Specific Plans <input type="checkbox"/> Google
<input type="checkbox"/> Stormwater (storm drain) system	<input type="checkbox"/> City/county public works <input type="checkbox"/> Special studies within cities and counties <input type="checkbox"/> Local Agency Formation Commission
<input type="checkbox"/> Power utilities, e.g., electricity generation, distribution, transmission systems	<input type="checkbox"/> California Energy Commission <input type="checkbox"/> California Public Utilities Commission <input type="checkbox"/> PG&E
<input type="checkbox"/> Pipelines, e.g., fuel and natural gas	<input type="checkbox"/> National Pipeline Mapping System <input type="checkbox"/> California Energy Commission <input type="checkbox"/> Kinder Morgan
<input type="checkbox"/> Oil refineries	<input type="checkbox"/> EPA <input type="checkbox"/> Air Resources Board <input type="checkbox"/> State Employment Statistics <input type="checkbox"/> County and City General Plans

Asset Class: Transportation Infrastructure	Data Sources
<input type="checkbox"/> Local streets and roads	<input type="checkbox"/> Metropolitan Transportation Commission 2011TeleAtlas
<input type="checkbox"/> Federal and state highways	<input type="checkbox"/> Metropolitan Transportation Commission 2011TeleAtlas <input type="checkbox"/> CA Department of Transportation
<input type="checkbox"/> Bridges, tubes and tunnels	<input type="checkbox"/> Metropolitan Transportation Commission 2011TeleAtlas <input type="checkbox"/> CA Department of Transportation <input type="checkbox"/> Bay Area Toll Authority
<input type="checkbox"/> Railroads, passenger and freight lines	<input type="checkbox"/> Metropolitan Transportation Commission 2011TeleAtlas <input type="checkbox"/> Capitol Corridor JPA <input type="checkbox"/> Altamont Corridor Express <input type="checkbox"/> Caltrain
<input type="checkbox"/> Transit services (bus, BART, light rail)	<input type="checkbox"/> Metropolitan Transportation Commission 2011TeleAtlas <input type="checkbox"/> Bay Area Rapid Transit
<input type="checkbox"/> Ferry service	<input type="checkbox"/> Golden Gate Bridge Highway and Transportation District <input type="checkbox"/> Water Emergency Transportation Authority
<input type="checkbox"/> Bike/pedestrian routes	<input type="checkbox"/> Local General Plan <input type="checkbox"/> San Francisco Bay Trail
<input type="checkbox"/> Airport	<input type="checkbox"/> Federal Aviation Administration <input type="checkbox"/> Regional Airport Planning Committee

<input type="checkbox"/> Seaports and Marine terminals	
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Asset Class: Communication Infrastructure	Data Sources
<input type="checkbox"/> Land line telephone systems	<input type="checkbox"/> Communication service providers
<input type="checkbox"/> Cable systems	<input type="checkbox"/> Communication service providers
<input type="checkbox"/> Cellular telephone antennae	<input type="checkbox"/> Communication service providers
<input type="checkbox"/> Underground communication conduits	<input type="checkbox"/> Communication service providers

Asset Class: Recreation, Open Space and Working Lands	Data Sources
<input type="checkbox"/> Park and recreation facilities	<input type="checkbox"/> California Protected Areas Database
<input type="checkbox"/> Designated open space	<input type="checkbox"/> California Protected Areas Database <input type="checkbox"/> Conservation Lands Network Explorer Tool
<input type="checkbox"/> Bike/pedestrian trails	<input type="checkbox"/> San Francisco Bay Trail
<input type="checkbox"/> Natural areas	<input type="checkbox"/> San Francisco Estuary Institute (SFEI) EcoAtlas
<input type="checkbox"/> Agricultural and working lands	<input type="checkbox"/> National Land Cover Database <input type="checkbox"/> County Tax Assessor Parcel Data <input type="checkbox"/> Local General Plan

Asset Class: Hazardous Materials Sites and Contaminated Lands	Data Sources
<input type="checkbox"/> Hazardous Materials Sites, e.g., RCRA regulated sites, CUPA sites	<input type="checkbox"/> US EPA Envirofacts
<input type="checkbox"/> Landfills (open and closed)	<input type="checkbox"/> US EPA Envirofacts <input type="checkbox"/> State Water Resources Control Board Geotracker
<input type="checkbox"/> Clean up sites, e.g., US EPA or DTSC regulated brownfield, cleanup sites, or landfills	<input type="checkbox"/> US EPA Envirofacts <input type="checkbox"/> State Water Resources Control Board Geotracker

Risk Assessment Scoping Handout

Use this scoping handout to help you plan the assessment your community will undertake. To help decide which assets to evaluate and if they will be assessed as individual assets, as an entire asset class, or if representative assets will be selected, consider both your community's goals and if data and information is readily available to begin answering the assessment questions.

Assets	Exposure Analysis Individual Asset	Assessment Questions			Would assessing this asset help you achieve your community's goals?	What information sources are available to help conduct the assessment?
		Individual Asset	Asset Class	Representative Assets		
Publicly-owned buildings	X					
Critical response facilities	X					
Police						
Fire						
Public schools						
Public health facilities						
Residential buildings						
Non-residential buildings						
People						
Total population						
Population with access or functional needs						
Community services						

	Exposure Analysis	Assessment Questions			Would assessing this asset help your community's goals?	What information sources are available to help conduct the assessment?
		Individual Asset	Asset Class	Representative Assets		
Assets	Individual Asset					
Utility infrastructure						
Power						
Water supply						
Wastewater						
Stormwater/Flood control						
Transportation						
Roads						
Rail						
Seaport						
Airport						
Bike/pedestrian routes						
Communication						
Recreation, open space and working lands						
Hazardous materials sites and contaminated lands						

Step 4: Conduct the Assessment

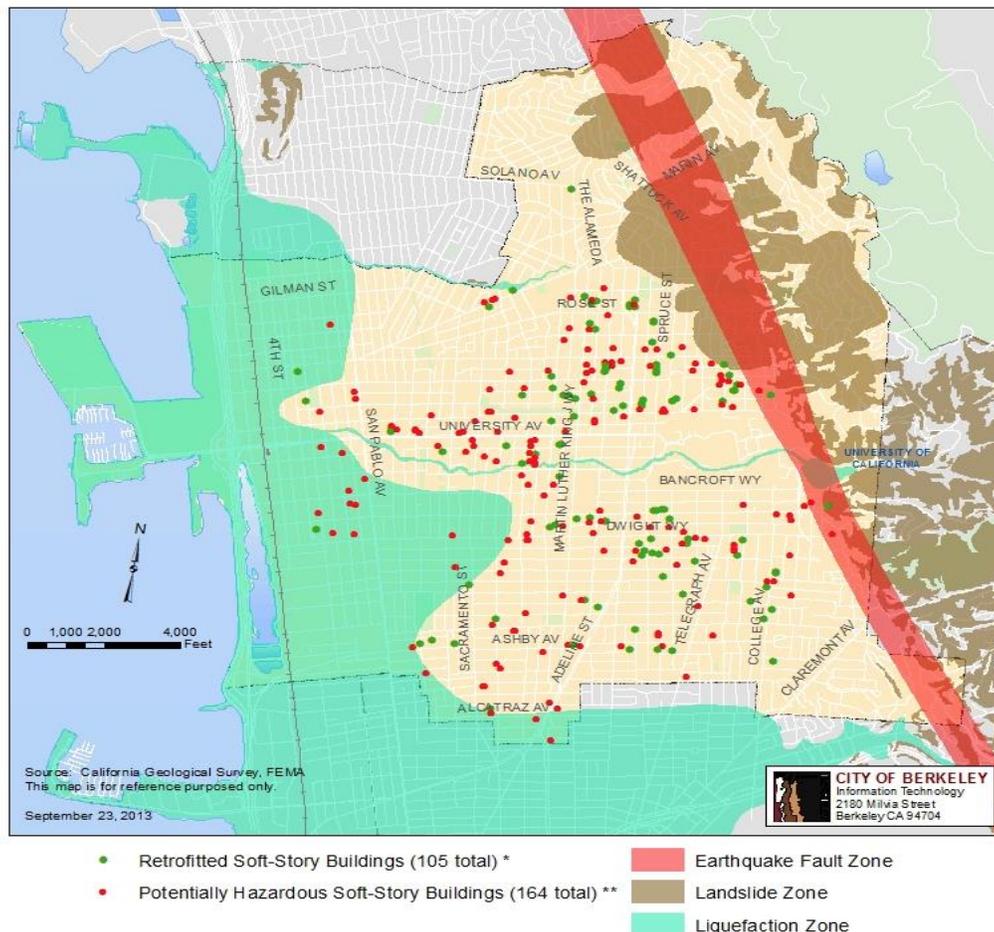
Key points of this step:

- Conduct an exposure analysis using your chosen hazards and assets
- Gather information on your assets to answer the assessment questions
- Understand what data you need if you want to conduct further refined evaluations using tools such as FEMA's HAZUS-MH model

Exposure analysis

An exposure analysis helps identify which assets will be exposed to a specific hazard and provides a basic understanding of the magnitude of possible damage or loss after a disaster. An exposure analysis can determine how many housing units are likely to be exposed to the highest ground shaking during an earthquake and provide a high-level estimate of the economic impacts and number of residents who could be displaced. While an exposure analysis is necessary for your risk assessment it does not capture the nuances of how hazards may affect certain assets; for example, if homes have been retrofitted, or are of newer construction types, they may be able to withstand more ground shaking than older, unretrofitted homes.

Example exposure map from City of Berkeley Hazard Mitigation Plan (Map 3.8 Retrofitted and Unretrofitted Soft-Story Buildings)



To conduct an exposure analysis you will need to combine the location and extent of the hazards with the location of your community assets. This is generally done through GIS mapping using pre-identified hazard scenario map layers and mapped community asset locations. An exposure analysis is a stepwise process (for more detail see **ART How-to Guide: Exposure Analysis**):

1. Add your relevant hazard layers into a new or existing map in ArcGIS. It's helpful to load all of the layers into a single map so that you can turn them on and off as needed. Many hazards are well-mapped, such as earthquake shaking scenarios, current flood zones, and fire zones. For future hazards, some, such as inundation from higher high tides due to sea level rise, may have ready-to-use mapping tools available to evaluate asset exposure. For hazards that are not as well-studied or understood (e.g., salinity intrusion due to sea level rise or precipitation patterns) reliable information may not be readily available.
2. Gather and map the locations of the community assets included in your assessment. Publically-available data sources for a range of asset categories are provided in the **Identifying Community Assets Worksheet**. To do this step, you will need to have the location of the assets (latitude and longitude) or a previously made map layer that contains your assets.
3. Compare your assets to the hazard layers. Note which assets are in which hazard zones, the magnitude of the hazard they are exposed to (for example, light, moderate, strong, very strong, violent, or very violent ground shaking) or the probability of the hazard (1% flood hazard zone vs. 0.2% flood hazard zone), and assets that are exposed to multiple hazards.
4. Create maps showing the extent of hazards and the location of assets that intersect with those hazards. It is also a good idea to develop summary tables for large asset classes to communicate the different types and levels of hazards exposure.
5. Ask those with local knowledge and experience to review the maps and analysis to help pinpoint locations that do not adequately characterize local conditions and where additional studies, field verification, remapping or reanalysis is needed

FEMA's HAZUS-MH

One assessment tool that can help inform the economic consequences of natural hazards is FEMA's HAZUS-MH software. HAZUS requires user input on structure type and value in order to calculate damages. HAZUS outputs can be used to identify areas where large investments will likely be lost and is used after a disaster to provide damage estimates to FEMA. HAZUS requires detailed and accurate data about individual structure type and value to be useful; therefore it is important to consider when, at what scale, and for which assets Hazus will be informative to your community. The type of data needed to run HAZUS includes:

- Building Type
- Replacement cost
- Content cost (if available)
- Occupancy class
- Year built
- Location
- Number of stories
- First floor elevation
- Foundation type
- Design level

You can download HAZUS software here:
<https://www.fema.gov/hazus-software>

Answering Assessment Questions

Assessment questions help you describe the existing conditions, different types of vulnerabilities, and consequences that may occur if an asset, or an asset class, is exposed to a specific hazard.

The process of answering the assessment questions is best approached in a stepwise manner (for more detail see ART How-to Guide: Assessment Questions):

1. Get familiar with the assessment questions and the types of vulnerability and consequence findings that these questions have revealed (see **Assessment Questions Worksheet**).
2. Develop an approach for answering the questions before diving in. Remember that the assessment questions are a tool to guide the collection of targeted information that can then be summarized in different ways. For each asset class identify whether the assessment questions will be answered for individual assets, the class as a whole, or representative assets. Recognize that it may be necessary to modify the approach for certain assets depending on input from the project team, availability of information, and preliminary findings as the assessment progresses.
3. Gather answers to assessment questions by conducting research to uncover readily available reports, documents, inspection and monitoring reports, and maps. Make a diligent effort to gather as much information as possible before seeking input from asset managers, owners or topic experts, as it is far easier and more efficient for them to help refine answers or provide specific resources to fill information gaps than to answer the entire worksheet. Keep in mind answers are typically a few sentences to a paragraph long. It is okay if the answer uncovers further, specific challenges that need to be further investigated.
4. Ground truth preliminary assessment answers with asset managers, owners, and topic experts. It can be beneficial to provide the preliminary assessment answers and sources of information to the asset manager, owner or topic expert before asking for their input. However, be sure to give them enough background on the assessment objectives if they are not already familiar with the risk assessment. Since input on the preliminary assessment answers is partially based on best professional judgment, it is often helpful to ask for assistance in engaging colleagues, co-workers, others in the field, community members and non-profit organizations to gather needed information. Lastly, be sure to ask if there are any additional data or resources available that can help fill in information gaps. If there are none then make sure to note this data need or knowledge gap as an information challenge.

Outputs:

- Exposure analysis demonstrating which assets are exposed to which hazards
- Answers to assessment questions

Resources:

- Assessment Questions Worksheet (attached)
- ART How-to Guide: Exposure Analysis
http://resilience.abag.ca.gov/wp-content/documents/mitigation_adaptation/ART_H2G-ExposureAnalysis_Vf5.pdf
- ART How-to Guide: Assessment Questions
http://resilience.abag.ca.gov/wp-content/documents/mitigation_adaptation/ART%20H2G-Assessment%20Questions%20Guide%20Vf5.pdf

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Risk Assessment Questions

Assessment questions help you understand the underlying causes and components of vulnerability and the potential consequences of those vulnerabilities. You can answer assessment questions in a very detailed way for individual assets that either a visual map inspection or a geospatial analysis has identified as being exposed to a hazard. Assessment questions can also be answered in a more general way for an entire asset class (e.g., residential housing) although this type of assessment is best supplemented by evaluating one or more representative assets.

Many of the assessment questions are broad and apply to all types of assets, while some are specific to a particular hazard or type of asset, so you will not need to answer all of the questions for all assets. In addition, some questions can easily be answered with readily available information, while others will require research or external input. It can be difficult to know how much effort to expend when answering assessment questions. Instead of spending a lot of effort to uncover hard-to-find, or in some cases nonexistent information, flag critical data needs and knowledge gaps that require further consideration and come back to these when developing your mitigation and adaptation actions.

Existing Conditions

Describe the asset and highlight current conditions or stressors that could affect vulnerability

1. Who owns and manages the asset? Note if the owner and manager are different entities.
2. What year was the asset built? What is the remaining service life?
3. Has there been an effort to extend the service life (e.g. improvements, seismic retrofit, mitigation actions)? If so, describe what was done and when.

Physical Vulnerabilities

Identify conditions or design aspects that make an asset particularly vulnerable to impacts

4. Does the asset have characteristics that make it vulnerable to flooding?
4a. Are there water or salt sensitive components of the asset are at-grade or below-grade, e.g., mechanical or electrical equipment, pumps, utilities, building heat, ventilation, power systems, or finished basements?

4b. Does the asset have openings are at-grade or below-grade that are entry points for flooding, e.g., entryways, tubes, tunnels, ventilation grates?
4c. Are their barriers (temporary or permanent) that can protect sensitive components or at- or below-grade entry points? Are there pumps or other systems in place to remove floodwaters if they do enter?
For building assets:
5. Does the asset have characteristics that make it vulnerable to earthquakes?
5a. Is the facility or building a mobile or manufactured structure? If yes, describe the foundation type.
5b. Is the facility or building constructed from unreinforced masonry? If yes, describe how and if seismic hazards have been assessed and/or mitigated.
5c. Is the facility or building multi-story, constructed from concrete and was built between 1950 and 1971? If yes, describe if and how seismic hazards have been assessed and/or mitigated.
5d. For residential buildings (either single family or multifamily), is it cripple wall construction (typically with short unreinforced walls that raise the first floor 1-5 feet above ground level)? If yes, describe how and if seismic hazards have been mitigated (i.e. the home has been bolted to the foundation and/or the cripple wall has been strengthened).
5e. For 1-2 unit residences, is the building house over garage construction? For multifamily residential, are there garages or other large openings on the first floor (soft-story construction)? If yes to either, describe how and if seismic hazards have been assessed and/or mitigated.
6. Have you taken any mitigation measures against wildfire? (e.g, does your city have an inspection system for fire mitigation actions?)



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Functional Vulnerabilities

Describe asset function and/or relationships with or dependence on other assets that can make them vulnerable to impacts

<p>7. Is the asset part of a networked system such that damage to other parts of the system would affect the asset’s ability to function? Describe what alternatives exist that could help maintain continuity of service if parts of the system are disrupted.</p>

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<p>8. What external services, such as power, communications, food or fuel supplies or materials does the asset rely on? If these external services were interrupted, are there back up supplies ready and in place, and how long would they last?</p>

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For building assets:

<p>9. Does the asset serve sensitive populations?</p>

<p>9a. Does the asset serve or house the elderly or very young, mobility or medically challenged individuals, or animals? If yes, describe what systems or plans are in place to enable either shelter-in-place or safe evacuation and relocation of the facility if necessary.</p>

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<p>9b. Does the asset serve or house community members that are resource limited, e.g., are they low or very low income, housing or transportation cost burdened, renters, or without a car? If yes, what programs or plans in place to help these members prepare for, respond to, or recover from a hazard event?</p>

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<p>9c. Does the asset serve or house community members that are ethnically or culturally diverse, have limited English-speaking capacity, or are non-English speakers? If yes, what programs or plans in place to help these members prepare for, respond to, or recover from a hazard event?</p>

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For transportation assets:

<p>10. Does the asset serves as a critical access road, emergency or lifeline route, provide sole or limited access to communities or facilities, or provide service to transit dependent communities? If yes, describe the communities, services, and facilities the asset serves.</p>

For recreation, open space, and working lands:
11. Does the asset provide recreational access or opportunities that are unique or limited in the area and/or region, e.g., access for persons with limited mobility, interpretive programs, access to the Bay, etc.? Could these functions be easily replaced in other areas?
12. Does the asset provide or protect habitat for threatened or endangered species? Is this habitat scarce in the region? Could this habitat be established in other areas?
For utility and communication infrastructure assets:
13. Does the asset provide critical services to sensitive populations (see question 12), emergency response providers, or critical facilities?

Governance Vulnerabilities

Describe challenges with management, regulatory authority, or funding options for adapting to impacts

14. Is the asset protected from flooding by land or assets owned or managed by others (e.g., structural protection, roadways, rail embankments)?
15. What types of permits (and from which agencies) are necessary to maintain, repair or improve the asset? Are there special processes for emergency repairs?
16. What funding sources currently exist that can be used to assess hazard risk or vulnerability to climate change? To improve asset resilience?

Consequences

Describe potential impacts on society, equity, the economy, and the environment

17. What economic disruption would occur if the asset was damaged, disrupted, or failed? Local, regional, state, or national? If your answer is based on a past weather event or an unplanned disruption, describe the type and duration of that disruption.
18. How would the community, particularly sensitive populations (see question 12), be affected by damage, disruption, or loss of asset function?
19. What would consequences to ecological services be if the asset was damaged or lost (e.g. habitat or species benefits, public access to the shoreline, or water quality)? What would the effect of this loss have on locally? Regionally?

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Rapid Risk Assessment Exercise

Step 1.

Resilience Goal:

Asset (pick one): <input type="checkbox"/> City Hall <input type="checkbox"/> Wastewater Treatment Plant <input type="checkbox"/> Senior Housing Complex <input type="checkbox"/> Hospital <input type="checkbox"/> Power Substation <input type="checkbox"/> Other:	Hazard (one or both) <input type="checkbox"/> Earthquake <input type="checkbox"/> Flooding	Hazard impact statement (see example hazard impacts):
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Step 2.

Assessment Questions (see Risk Assessment Questions Handout)

Existing Conditions <i>Describe the asset and highlight current conditions or stressors that could affect vulnerability</i>		
Asset functions (e.g., type of land use, community served, services provided):	Land Use <input type="checkbox"/> Residential <input type="checkbox"/> Institutional <input type="checkbox"/> Industrial <input type="checkbox"/> Commercial <input type="checkbox"/> Other:	Community Served: <input type="checkbox"/> Elderly <input type="checkbox"/> Youth <input type="checkbox"/> Low income <input type="checkbox"/> Mobility challenged <input type="checkbox"/> Other:
Who owns the asset? Are owner and manager different?	Owner: <input type="checkbox"/> Public <input type="checkbox"/> Private	Manager: <input type="checkbox"/> Public <input type="checkbox"/> Private <input type="checkbox"/> Different than owner? If so, explain:
Has the asset been retrofit for earthquakes or flooding?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, explain when and to what standard:	

Physical Vulnerabilities <i>Identify conditions or design aspects that make an asset particularly vulnerable to impacts</i>	
What characteristics make the asset more or less vulnerable to flooding?	<input type="checkbox"/> Water or salt sensitive mechanical or electronic components <input type="checkbox"/> Openings at-grade or below-grade <input type="checkbox"/> Temporary or permanent barriers <input type="checkbox"/> Pumps or water removal systems <input type="checkbox"/> Other:

What characteristics make the asset more or less vulnerable to earthquakes?	<input type="checkbox"/> Mobile or manufactured structure <input type="checkbox"/> Unreinforced masonry construction <input type="checkbox"/> Multi-story, concrete, constructed between 1950 and 1971 <input type="checkbox"/> Soft story or house over garage construction <input type="checkbox"/> Other:
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Functional Vulnerabilities <i>Describe asset function and/or relationships with or dependence on other assets that can make them vulnerable to impacts</i>		
Is the asset part of a networked system such that damage to other parts of the system would affect the asset's ability to function?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, are there alternatives to help maintain continuity of service?	
What external services does the asset rely on?	<input type="checkbox"/> Power <input type="checkbox"/> Communications <input type="checkbox"/> Food	<input type="checkbox"/> Fuel <input type="checkbox"/> Materials/supplies <input type="checkbox"/> Other:
If external services were interrupted, are there back up supplies in place?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, how long would they last (circle one): Hours Days Weeks	

Governance Vulnerabilities <i>Describe challenges with management, regulatory authority, or funding options for adapting to impacts</i>		
Is the asset protected from flooding by land or assets owned by others?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe:	
What types of permits and from what agencies are necessary to maintain, repair or improve the asset?	<input type="checkbox"/> One agency <input type="checkbox"/> Multiple agencies (circle): Local State Regional Federal	
Are there funding sources that can be used to assess hazard risk, climate vulnerability or resilience?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe:	

Consequences <i>Describe potential impacts on society, equity, the economy, and the environment</i>		
What scale of economic disruption would occur if the asset was damaged, disrupted, or failed?	<input type="checkbox"/> Local <input type="checkbox"/> Regional <input type="checkbox"/> State <input type="checkbox"/> National	Is this based on a past event or an unplanned disruption? If yes, describe:
Who in the community would be affected by damage, disruption, or loss of asset function?	<input type="checkbox"/> People where they live <input type="checkbox"/> People where they work <input type="checkbox"/> People where they recreate	<input type="checkbox"/> Elderly <input type="checkbox"/> Youth <input type="checkbox"/> Low Income <input type="checkbox"/> Other:
What would the consequences be to ecological services be if the asset was damaged or lost?	<input type="checkbox"/> Habitat or species benefits <input type="checkbox"/> Public access <input type="checkbox"/> Flood risk management	<input type="checkbox"/> Water quality <input type="checkbox"/> Other:

Assessment Questions

This guide helps with...

Using the ART Assessment Questions to collect data and information that will inform your characterization of vulnerability and consequences for the assets, systems of assets, sectors and services addressed in the project.

Definitions: Assessment Questions

The ART assessment questions provide a framework for collecting the data and information that lead directly to the identification of vulnerabilities, consequences, and key planning issues. These assessment questions, which have been tested and refined in a number of previous assessments, can be applied to a variety of asset categories, sectors and services, and to a number of different asset scales, with little customization. Answers to the questions help build an understanding of the underlying causes and components of vulnerability and the potential consequences of those vulnerabilities on society and equity, environment and economy.

Don't wait for exposure!

It is not necessary to analyze the exposure of the project area or assets to the selected climate impacts before answering the assessment questions. Most questions will not require knowing when or how assets will be exposed. If understanding exposure becomes critical to initiating the assessment, there are, for most locations, adequate planning-level maps available to inform the extent and timing of climate impacts.

Steps to using the ART assessment questions:

1. Get familiar with the assessment questions and the types of vulnerability and consequence findings that these questions have revealed in the ART program
2. Develop an approach for answering the questions
3. Gather answers to assessment questions
4. Ground-truth answers with asset managers, owners, and topic experts

1. Get familiar with assessment questions and example findings

Types of Assessment Questions

The ART assessment questions are grouped according to those that describe existing conditions, different types of vulnerabilities often observed, and consequences. This organization – referred to as the ART classifications – simplifies translating the information into vulnerability and consequence statements later on. The types of ART questions are listed below with a few examples for each. Note that the term “asset” refers collectively to an asset, a system of assets, a sector or a service. The assessment questions can be found in Appendix A, Tables 1 and 2, and are available to download as a spreadsheet ([ART Assessment Questions Supplement.xls](#)) with a separate worksheet for each asset type (e.g., transportation, wastewater, etc.).

Existing Conditions: Describes the asset and highlights current conditions or stressors that could affect its vulnerability.

- Where is the asset located?
- What is its function?
- Who owns and manages it?

Information: Determines if data or information is lacking, incomplete, poorly coordinated, or difficult to access.

- What types of information sources for the asset(s) are publicly available?
- What is the quality of available information?
- What types of mechanisms exist to share information between owners of connected infrastructure?

Functional: Considers the function of the assets and their relationship to or dependence on other assets.

- What services does the asset rely on?
- Is it physically connected to other assets such that failure in one part of the system disrupts the entire system?
- Does the asset provide functions or services that are limited?

Physical: Identifies conditions or design aspects that make an asset particularly vulnerable to impacts.

- Is the asset co-located with other assets?
- Are water- or salt-sensitive components of the asset located at- or below-grade?

Governance: Identifies challenges with management, regulatory authority or funding options for adapting to impacts.

- What plans, procedures, etc are in place to manage the assets?
- What types of permits are needed to make changes?
- What funding sources exist that can be used for adaptation?

Consequences: Informs how climate change may impact society and equity, the economy and environment.

- Does the asset serve vulnerable communities or critical facilities?
- Are hazardous materials at the asset site that could pose a risk to the environment?
- What is the scale of economic costs if the asset experiences disruptions or damage?

Example Findings

In addition to reviewing the questions themselves, review examples of summarized vulnerability and consequence findings from the ART Program. These findings were developed using the assessment questions, and reviewing them will enable your project staff, working group members and others who are

providing assessment information to understand the types of vulnerabilities and consequences that are likely to be revealed by the assessment questions. Three suggested sources of examples are available in **ART Portfolio: How-to > ART Supplies:**

- **ART Subregional Findings** (📄)
- **Hayward Shoreline Resilience Project Profile Sheets** (📄)
- **Oakland/Alameda Resilience Study Example Profile Sheets** (📄).

2. Develop an approach for answering the questions

Before diving into the work of gathering answers to the assessment questions, consider which assets will be evaluated and to what extent. Depending on the type and number of assets being considered it may not be possible or reasonable to collect detailed answers for each. In addition, if one agency or organization owns or manages a number of different assets it can be difficult to decide how to collect the answers: e.g., for all of the assets collectively or for each asset separately.

Remember that the assessment questions are a tool to guide the collection of targeted information that can then be summarized in different ways, e.g., for individual assets; agencies or organizations; watersheds or focus areas within the project area, etc. Ultimately, the approach will depend on the scope of the project as well as the type of asset. Refer to the **ART Scope & Scale Issue Paper** (📄) to learn more about how these factors affect project outcomes.

For each type of asset, identify whether the assessment questions will be answered for representative or specific assets, recognizing that it may be necessary to modify the approach for certain assets depending on input from the working group and other stakeholders, availability of information and preliminary findings as the assessment progresses.

Representative vs. Specific Assets

REPRESENTATIVE ASSETS

Answering the assessment questions for a smaller number of representative assets works well for numerous, similar assets. For example, vulnerabilities and consequences of climate impacts to numerous contaminated sites within a project area may be very similar. Rather than assessing each site individually, answering the questions for a few examples that represent a cross-section of the types of contaminated sites can reveal the range of vulnerabilities and consequences that are likely. Other types of assets that can be addressed with this approach often include schools and local roads.

SPECIFIC ASSETS

Unique assets for which the findings from the assessment questions are unlikely to carry over from asset to asset need to be addressed individually. Examples of these include wastewater treatment plants, and tidal creeks and flood channels. Additionally, if the project scope includes only a small number of assets, the questions should be answered for each of these specifically.

3. Gather answers to the assessment questions

In gathering answers to the assessment questions it is often necessary to use a number of approaches, including research to uncover readily available reports, documents, inspection and monitoring reports, and maps. The table in Appendix B has a list of asset types and useful information and data sources.

Gathering the information to answer the assessment questions is a balancing act. On the one hand, it may be helpful to check in with asset managers, owners or topic experts early on in the process to make sure that you are aware of and using recommended data and information sources. However, it is important not to seek significant input on the questions without having made a diligent effort to gather information and answer them on your own. It can be challenging for your stakeholders and other experts to generate complete answers from scratch, and it is far easier and more efficient for them to help refine answers or provide additional, specific resources to fill information gaps. Keep in mind answers typically range in length from a phrase to a couple of sentences. It is okay if the answer uncovers further, specific challenges that need to be further investigated.

When gathering information make sure to use the assessment question sheets to keep track of sources, including if information is provided through personal communications. Knowing where and when the information was collected and by whom is very helpful later on when validating the assessment findings, and it is critical for maintaining transparent decision-making in the project.

Gathering answers: Keep looking? Stop and ask?

Some questions can be answered with data and information that is readily available, while others will require much more effort or cannot be answered through research. It can be difficult to know how much effort to expend when answering an assessment question with or without assistance from the asset manager. Below are a few examples of topics and questions for which the ART Program has had to rely on information and best professional judgments provided directly from asset owners and managers.

- Land subsidence at the site of the asset.
- Detailed information about asset management: e.g., types and frequency inspections and maintenance conducted, major repairs and upgrades.
- Has the asset been disrupted in the past due to an unplanned event e.g., weather-related closure, emergency repair or improvement, work strike, or other event?

Avoid spending the effort to uncover hard-to-find, or in some cases nonexistent information. Instead, flag critical data needs and knowledge gaps that will require further consideration or research.

4. Ground-truth answers with asset managers, owners, and topic experts

It is important to confirm, or ground-truth preliminary assessment answers with asset managers, owners, and topic experts. There are a number of approaches that can be used to solicit input as efficiently as possible, including;

- written surveys
- individual or small group meetings
- phone interviews
- field visits
- collaborative websites (e.g., Google docs)

Prior to taking any of these approaches to get input from an asset manager or owner or topic expert, it is essential to provide them with any preliminary assessment information already gathered.

Some asset managers may be able to provide needed information and data when given the assessment questions and “raw” answers in a spreadsheet or Word® document. However, the ART Team has found that many asset managers and owners tend to respond better and more effectively when the preliminary information has been summarized in draft profile sheets. See the [How-to Guide: Profile Sheets](#) (📄) for an explanation of the different components of a profile sheet, and the [Hayward Shoreline Resilience Project Profile Sheets](#) (📄) and [Oakland/Alameda Resilience Study Example Profile Sheets](#) (📄) for examples of *finalized* profile sheets. (Note that at this stage in the planning process, the draft profile sheets would be much less complete, and would not have proposed adaptation actions or responses.) The questions on their own can be overwhelming, whereas the summarized information on the profile sheets provides context for why certain information (questions) are helpful to understanding vulnerability and consequence. It may be helpful to share an example final profile sheet to help them understand how the information will be ultimately communicated. Additionally, be sure to provide them with enough background on the assessment objectives if they are not already familiar with the project.

Since input on the preliminary assessment answers is partially based on best professional judgment, it may be that others besides those participating directly in the working group have the necessary knowledge or expertise. It is often helpful to ask for assistance in engaging colleagues, co-workers, others in the field, community members and non-profit organizations to gather needed information. Lastly, be sure to ask if there are any additional data or resources available that can help fill in knowledge gaps. If there are none then make sure to note this data need or knowledge gap as an information challenge.

Appendix A: ART Assessment Questions

Questions in Table 1 apply (as noted) to all asset types except Community Characteristics which are in Table 2. The questions are also available to download as a spreadsheet ([ART Assessment Questions Supplement](#) ) with a separate worksheet for each asset type (e.g., transportation, wastewater, etc.).

- Remember that it is not necessary or advisable to answer every question! Some questions may not apply (mark 'NA') and others you may not know (mark '?').

TABLE 1. QUESTIONS FOR TRANSPORTATION, STORMWATER, WASTEWATER, STRUCTURAL SHORELINES, NATURAL SHORELINES, COMMUNITY FACILITIES, PARKS, ENERGY AND PIPELINES AND WATER SUPPLY.

Existing Conditions		
Describe the asset and highlight current conditions or stressors that could affect vulnerability		
1	Briefly describe the asset and its functions.	.
2	Where is the asset located, and what is its geographic extent? Attach maps or diagrams if necessary.	For private facilities, permit documents can have maps that with useful info.
3	Is asset located within a FEMA Special Flood Hazard Area (SFHA), e.g., within the current 100-year floodplain (1% annual chance event)? Is it located in the 500-year floodplain (0.2% annual chance event)?	.
4	Has there been locally observed land subsidence that could potentially put the asset at greater risk of flooding? If yes, describe the location, amount of land motion, and the approximate timeframe over which the subsidence has occurred.	Information is difficult to find, so it's best to ask the asset manager.
5	Who owns and manages the asset? Note if the owner and manager are different entities.	It may be useful to include the names of past owners, because some of the information you may look for may be under the old name or owner.
6	What year was the asset built and what is its expected remaining service life?	Remaining service life is a difficult number to find sometimes. It may be more helpful to look at when/how often the asset is upgraded and inspected.
7	When and what was the last major repair or improvement to the asset?	.
8	What is the most frequent type of maintenance and how often is it conducted?	.
9	Has the asset been disrupted in the past due to an unplanned event e.g., weather-related closure, emergency repair or improvement, work strike, or other event? If yes, how long did the disruption last and was the asset able to continue functioning either partially or fully?	.
10	Is the asset currently under consideration for capital improvement or investment, or is it in an area that is planned for future development or redevelopment?	This information may be found on the City/County's General Plan, Capital Improvements Plan, or budget.
11	Is the asset located in a state mandated "Zone of Required Investigation" due to proximity to an earthquake fault zone, liquefaction seismic hazard zone, or earthquake-induced landslide zone?	For multi-hazard assessment
12	Has a seismic assessment or other hazard assessment been conducted for the asset? If so, how does this inform asset maintenance or future capital improvements or investments?	For multi-hazard assessment

13	Has the asset been retrofitted? If yes when was the retrofit completed and what guidelines or standards were used?	For multi-hazard assessment, for COMMUNITY FACILITIES only.
14	Has any mitigation occurred for earthquake-induced liquefaction? This could include ground strengthening or enhanced foundation designs. If yes, describe what mitigation was done and what standards or guidelines were used.	For multi-hazard assessment, for COMMUNITY FACILITIES only.

Information Vulnerabilities		
Describe if data is lacking, incomplete, poorly coordinated, or hard to obtain. (It's best to answer these questions after you've attempted to answer all of the other questions first. Difficulties finding data for the assessment may inform your answers to these questions.)		
15	Is planning-level or project-level information available to assess vulnerability, e.g., existing conditions reports, as-built drawings, monitoring or inspection reports, etc.?	.
16	What mechanisms exist to share information between departments within the managing agency? What mechanisms exist to share information with partner agencies, non-governmental organizations, and the public? Are these mechanisms adequate?	.

Governance Vulnerabilities		
Describe challenges with management, regulatory authority, or funding options for adapting to impacts		
17	Is the asset managed to achieve multiple goals or objectives e.g., habitat, water quality, flood control, recreation, shoreline access, etc.? If yes, are their conflicts among them?	.
18	If the asset owner and manager are different, what is the relationship between them, e.g., a legal agreement such as a lease, right-of-way, access easement, JPA, MOU or MOA?	.
19	Describe any plans that are relevant to asset management or improvement, e.g., Master Plan, Capital Improvement Plan, and if/how they consider sea level rise.	May not be directly relevant to your asset, but it provides context on existing policies and political climate.
20	If the asset is protected from flooding by land or assets owned or managed by others (e.g., structural protection, roadways, rail embankments), what is the relationship between the asset owner/manager and these entities? Do they coordinate information, funding or decision-making?	The easiest way is to look at a map with the asset manager to determine neighboring parcels that may be protecting the asset and discuss these questions.
21	What types of permits (and from which agencies) are necessary to maintain, repair or improve the asset? Are there special processes for emergency repairs?	.
22	What funding sources currently exist that can be used to assess hazard risk or vulnerability to climate change? To improve asset resilience?	.

Physical Vulnerabilities		
Identify conditions or design aspects that make an asset particularly vulnerable to impacts		
23	To what extent is the asset currently exposed to tidal, wind or wave erosion or scour?	.
24	What water or salt sensitive components of the asset are at-grade or below-grade, e.g., mechanical or electrical equipment, pumps, utilities, building heat, ventilation, power systems, or finished basements?	Specific information is best found by asking the asset manager.

Sector-specific questions		
25	Is the facility or building a mobile or manufactured structure? If yes, describe the foundation type.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
26	Is the facility or building (commercial or residential) susceptible to a seismic event? E.g.,	.
26a	Is the facility or building constructed from unreinforced masonry? If yes, describe how and if seismic hazards have been assessed and/or mitigated.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
26b	Is the facility or building constructed from concrete and was built between 1950 and 1971? If yes, describe if and how seismic hazards have been assessed and/or mitigated.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
26c	For residential buildings (either single family or multifamily), is it cripple wall construction (typically with short unreinforced walls that raise the first floor 1-5 feet above ground level)? If yes, describe how and if seismic hazards have been mitigated (i.e. the home has been bolted to the foundation and/or the cripple wall has been strengthened).	For multi-hazard assessment, for COMMUNITY FACILITIES only.
26d	For 1-2 unit residences, is the building house over garage construction? For multifamily residential, are there garages or other large openings on the first floor (soft-story construction)? If yes to either, describe how and if seismic hazards have been assessed and/or mitigated.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
27	Does the asset have openings that are at-grade or below-grade that are entry points for flooding, e.g., entryways, tubes, tunnels, ventilation grates? If yes, are their barriers (temporary or permanent) that can protect these openings from allowing floodwaters to enter? Are there pumps or other systems in place to remove floodwaters if they do enter?	For TRANSPORTATION, WASTEWATER, COMMUNITY FACILITIES, ENERGY/PIPELINES, WATER SUPPLY
28	Are there existing systems in place to manage groundwater, e.g., pumps or other systems to keep water away from below-grade systems, basements, or foundations? Would these systems have adequate capacity to remove additional groundwater if levels increase?	For TRANSPORTATION, WASTEWATER, COMMUNITY FACILITIES, ENERGY/PIPELINES, WATER SUPPLY
29	Is the asset currently being used or functioning at capacity, or does it have additional capacity to meet future conditions, e.g., projected increases in demand, level of service, higher Bay water levels, or elevated groundwater?	For TRANSPORTATION, WASTEWATER, ENERGY/PIPELINES, WATER SUPPLY
30	For stormwater infrastructure and flood control channels what recurrence-interval rainfall event and Bay tide level (if considered) was the system designed for? Is the asset currently at capacity or does it have additional capacity to meet future conditions, e.g., projected higher Bay water levels, combined riverine and higher Bay water levels, or elevated groundwater?	For STORMWATER/FLOOD CONTROL
31	For flood control channels, what is the current extent of tidal influence, e.g., how far inland does high tide currently reach? If the tide migrates upstream are there protections in place that would prevent adjacent areas from flooding?	For STORMWATER/FLOOD CONTROL
32	For flood control channels and stormwater outfalls, is there a mechanism to control inflow to the system from the Bay such as a flap gate, tide gate, check valve, etc.? Can these water control structures be adjusted to maintain system function as sea level rises?	For STORMWATER/FLOOD CONTROL
33	For pipelines located below-ground, are they secured or tied down in a manner that as groundwater levels rises they will not float or become buoyant?	For WASTEWATER, ENERGY/PIPELINES, WATER SUPPLY
34	Describe the structural shoreline design, e.g., engineered levee or floodwall, engineered shoreline protection (revetment or bulkhead), non-engineered berm or levee?	For STRUCTURAL SHORELINES

35	For natural and restored tidal marshes, do current sustainability models predict they will keep up with sea level rise, e.g., accrete vertically? If so, for how long? Is there space adjacent of the marsh that would allow for landward migration?	For NATURAL AREAS
36	For managed ponds and managed marshes, can the water control infrastructure such as berms, levees, and tide gates be adjusted to maintain system function as sea level rises?	For NATURAL AREAS

Functional Vulnerabilities		
Describe asset relationships with or dependence on other assets that can make them vulnerable to impacts		
37	Is the asset part of a networked system such that damage to other parts of the system would affect the assets ability to function? Describe what alternatives exist that could help maintain continuity of service if parts of the system are disrupted.	.
38	If the asset is disrupted or damaged, what redundant assets exist that could help maintain the capacity, function, or level of service that is normally provided by the asset?	.
39	What external services, such as power, communications, food or fuel supplies or materials does the asset rely on? If these external services were interrupted, are there back up supplies ready and in place, and how long would they last?	.
Sector-specific questions		
40	Does the asset serve or house the elderly or very young, mobility or medically challenged individuals, or animals? If yes, describe how and if these services and functions can be protected to ensure continuity of service. What systems or plans are in place to enable either shelter-in-place or safe evacuation and relocation of the facility if necessary?	For COMMUNITY FACILITIES
41	Does the asset serve or house community members that are resource limited, e.g., are they low or very low income, housing or transportation cost burdened, renters, or without a car? If yes, what programs or plans in place to help these members prepare for, respond to, or recover from flooding?	For COMMUNITY FACILITIES
42	Does the asset serve or house community members that are ethnically or culturally diverse, have limited English-speaking capacity, or are non-English speakers? If yes, what programs or plans in place to help these members prepare for, respond to, or recover from flooding?	For COMMUNITY FACILITIES
43	Does the asset serves as a critical access road, emergency or lifeline route, provide sole or limited access to communities or facilities, or provide service to transit dependent communities? If yes, describe the communities, services, facilities the asset serves.	For TRANSPORTATION
44	Does the asset provide recreational access or opportunities that are unique or limited in the area and/or region, e.g., access for persons with limited mobility, interpretive programs, access to the Bay, etc.? Could these functions be easily replaced in other areas?	For STRUCTURAL SHORELINES, NATURAL SHORELINES, PARKS
45	Does the asset provide or protect habitat for threatened or endangered species? Is this habitat scarce in the region? Could this habitat be established in other areas?	For STORMWATER/FLOOD CONTROL, NATURAL AREAS

46	Is the facility or building a mobile or manufactured structure? If yes, describe the foundation type.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
47	Is the facility or building (commercial or residential) constructed from unreinforced masonry? If yes, describe how and if seismic hazards have been assessed and/or mitigated.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
48	Is the facility or building (commercial or residential) constructed from concrete and was built between 1950 and 1971? If yes, describe if and how seismic hazards have been assessed and/or mitigated.	For multi-hazard assessment, for COMMUNITY FACILITIES only.
49	For residential buildings (either single family or multifamily), is it cripple wall construction (typically with short unreinforced walls that raise the first floor 1-5 feet above ground level)? If yes, describe how and if seismic hazards have been mitigated (i.e. the home has been bolted to the foundation and/or the cripple wall has been strengthened).	For multi-hazard assessment, for COMMUNITY FACILITIES only.
50	For 1-2 unit residences, is the building house over garage construction? For multifamily residential, are there garages or other large openings on the first floor (soft-story construction)? If yes to either, describe how and if seismic hazards have been assessed and/or mitigated.	For multi-hazard assessment, for COMMUNITY FACILITIES only.

Consequences		
Describe potential impacts on society, equity, the economy, and the environment		
51	What degree and scale of economic disruption would occur if the asset was damaged, disrupted, or failed? Local, regional, state, or national? If based on a past weather event or an unplanned disruption, describe the type and duration of that disruption.	.
52	If the asset was damaged, disrupted or failed, how much direct revenue would be lost? For how long?	.
53	What would the water quality impacts be if the asset was damaged, disrupted, or failed, e.g., release of hazardous materials stored on site or pollutants leaching into groundwater as the water table rises?	.
54	What habitat or species benefits would be lost if the asset was damaged or lost? What would the effect of this loss have on local and regional biodiversity and ecosystem health?	.
55	If the asset was damaged, disrupted, or failed, would there be a loss of flood protection or wave attenuation benefits? If yes, what would the affect of this loss be on adjacent assets or communities?	.
56	If the asset was damaged, disrupted or failed, would there be a loss of public access to the shoreline? Of recreational, educational or interpretation opportunities?	.
57	What critical emergency services would be affected if the asset was damaged, disrupted or failed?	.
58	How would the community, particularly at-risk members, be affected by damage, disruption, or loss of asset function?	.
59	If the asset was damaged, disrupted or failed, how many and what type of jobs or employment centers would be affected? For how long?	.

TABLE 2. QUESTIONS FOR COMMUNITY CHARACTERISTICS

Existing Conditions – Community Characteristics	
Describe the asset and highlight current conditions or stressors that could affect vulnerability	
1	Generally describe the community(ies) in the project area, e.g., neighborhood names and general boundaries, current land uses, transportation infrastructure.
2	Describe community serving facilities in the project area that could play a role in responding to or recovering from a flood or other hazard, e.g.,
2a	Emergency responders, e.g., police and fire stations, operations centers, etc.
2b	Medical facilities, e.g., hospitals, clinics, pharmacies, skilled nursing facilities, etc.
2c	Places of worship.
2d	Community centers, shelters, food banks, grocery stores.
2e	Public schools, buildings, parks or other public spaces that could serve as a gathering or sheltering-in-place location.
3	Describe the agencies, organizations, and informal groups that increase the community or neighborhood capacity to respond to or recover from a flood or other hazard. Consider:
3a	What groups active in the project area such as NERTS, CERTS, neighborhood councils that increase preparedness.
3b	Are their emergency caches in the project area? If yes where are they, how many can they serve, and for how long?
3c	What community-based organizations, non-profits, faith-based or civic organizations are active in the project area? Where are they focusing attention and on what issues?
3d	What existing public or private programs that serve the socially or economically disadvantaged have a presence in the project area? Where are they focusing attention and on what issues?
4	Describe the distribution of households with characteristics that limit access to resources or capacity to respond to or recover from a flood or other hazard, e.g.,
4a	Very low income household, e.g., earning less than 50% of the Area Median Income or less than 200% of the federal poverty level.
4b	Housing cost burdened, e.g., moderately burdened (spending greater than 30% of gross monthly income on housing) or severely burdened (spending greater than 50% of gross monthly income on housing).
4c	Transportation cost burden, e.g. spending greater than 5% of gross monthly income on transportation.
4d	Housing tenure, e.g., number or proportion of rented households
4e	Overcrowded households, e.g., those having a high number of persons per room compared to the city/county/regional average.
4f	Transit dependent households, e.g. those without a vehicle.
4g	Non-English speaking households, e.g. households where no one age 14 or older speaks English well.
5	Describe the distribution of individuals with characteristics that limit access to resources or capacity to respond to or recover from a flood or other hazard, e.g.,
5a	Educational attainment, e.g. people without a high school diploma and/or college education.
5b	Race or ethnicity, e.g., Hispanic or Latino, African American, Asian, Pacific Islander, etc.
5c	People of dependent ages such as the elderly (e.g., over 65) or very young (e.g., under 5 or under 14).
5d	Elderly living alone or as head of household.
5e	People with functional needs, e.g., physical, mental or emotional disabilities, chronic diseases, homebound or medically dependent.
5f	Institutionalized, e.g., people in nursing homes, hospitals, jail or prison.

Information Vulnerabilities – Community Characteristics	
Describe if data is lacking, incomplete, poorly coordinated, or hard to obtain.	
6	What up-to-date information is available to understand the location and specific needs of the communities, neighborhoods, households, and/or individuals with limited resources or capacity to respond to or recover from a flood or other or hazard?
7	What information is available to decision-makers to help them understand and respond to specific community needs during and after an emergency, e.g., the amount and type of financial or technical aid that is needed to offset job or housing loss to avoid displacement/dislocation.
8	What mechanisms exist for public agencies to coordinate information gathering efforts with the non-profit, community or faith-based groups that could serve as trusted partners in the community?

Governance Vulnerabilities – Community Characteristics	
Describe challenges with management, regulatory authority, or funding options for adapting to impacts	
9	What capacity do the non-profits, faith-based and community based organizations in the project area have to actively participate in adaptation planning? What processes are in place for the local jurisdiction and these groups to engage in existing planning and decision making?
10	Do neighborhoods in the project area have a strong social networks, e.g., informal connections between those that live, work, obtain services, or are invested in the neighborhood? If yes, describe how the social network currently functions. Which non-profits, faith, or community-based organizations have a role in building and maintaining strength and capacity of the networks?
11	Does the jurisdiction, community serving facilities, or neighborhoods have up-to-date emergency plans? Are these plan adequate to address the potential contingencies and secondary impacts that could occur with widespread or long lasting flood events?
12	What level of coordination exists among local, regional and state authorities to understand and respond to specific community characteristics and needs, e.g., emergency response policies, trainings, procedures such as the purchase of specialized equipment or the development of appropriate evacuation procedures?

Consequences – Community Characteristics	
Describe potential impacts on society, equity, the economy, and the environment	
13	What would the economic effects be on communities if a flood occurred? Would there be lost wages, lost housing, lower productivity, or relocation of community members (temporary or permanently)? Would there be disproportionate effects on those that have limited access to resources or capacity, e.g., socially or economically disadvantaged?
14	What would the effects be on community mobility if a flood occurred (ability to access jobs, schools, goods or services)? Would there be disproportionate effects on those that have limited access to resources or capacity, e.g., socially or economically disadvantaged?
15	What would the effects on public health or safety if a flood occurred? Would there be disproportionate effects on those that have limited access to resources or capacity, e.g., socially or economically disadvantaged?
16	What would the effect be on community or neighborhood social networks if a flood occurred? Would there be disproportionate effects on those that have limited access to resources or capacity, e.g., socially or economically disadvantaged?

Appendix B: Information Sources

TABLE 3. COMMON DATA SOURCES FOR DIFFERENT TYPES OF ASSETS

Asset: People	Data Sources
Total population – current and future	U.S. Census, American Community Survey, General Plan, Specific Plan, Plan Bay Area and Planned Development Areas, Regional Housing Needs Assessment, Housing Element, ABAG Projections Series 2013, Current Zoning, County Quick Facts
Population with access or functional needs, including:	U.S. Census, American Community Survey, General Plan, Specific Plans, Local studies, Housing Element, Local Hazard Mitigation Plan, County Health Department Status Reports, Non-Profit and Community Based Organizations, Bay Area Regional Health Inequities Initiative, East Bay Indicators-East Bay Economic Development Alliance
· Age dependent, children and seniors	
· Medically or mobility dependent	
· Language constraints	
· Low income	
· Lack of education	
· Culture or ethnicity	
· Cost burdened (housing and/or transportation)	
· Transit dependent (no car)	
· Housing tenure (renters)	
Asset: Building Stock	Data Sources
City-owned buildings	County Tax Assessor Parcel Data
Privately-owned buildings:	County Tax Assessor Parcel Data, U.S. Census, American Community Survey, Housing Element of Local General Plan, Specific Plans, General Plans, Zoning Code, Google
· Residential buildings, e.g., single and multi-family, mobile homes, senior and dependent housing	
· Nonresidential buildings, e.g., industrial, commercial or institutional structures	
Future buildings, growth areas and infrastructure	General Plan, Plan Bay Area, Regional Housing Needs Assessment, Capitol Plans, City and County Budgets, Zoning Code, Housing Element, Local Growth Boundaries or growth phasing ordinances
Asset: Critical Response Facilities	Data Sources
Public health infrastructure, e.g., hospitals and medical facilities	County Tax Assessor Parcel Data, Safety Element of Local General Plan, Emergency Operations Plans, Local Area Formation Commission Municipal Service Reviews
Police stations	County Tax Assessor Parcel Data
Fire stations	County Tax Assessor Parcel Data
Public schools	County Tax Assessor Parcel Data

Asset: Community Services	Data Sources
Community facilities, e.g., day cares, food banks, senior centers, grocery stores	County Tax Assessor Parcel Data, Google, City licensing and regulating authorities, General and Specific Plans and Local Zoning
Places of worship	County Tax Assessor Parcel Data, Same as above
Education and research institutions, e.g., schools, colleges, universities	County Tax Assessor Parcel Data, Same as above
Waste transfer stations	CalRecycle, County Environmental Health Departments
Household hazardous waste collection sites	CalRecycle, County Environmental Health Departments
Asset: Utilities Infrastructure	Data Sources
Water systems, including reservoirs and dams	Urban Water Management Plans, Bay Area Integrated Regional Management Plan
Wastewater, e.g., industrial and sanitary sewer systems)	Urban Water Management Plans, Bay Area Integrated Regional Management Plan
Flood control infrastructure	City/county public works or flood control district watershed restoration plans, hydrology and hydraulics analyses, and environmental assessments/impact reviews/studies
Stormwater (storm drain) system	City/county public works, special studies within cities and counties, Local Agency Formation Commission
Power utilities, e.g., electricity generation, distribution, transmission systems	California Energy Commission, PG&E, California Public Utilities Commission,
Pipelines, e.g., fuel and natural gas	California Energy Commission, National Pipeline Mapping System, Kinder Morgan
Oil refineries	County and City General Plans, EPA, Air Resources Board, State Employment Statistics
Asset: Transportation Infrastructure	Data Sources
Local streets and roads	Metropolitan Transportation Commission 2011TeleAtlas
Federal and state highways	Metropolitan Transportation Commission 2011TeleAtlas, CA Department of Transportation
Bridges, tubes and tunnels	Metropolitan Transportation Commission 2011TeleAtlas, CA Department of Transportation, Bay Area Toll Authority
Railroads, passenger and freight lines	Metropolitan Transportation Commission 2011TeleAtlas, Capitol Corridor JPA, Altamont Corridor Express, Caltrain
Transit services (bus, BART, light rail)	Metropolitan Transportation Commission 2011TeleAtlas, Bay Area Rapid Transit
Ferry service	Golden Gate Bridge Highway and Transportation District, Water Emergency Transportation Authority
Bike/pedestrian routes	Local General Plan, SF Bay Trail
Airport	Federal Aviation Administration, Regional Airport Planning Committee
Seaports and Marine terminals	

Asset: Communication Infrastructure	Data Sources
Land line telephone systems	Communication service providers
Cable systems	Communication service providers
Cellular telephone antennae	Communication service providers
Underground communication conduits	Communication service providers
Asset: Recreation, Open Space and Working Lands	Data Sources
Park and recreation facilities	California Protected Areas Database
Designated open space	California Protected Areas Database, Conservation Lands Network Explorer Tool
Bike/pedestrian trails	SF Bay Trail
Natural areas	San Francisco Estuary Institute (SFEI) EcoAtlas
Agricultural and working lands	General Plan, County Tax Assessor Parcel Data, National Land Cover Database
Asset: Hazardous Materials Sites and Contaminated Lands	Data Sources
Hazardous Materials Sites, e.g., RCRA regulated sites, CUPA sites	US EPA Envirofacts
Landfills (open and closed)	US EPA Envirofacts, State Water Resources Control Board Geotracker
Clean up sites, e.g., US EPA or DTSC regulated brownfield, cleanup sites, or landfills	US EPA Envirofacts, State Water Resources Control Board Geotracker

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Step 5: Summarize Vulnerability

Key points of this step:

- Summarize assessment information into clear, outcome-oriented problem statements

After you have conducted your risk assessment you will need to summarize your findings to identify the most significant risks in your community. These findings will help you to craft appropriate and responsive mitigation and adaptation actions and create a clear and cogent “story” to help support decision-making by elected officials and other stakeholders and provide a foundation for seeking funds to reduce risks and increase community resilience.

This can be best achieved by developing problem, or key issue, statements. Key issue statements help communicate the critical planning issues that emerged during the risk assessment, for example which critical assets are particularly vulnerable, what areas currently have repetitive losses, or how many high hazard areas are currently zoned for future development. Problem statements can help you prioritize and focus on the areas that have the greatest need for mitigation or adaptation based on the vulnerabilities and consequences identified. They can also help clearly communicate which issues require collaborative decision making, shared funding, or changes in laws, regulations, policies or other processes.

Problem statements can be developed for each hazard, asset class, or specific individual assets you evaluated in your risk assessment, for example:

“The North Creek Sewage Treatment Plant is located in the 100-year floodplain and has been damaged by past flood events. It serves 10,000 residential and commercial properties and it is the primary treatment plant for this area.”

“City Hall is located in an area that is likely to experience very high levels of shaking in either a San Andreas or Hayward earthquake. The building is an unretrofitted unreinforced masonry building built before 1930 and therefore highly vulnerable to damage in an earthquake.”

“Five of the eight public elementary schools in this city are in moderate or high ground shaking areas and one is located in both a liquefaction zone and in the 100-year floodplain. One middle school is not currently in any hazard zone but will likely experience future flooding with 36” of sea level rise. There is a data gap around the retrofit status of any of the schools; it is unknown if any have been seismically retrofitted.”

The first step in writing problem statements is to review the exposure analysis maps and answers to the assessment questions. It is often the case that a number of assets will have similar characteristics, conditions and challenges, so it makes sense to read through and reflect on all of the answers before beginning to summarize.

The second step is to use the answers to the assessment questions to write brief summary statements describing the vulnerabilities and consequences identified. Depending on the process, the statements can summarize the assessment findings for individual assets, particular asset categories or services, the community as a whole, or the agencies and organizations that own, operate or manage the assets evaluated.

When writing problem statements, it is helpful to consider what vulnerabilities or consequences to include, and which can be coalesced into a single problem statement or which should have stand alone problem statements. Generally speaking problem statements describe vulnerabilities and consequences that:

- ✓ Produce broad or wide ranging effects on society and equity including impacts to a large geographic area, people where they live, or people with specific characteristics or special needs
- ✓ Affect the environment by reducing ecosystem benefits provided by natural areas, such as flood risk reduction, water quality improvement, and supporting biodiversity
- ✓ Affect the economy at multiple scales, including local, regional, statewide and national
- ✓ Are urgent because impacts will occur in a shorter timeframe than it takes to address the vulnerabilities identified. For example, there may be a stretch of shoreline that will allow inland areas to flood either with small amounts of sea level rise or under current storm conditions, but addressing this issue requires a long lead time to due to complexities in ownership, management, financing, and regulatory oversight.
- ✓ Could cause cascading effects on other assets, services, or communities. This is particularly an issue for networked assets, such as transportation, utilities, and shoreline protection, which are interconnected in a manner such that failure of one part of the system will disrupt the rest of the system. This will also be an issue for assets that rely on other assets to maintain functionality, for example hospitals, nursing homes, and wastewater treatment plants that rely on uninterrupted power supplied by others.

Outputs:

- Problem Statements
- Fulfillment of Element B3 in FEMA’s Local Mitigation Plan Review Tool Checklist**

Resources:

- ART How-to Guide: Vulnerability and Consequence Statements
http://resilience.abag.ca.gov/wp-content/documents/mitigation_adaptation/ART%20H2G-V&C%20Statement%20Guide_Vf3.pdf

Issue Statement Exercise

<p>Asset (pick one):</p> <input type="checkbox"/> City Hall <input type="checkbox"/> Wastewater Treatment Plant <input type="checkbox"/> Senior Housing Complex <input type="checkbox"/> Hospital <input type="checkbox"/> Power Substation <input type="checkbox"/> Other:	<p>Hazard (one or both)</p> <input type="checkbox"/> Earthquake <input type="checkbox"/> Flooding	<p>Hazard impact statement (see example hazard impacts):</p>
<p>Issue or Problem Statement</p>		
<p>Issue or Problem Statement</p>		
<p>Issue or Problem Statement</p>		

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Issue Statements

This guide helps with...

Synthesizing the existing conditions, vulnerabilities and consequences for each of the project assets into issue statements.

These statements are included on the asset profile sheets, and are helpful in quickly communicating the issues identified for each asset. Additionally, the process of summarizing these asset-specific issues helps the project team begin to identify bigger, key planning issues that, together, the project team and working group will need to address in the Plan stage of the project.

Definitions: Issue Statements

To enable the project team and working group to determine priorities for developing adaptation responses, they need a clear picture of issues – the problems resulting from the climate impacts addressed in the project area. In the ART approach to adaptation planning, these issues derive from the existing conditions, vulnerabilities and consequences for the assets, systems of assets, sectors or services (collectively referred to as assets in the rest of this guide) considered. Asset-specific issue statements summarize the problems that need to be addressed, and help the project team and working group hone in on the project's key planning issues, the next task in the Define step. (See [How-to Guide: Key Planning Issues](#) )

A Challenging Task

There is no getting around that these Define step tasks – identifying and summarizing issues into statements, and identifying the key planning issues for the project – are a challenge. Despite taking multiple projects through the Define step, the ART team continues to struggle to land on a single approach that works across the range of project scales, asset types and stakeholder working group members involved. Yet rather than resort to ranking or scoring vulnerabilities or assets (which would be faster in the short-term) we continue to take projects through the Define step because it is worth the benefit that it ultimately provides to the project stakeholders, including the project team and funders.

Laid out here is an approach that reflects our lessons learned and current best practice, but your project team may find that it needs modification to work for your project. And, if you are struggling with this step, ask for help. Visit the [ART Portfolio Help Desk](#) and find an ART team member to contact.

Before writing the asset-specific issue statements, the project team should summarize each asset's vulnerabilities and consequences on its profile sheet. Refer to the Design Your Project Step 4 and [How-to Guides: Vulnerability and Consequence Statements](#) (📄) and [Profile Sheets](#) (📄).

The issue statement that is added to the profile sheet should clearly and succinctly describe how the climate impacts affect the asset, including the primary reason for the vulnerabilities and what the likely consequences would be. It should synthesize assessment findings as opposed to simply re-stating them. In preparing an issue statement, the project team may find it helpful to think of it as the “story” of the asset’s climate impacts vulnerability and consequences. For example issue statements developed for ART Program projects, see: [Hayward Shoreline Resilience Project Profile Sheets](#) (📄) and [Oakland/Alameda Resilience Study Example Profile Sheets](#) (📄).

Identifying and Summarizing Issues

Laid out here are steps that the ART Program has found helpful in guiding project staff through identifying planning issues and writing issue statements.

1. Identify asset functions

Based on the asset description (on the draft profile sheet) identify the asset’s function(s).

An asset may only have one primary function (e.g., a train station that is a rail commuter stop, or a system of lagoons that are part of a stormwater management system), but most assets will have more than one function (e.g. a school that serves as an educational facility, community meeting space and emergency shelter; a stretch of road that carries commuter traffic and goods movement, provides important access to an airport or seaport, and serves as an emergency evacuation route for residents).

2. Identify how the functions are vulnerable to impacts

Once the primary functions of an asset have been noted, identify how these are vulnerable to sea level rise and storm impacts.

Review the asset profile sheet information – the asset description and existing conditions information, and the vulnerability and consequence statements. Also see the vulnerability themes in Appendix A, and the ART Portfolio: Findings by Issues > [Overarching Vulnerabilities](#) webpage. These highlight some common themes that the ART Program has found to be relevant for a wide range of asset types, and can be helpful in articulating issues:

- Certain populations, land uses and community services are particularly vulnerable to impacts.
- Networked infrastructure that functions as a continuous corridor, or as a system of linked segments, for which impacts to one part can disrupt the function of other parts
- Assets that rely on other assets, sectors or services to function
- A lack of redundancy, such that no or few alternatives exist that serve the same function(s)
- Multiple public agencies and/or private entities share ownership and management responsibilities for the asset itself and/or surrounding land uses

- Plans, policies, and practices for the asset do not factor in sea level rise and other climate impacts
- Lack information (or access to information) needed to understand vulnerabilities and consequences sufficiently to develop adaptation responses
- Existing conditions or design aspects of an asset that make it especially sensitive to impacts

3. Write a draft issue statement

Using the identified function(s) and vulnerabilities, write an issue statement of a few sentences for each asset. This statement is essentially a concise “story” of the problem that the asset would face or cause as a result of the climate impacts addressed in the project.

There is no magic formula for writing an issue statement, but important elements to include are:

- the asset’s primary functions that may be disrupted by impacts, and any context that is needed to understanding why these functions matter
- special circumstances related to the loss of the functions, e.g., no comparable alternatives exist for the asset’s function(s).
- description of the key ways in which these function(s) are vulnerable to impacts.

Other tips include: being specific where possible; avoiding putting forth solutions; and keeping consistent with findings of the assessment (i.e., not offering opinions about existing conditions, vulnerability and consequences that are not supported by the findings).

A few examples of issue statements are shown below. Others can be found in the [Hayward Shoreline Resilience Project Profile Sheets](#) (📎) and [Oakland/Alameda Resilience Study Example Profile Sheets](#) (📎).

Plagiarism is good.

Whenever possible, copy language from existing issue statements, as well as the vulnerability and consequence statements – particularly if you can find assets with similar issues as those you are evaluating. Using copied text as a starting point can speed up the process of drafting issues statements – which is important for projects that assess numerous assets!

Example Issue Statements from Oakland/Alameda Resilience Study:

Asset: Coliseum Amtrak Station

Functions: passenger rail stop

Issue statement: The function of the Coliseum Amtrak Station as a passenger rail stop on the intercity connection between San Jose and Sacramento is vulnerable to sea level rise and seismic impacts if the station (building) and parking lot, supporting utilities infrastructure that is below grade, and vulnerable parts of the rail line elsewhere are damaged or disrupted. A complex arrangement of shared ownership and operations of the station has led to a lack of accessible, detailed and well-coordinated information about the station’s components, which in turn presents a challenge to sufficiently understanding vulnerabilities of the station.

Asset: Bay Farm Island Lagoons

Functions: stormwater discharge

Issue statement: Lagoons on Bay Farm Island that are part of the Island’s stormwater management system rely on infrastructure (e.g., pumps, pipes) that are undersized or otherwise not equipped to keep the lagoon system functional with future sea level rise and storm event impacts.

Asset: Highway I-880 between Coliseum Way and 98th Avenue

Functions: commuting, goods movement, linkages to major airport accessways

Issue statement: No comparable alternatives exist for the functions that the section of I-880 between Coliseum Way and 98th Avenue serves: commuting, goods movement, and linkages to all of the Oakland International Airport access roads. Within this section of I-880, the most vulnerable components are bridges that cross flood channels (Damon Slough and Elmhurst), and road surface drainages that are at-grade. To fully understand these vulnerabilities, more detailed information is needed regarding the capacity of these components to accommodate impacts, as well as the impacts of groundwater rise.

Signs of key planning issues

As the project staff summarizes asset-specific issues, certain challenges or problems that are ‘signs’ of broader, key planning issues will probably become apparent. If the individual staff members who work on the issue statements track these ‘signs’ along the way, the project team will have an easier time narrowing in on key planning issues. Look for:

- Vulnerabilities that cut across multiple assets, sectors, jurisdictions or geographies will often appear on multiple profile sheets, and stem from the same source or dependency (e.g., one stretch of vulnerable shoreline protection.)
- Problems that individual asset managers cannot or should not try to solve independently. These vulnerabilities tend to require coordinated decision-making or funding.
- Issues or vulnerabilities that have significant and/or near-term consequences on society and equity, environment and/or economy.
- Issues that are clustered in/around a discrete geography.
- Vulnerabilities that require regulatory changes to solve.

For example, in the Oakland/Alameda Resilience Project, all of the assets on Bay Farm Island are highly vulnerable because access routes on and off the island are highly susceptible to flooding.

4. Share the updated profile sheets

Share the profile sheets that now have the issue statements with relevant asset managers and owners and other experts, and encourage them to provide comments. Admittedly it is difficult to get input on another iteration of the profile sheets, but it is still important to keep stakeholders up to speed on the direction that the project is headed with respect to their assets and/or interests. If they do review and provide comments on the updated profile sheets, try to incorporate this feedback prior the next meeting in which the project team will be discussing draft key planning issues (the next task in the Define step).

Appendix A. Vulnerability Themes

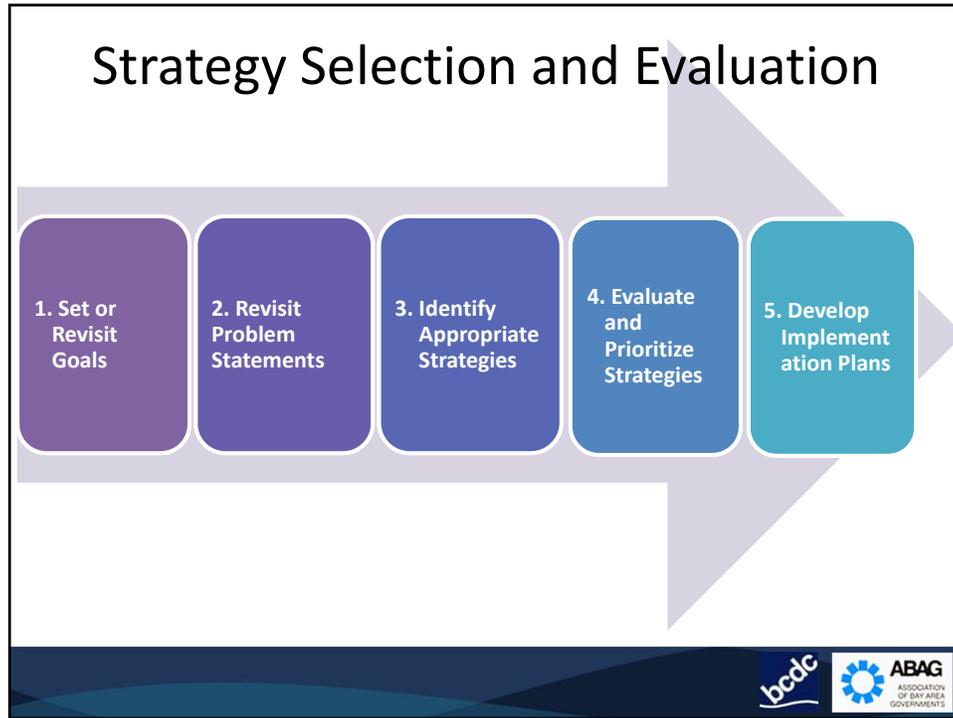
The ART Program has identified common vulnerability themes found for a wide range of asset types. These are listed below with example vulnerabilities from the ART Subregional Project and the Hayward Shoreline Resilience Study Project that highlight these themes. (Note that even though each vulnerability is listed only once, many exemplify multiple themes.)

EXAMPLE VULNERABILITIES	SOURCE	VULN. TYPE
Networked infrastructure that functions as a continuous corridor, or as a system of linked segments, for which impacts to one part can disrupt the function of other parts		
Some assets along the Bay shoreline function as a continuous corridor, or as a series of linked segments, and impacts to one segment of the Bay shoreline can compromise the function of the other segments. This is especially true of the system of natural and structural shorelines along the Bay edge; energy, gas, and pipelines infrastructure; and for long, linear ground transportation assets such as the Bay Trail and the regional rail network.	ART Subregional Project	FUNC
Certain populations, land uses and community services are particularly vulnerable to impacts		
Residences, elder care facilities, hospitals, childcare facilities, schools, and animal shelters are particularly difficult to protect, evacuate, and rebuild due to the critical functions they serve.	ART Subregional Project	FUNC
Certain populations, including young children, the elderly, people with mobility or medical needs, people without automobiles, renters, people without insurance, the linguistically isolated, people at or below poverty level and caretakers of young children and the elderly, are highly susceptible to flooding impacts.	ART Subregional Project	FUNC
Assets that rely on other assets, sectors or services to function		
Vulnerable assets are often protected from flooding impacts by shorelines (structural and natural) that the assets' landowners, agencies and facility managers often do not own, have control over, and may not realize is protecting their assets.	ART Subregional Project	GOV
Proper functioning of utilities, which themselves are vulnerable to sea level rise and storm events, is essential for communities to effectively respond during a disaster, and for communities, businesses, the airport, seaport, parks and recreation areas, and natural shorelines to function on a day-to-day basis.	ART Subregional Project	FUNC
Businesses and community land uses rely on power, water, access roads and other utilities to function. If these are disrupted due to sea level rise, these land uses will also be affected.	Hayward Focus Area	FUNC
A lack of redundancy for the asset, such that no or few alternatives exist that serve the same function(s)		
Alternative routes have limited additional capacity to accommodate re-routed commuter traffic (e.g., buses or carpools) or goods movement. If significant roadways or nodes are disrupted, re-routing would result in heavy congestion that could overwhelm the region's roadways and interstates as well as non-motorized transportation corridors (bike and pedestrian).	ART Subregional Project	FUNC
The temporary disruption or permanent loss of public transportation assets due to sea level rise and storm events, and the lack of sufficient alternatives, could leave residents in some communities unable to travel on a day-to-day basis, compounding evacuation challenges during an emergency.	ART Subregional Project	FUNC
The rail system lacks redundancy, and fixed stations and maintenance yards serve long, linear lengths of track. The interconnected nature of rail and the lack of redundancy mean that damage at any point in the system can disrupt commuter and goods movement system-wide, causing significant economic effects in the region, particularly if there is a loss of service to the seaport or airport. Repair or relocation of rail infrastructure may require significant investment to ensure public safety and security.	ART Subregional Project	FUNC

Certain communities or facilities are linked by only one or two access-ways (e.g., road, rail, or transit) and could become isolated during disasters. For example, the majority of access roads to the Port of Oakland's seaport and Oakland International Airport are vulnerable, and if they flood they could isolate these regionally significant facilities.	ART Subregional Project	FUNC
There are no nearby, comparable alternative routes for SR-92 and the Bay Trail in the focus area. Sea level rise impacts anywhere along these networks can affect the entire system's function.	Hayward Focus Area	FUNC
Multiple public agencies and/or private entities share ownership and management responsibilities for the asset itself and/or surrounding land uses		
The number and relationships of public agencies and private entities that own and operate transportation assets complicates planning and implementing improvements or use changes. Due to the function and physical characteristics of these assets, numerous agencies and organizations will be affected by the temporary disruption and permanent loss, or adaptation responses for, transportation assets.	ART Subregional Project	GOV
Public agencies and private entities that own or manage transportation assets do not have control over the surrounding land, road, or transit that provide access to their facilities or services, or in some cases provide protection against flooding. Ensuring that access to these facilities remains viable and that current levels of flood protection are maintained will require cooperation that goes beyond the agencies operating the transportation infrastructure. This is of particular importance to regionally and nationally significant infrastructure such as the Oakland International Airport, the Port of Oakland seaport, the interstate system, and lifeline facilities.	ART Subregional Project	GOV
Plans, policies, and practices for the asset do not factor in sea level rise and other climate impacts		
Capital investment planning, design, and funding for new infrastructure or for substantial repairs and improvements to existing infrastructure do not consider sea level rise impacts. Infrastructure designed to remain in place for longer spans of time and that is not built or rebuilt to be resilient to flooding and salt-water exposure will need to be protected or retrofitted long before the end of the expected life of the infrastructure. Resources to maintain or improve existing infrastructure are limited, and investments needed in the future to address sea level rise will affect financial resources, economic opportunities, and communities.	ART Subregional Project	GOV
Many of the plans, policies, and practices that guide community development, land use planning, emergency planning, and capital investments do not consider sea level rise or the adaptation responses that will be necessary to reduce the vulnerabilities and risks associated with sea level rise.	ART Subregional Project	GOV
The capacity to plan for sea level rise and storm event impacts on transportation infrastructure in a timely manner is limited due to the current lack of financing and regulatory mechanisms.	ART Subregional Project	GOV
Existing regulations make maintenance, restoration, and adaptation near and within tidal marshes and managed ponds difficult to implement, particularly because some adaptation actions remain untested.	Hayward Focus Area	GOV
Assets without maintenance programs are more vulnerable to sea level rise impacts because managers already have limited ability to complete repairs and sea level rise will increase damage related to erosion and overtopping.	Hayward Focus Area	GOV
Emergency response planning, funding, policies, approaches, and current public and private standards and operations do not consider sea level rise which could significantly change flooding impacts and, in turn, response needs.	Hayward Focus Area	GOV
Lack information (or access to information) needed to understand vulnerabilities and consequences sufficiently to develop adaptation responses		
Information about the effects of sea level rise on groundwater levels and salinity intrusion is insufficient for assessing vulnerability and risk, supporting identification of priority issues, and developing adaptation responses.	ART Subregional Project	INFO
There is limited availability of and access to regionally relevant, current and historic weather data needed to understand flood risk.	ART Subregional Project	INFO

There is a limited understanding of how dynamic baylands habitats such as tidal marshes, intertidal mudflats, and subtidal areas will respond to accelerating sea level rise, or how these habitats will be affected by shoreline adaptation responses (e.g., structural solutions such as levees) that may change tide, wave or sediment conditions.	ART Subregional Project	INFO
There is a lack of detailed, easily accessible and well coordinated transportation infrastructure information which is necessary for vulnerability and risk assessments.	ART Subregional Project	INFO
There is a lack of centrally coordinated information systems for contaminated lands and hazardous material sites which is needed for effective emergency and adaptation planning, and for setting remediation, monitoring and enforcement priorities to reduce risks	ART Subregional Project	INFO
Existing conditions or design aspects of an asset that make it especially sensitive to impacts		
Many high-cost and critical elements of transportation infrastructure are highly vulnerable to flooding because they are located at or below grade (tubes, tunnels, ventilation), in low-lying areas (airport runways, storage and maintenance facilities), or on top of levees (rail alignments).	ART Subregional Project	PHYS
Water- and salt-sensitive electronic and mechanical components and power supplies critical to the continued function of transportation infrastructure are often at or below grade and therefore are vulnerable to sea level rise, storm events, and elevated groundwater levels.	ART Subregional Project	PHYS
Certain assets such as bridges across tidal streams or in the Bay, and infrastructure located under the wharves at the Port of Oakland seaport, may be increasingly vulnerable to high water levels and wave erosion during storm events, which can disrupt asset function, cause scour, require additional maintenance, and potentially shorten asset life span.	ART Subregional Project	PHYS
Tidal marshes will not keep up with sea level rise solely through vertical accretion, especially in light of the Bay's declining suspended sediment supply and the lack of space to shift landward.	ART Subregional Project	PHYS
Stormwater and flood control infrastructure is vulnerable to higher Bay water levels and rising groundwater levels that will reduce the capacity of these systems to collect, convey, and discharge flows.	ART Subregional Project	PHYS
Shoreline recreation areas with activities that depend on grass (sports fields, golf) are highly sensitive to saltwater flooding and salinity intrusion.	ART Subregional Project	PHYS

Develop and Evaluate Strategies



- ## Strategy Outcomes
- Prioritized, implementable strategies that tie back to community goals, problem statements, and other local actions
 - Implementation plans for strategies
 - A case that decision makers and funders can use to support strategy implementation
 - Community buy-in
- bcdc ABAG ASSOCIATION OF BAY AREA GOVERNMENTS

Set or Revisit your Resilience Goals

- Resilience goals that have helped frame and guide the assessment may have been based on existing community goals
- Before developing strategies resilience goals should be reviewed, and refined if necessary, based on the findings of the the risk assessment
- If you did not develop goals yet, it is not too late !!!



bcdc



What is a robust strategy? Getting beyond the list

- Connect each strategy directly to the outcomes of the assessment, i.e., key issue or problem statement
- Characterize the strategy by problem statement it addresses, hazard, and type
- Highlight responsible agencies, possible partners, and processes that may be involved in implementation

bcdc



STRATEGY DEVELOPMENT INFORMATION							
Strategy Name*	This is a one-sentence summary of the strategy						
Problem Statement*	This is the problem statement that the strategy is responding to. This should come out of your risk assessment and should include community goals.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation Actions to improve data and information or conduct new analysis	Program/ Operation Actions to update plans, procedures, or management activities	Policy Development Actions to develop or revise policies and guidelines		Coordination Actions to initiate or expand partnerships	Education/ Outreach Actions to communicate information and build	
Process/ Implementation Mechanism	Long-Range Planning e.g., master plans, climate action plans	Land Use Planning e.g., general plan, specific plan	Capital Planning e.g., capital improvement plan	Operations e.g., annual budgeting	Emergency & Hazards Planning e.g., hazard mitigation plans	Project Planning & Design e.g., private and public development projects	New Initiatives e.g., legislation, ballot measure
Responsible Agency*	Which department has the proper authority, capacity, and knowledge to implement the strategy						
Partners*	Internal or external stakeholders who have some decision-making authority, political influence, policy or regulation authority, or who can assist with implementation						



Example strategies – Berkeley LHMP

2014 URM	Complete the ongoing program to retrofit all remaining non-complying Unreinforced Masonry (URM) buildings.
Proposed Activities	<ul style="list-style-type: none"> - Begin by working with owners of remaining potentially hazardous URM buildings to obtain structural analyses of their buildings and to undertake corrective mitigation measures to improve seismic resistance or to remove the buildings and replace them with safer buildings. - Apply available legal remedies, including but not limited to citations, to owners who fail to comply with the URM ordinance. - Maintain program notification to building occupants and owners.
Related Natural Hazard(s)	Earthquake
Associated LHMP Objective(s)	A. Reduce the potential for loss of life, injury and economic damage to Berkeley residents and businesses from earthquake, wildland-urban interface fire, landslide, flood, tsunami, climate change, and the cascading impacts of these hazards.
Related Policies from the General Plan or Climate Action Plan	General Plan Policy S-20, Action A
Special Environmental Concerns	All building upgrade activities will include efforts to minimize impacts to existing residential and commercial tenants, and historic resources.
Lead Organization and Staff Lead	Planning Department - Building and Safety Division Staff Lead: Program and Administration Manager
Priority	High
Timeline	Engage all remaining URM building owners by January 2015 Complete all remaining URM retrofits/demolitions by



Example strategies – ABAG/BCDC Stronger Housing, Safer Communities

27. Reduce flood risk through integrated watershed management

Develop a program to work with public and private landowners to decrease the risk of flooding by advancing watershed management projects that reduce and/or store runoff during rainfall events, including the installation of green infrastructure and low impact development (LID) practices, and improve the condition in the floodplains, for example through floodplain restoration or improvement.

Lead					Scale of Benefit			
State	Region	Local jurisdiction			Region	Community	Resident	
Target Development Type					Hazard Addressed			
Existing		New			Ground Shaking	Liquefaction	Flooding	
Community Vulnerability Addressed					Vulnerable Housing Type Addressed			
Age	Language & Ethnicity	Cost Burdened	Housing Tenure	Access to Resources	Single or Two Family	Multi-family	Cripple Wall	Soft story or House over garage
Action Categories								
Evaluation	Program/ Operation	Plans and Policies	Codes, Regulations, and Ordinances		Coordination	Educational/ Outreach		
Prerequisite Strategies					Other Related Strategies			
None					None			

Description

This strategy recommends developing an integrated watershed management program to reduce the risk of coastal and riverine flooding. The program would encourage watershed-wide solutions, including engineered and nature-based watershed management approaches such as the installation of green infrastructure, use of Low Impact Development (LID) practices, and improving the condition of the floodplain through restoration or maintenance. This strategy will help protect both existing and future housing located in coastal and riverine floodplains as well as adjacent low-lying areas that will be susceptible to flooding during storm events as sea level rises.



Example strategies – BCDC Adapting to Rising Tides

Overarching Adaptation Response

Adapting to Rising Tides

Functional Vulnerability

Vulnerability O9: Proper functioning of utilities, which themselves are vulnerable to sea level rise and storm events, is essential for communities to effectively respond during a disaster, and for communities, businesses, the airport, seaport, parks and recreation areas, and natural shorelines to function on a day-to-day basis.

Action Number	Action	Action Type	Process	Possible Actors	Action Characterization
O9.1	Reduce downstream flood risk and stress on stormwater and flood control systems by minimizing runoff volumes and peak flow rates from new developments and substantial redevelopments using site-specific low impact design (LID) and source control techniques	Policy Development	Land Use Planning, Codes and Standards	Cities, County, RWQCB, SFEP	Do It Yourself, Multi-benefit, Local, Regional
O9.2	Avoid new development and substantial redevelopments that will require expanding the capacity of utilities and infrastructure in areas at risk	Policy Development	Land Use Planning, Codes and Standards	Cities, County, RWQCB, CPUC, City DPW, ACFWCDC	Local, Regional



Exercise: Strategy Development

1. Working in your small group, use the issue statement(s) you wrote in the last exercise and develop two or three strategies that would respond to one or more of issues you identified based on your rapid risk assessment
2. Share your strategies - and challenges or a-ha moments you had in writing them - in a lightning round report back

Strategy Development Exercise EXERCISE

STRATEGY DEVELOPMENT INFORMATION

Problem Statement:

Strategy Name:

Strategy Addressed:	Continuity of Operations Planning	Emergency Preparedness	Asset Protection	Business Continuity	Information Security	Other Assets
Strategy Type:	Education	Program/Operational	Risk Assessment	Coordination	Education Outreach	
Product/Implementation/Measurement/Action:	Long Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Incident Planning	Public Safety & Emergency Response

Problem:

Problem:

* Indicates overlap with TEMA Worksheet 6.2, Mitigation Action Implementation Worksheet

RESILIENCE PROGRAM Adapting to a Changing World



What are evaluation criteria

- An essential tool that agencies, organizations, and communities can use to develop a balanced hazard mitigation + climate adaptation plan to help achieve community goals
- A way to gain perspective on how different strategies affect society and equity, economy, environment, and governance
- The balance of the “four frames” highlight benefits and trade-offs, which can be very useful when gathering political, community, and financial support for implementation

Society & Equity

Effects on communities and services on which they rely, with specific attention to disproportionate impacts due to inequalities.

Economy

Economic values that may be affected such as costs of physical and infrastructure damages or lost revenues during periods of recovery.

Environment

Environmental values that may be affected, including ecosystem functions and services, and species biodiversity.

Governance

Factors such as organizational structure, ownership, management responsibilities, jurisdiction, mandates, and mechanisms of participation that affect vulnerability to impacts.



Evaluate and Select

Lay a path towards action implementation

- Develop criteria to evaluate strategies against community goals and the four sustainability frames
- Use this process to help decision-makers and community members understand tradeoffs and consequences among different strategies options
- Determine which strategies are high priority for implementation based on the agreed upon criteria



Evaluation criteria worksheet

Feasibility						Social Benefits					
Funding	Political Support	Local Champion	Administrative	Technical	Legal	Access	Life Safety	Awareness	Social Capacity	Vulnerable Residents	Recreation
With existing or expected funding sources	Likelihood of political support	Supported by a strong advocate or local champion	With existing operations or procedures	With existing technology or know-how	With existing authorities or policies	Protects access to jobs or services	Protects residents lives and prevents injuries	Increases public awareness	Builds social networks and community capacity	Protects especially vulnerable community members	Maintains recreational or educational opportunities

Economic Benefits				Environmental Improvement					Community Objectives	
Jobs	Commuter Movement	Reduces Disruption	Reduces Damage	Habitats and Biodiversity	Water Quality	GHG	Water Use	Energy Use	Community Objectives	Existing Plans
Promotes or retains jobs	Maintains commuter movement	Reduces service or network disruptions	Reduces asset damage, e.g., to structures or infrastructure	Creates or maintains habitat and biodiversity	Maintains or improves water quality	Reduces GHG emissions	Reduces water use	Reduces energy use	Advances other community objectives	Supports existing plan objectives, e.g., general plan policies



Strategy Implementation Plan

STRATEGY IMPLEMENTATION INFORMATION	
Priority (Evaluation Score)*	Evaluation score and priority level. Priority levels may vary by jurisdiction for different scores (for example, a score of 10 may be high priority in one jurisdiction and medium priority in another)
Actions/Activities	Steps that need to be taken to implement the strategy.
Staff Lead	Who has responsibility for overseeing the project and ensuring that the actions are taken.
Cost Estimate*	General estimate of the cost of implementation. This can be quantitative or qualitative (no cost, low, medium, high).
Benefits (losses avoided)*	General estimate of the impact of the strategy. Can be quantitative (lives, homes, or dollars saved), or qualitative (low, medium, high benefit).
Potential Funding Sources*	How the implementation of the strategy might be funded. This may include general operation funds, grants, fees, or other financing tools.
Timeline*	How long it will take to implement the strategy. You may choose to set a date by which the action should be implemented, or use a qualitative timeline estimate (near term, long term).
Related Policies*	Goals or policies already in place that support or assist the strategy. This may be in your general plan, climate action plan, housing element, climate adaptation plan, or sustainability plan.



Strategy Implementation Plan (example)

STRATEGY IMPLEMENTATION INFORMATION	
Priority (Evaluation Score)*	12 (out of 23) = High
Actions/Activities	<ul style="list-style-type: none"> Begin by working with owners of remaining potentially hazardous URM buildings to obtain structural analyses of their buildings and to undertake corrective mitigation measures to improve seismic resistance or to remove the buildings and replace them with safer buildings. Apply available legal remedies, including but not limited to citations, to owners who fail to comply with the URM ordinance. Maintain program notification to building occupants and owners.
Staff Lead	Program and Administration Manager
Cost Estimate*	Low cost
Benefits (losses avoided)*	High benefit
Potential Funding Sources*	General operations budget
Timeline*	Engage all remaining URM building owners by January 2015
Related Policies*	General Plan Policy S-20, Action A



Ideas to help with implementation, e.g., how to get your community on board

Start with actions that are:

- ✓ Ready for implementation but lack funding....step one is to craft a set of recommendations for funding these actions
- ✓ Need further refinement or feasibility assessments
- ✓ Will require changes in governance or regulations, or the addition of new partners and participants

Review actions not ready for implementation, and identify which need immediate further attention



Other ideas

- Have one-on-one discussions with partners, working group members and stakeholders to hear their ideas on next steps
- Engage the community in a hands-on exercise to explore options for action implementation

Pathways to Adaptation Implementation

ADAPTING TO RISING TIDES PROGRAM

ENGAGEMENT EXERCISE

Purpose

Develop an understanding of the options for implementing adaptation responses and how selecting among these options can result in tradeoffs and other kinds of resilience among the assets and services.

Approach

The exercise includes seeking different 'action implementation pathways' to develop an adaptation response to address a key issue and help achieve resilience goals. Participants work in small groups to select from a pool of adaptation actions and determine in what order and at what scale these actions could be implemented, and how the order and scale can affect outcomes and effectiveness. The exercise helps participants to identify tradeoffs among the different implementation pathways for adaptation actions and provides an opportunity to explore various possible outcomes against resilience goals.

Outcomes

1. Develop a working group and project team increase their understanding of:
 - The information included in an adaptation response,
 - How the sequence in which adaptation actions are taken up and the scale at which they are implemented can affect their capacity to achieve desired outcomes,
 - The possible unintended or secondary consequences of the adaptation actions on people, economy and environment.
2. The project team gathers working group feedback and expertise on a suite of policy, design and/or siting options to address a key issue identified in a vulnerability and risk assessment.

When to use this exercise...

By emphasizing different aspects of this exercise, it can be used effectively to fit multiple needs in a planning process. If the team is focused on conducting a vulnerability and risk assessment to adaptation planning, the



Strategy Development and Implementation Worksheet

STRATEGY DEVELOPMENT INFORMATION							
Problem Statement*							
Strategy Name*							
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency*							
Partners*							
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)*							
Actions/ Activities							
Staff Lead							
Cost Estimate*							
Benefits (losses avoided)*							
Potential Funding Sources*							
Timeline*							
Related Policies*							

* Indicates overlap with FEMA Worksheet 6.2, Mitigation Action Implementation Worksheet

STRATEGY DEVELOPMENT INFORMATION							
Problem Statement*	<i>This is the problem statement that the strategy is responding to. This should come out of your risk assessment and should include community goals.</i>						
Strategy Name*	<i>This is a one-sentence summary of the strategy</i>						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation <i>Actions to improve data and information or conduct new analysis</i>	Program/ Operation <i>Actions to update plans, procedures, or management activities</i>	Policy Development <i>Actions to develop or revise policies and guidelines</i>	Coordination <i>Actions to initiate or expand partnerships</i>	Education/ Outreach <i>Actions to communicate information and build</i>		
Process/ Implementation Mechanism	Long-Range Planning <i>e.g., master plans, climate action plans</i>	Land Use Planning <i>e.g., general plan, specific plan</i>	Capital Planning <i>e.g., capital improvement plan</i>	Operations <i>e.g., annual budgeting</i>	Emergency & Hazards Planning <i>e.g., hazard mitigation plans</i>	Project Planning & Design <i>e.g., private and public development projects</i>	New Initiatives <i>e.g., legislation, ballot measure</i>
Responsible Agency*	<i>Which department has the proper authority, capacity, and knowledge to implement the strategy</i>						
Partners*	<i>Internal or external stakeholders who have some decision-making authority, political influence, policy or regulation authority, or who can assist with implementation</i>						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score) *	<i>Evaluation score and priority level. Priority levels may vary by jurisdiction for different scores (for example, a score of 10 may be high priority in one jurisdiction and medium priority in another)</i>						
Actions/ Activities	<i>Steps that need to be taken to implement the strategy.</i>						
Staff Lead	<i>Who has responsibility for overseeing the project and ensuring that the actions are taken.</i>						
Cost Estimate*	<i>General estimate of the cost of implementation. This can be quantitative or qualitative (no cost, low, medium, high).</i>						
Benefits (losses avoided) *	<i>General estimate of the impact of the strategy. Can be quantitative (lives, homes, or dollars saved), or qualitative (low, medium, high benefit).</i>						
Potential Funding Sources*	<i>How the implementation of the strategy might be funded. This may include general operation funds, grants, fees, or other financing tools.</i>						
Timeline*	<i>How long it will take to implement the strategy. You may choose to set a date by which the action should be implemented, or use a qualitative timeline estimate (near term, long term).</i>						
Related Policies*	<i>Goals or policies already in place that support or assist the strategy. This may be in your general plan, climate action plan, housing element, climate adaptation plan, or sustainability plan.</i>						

Strategy Development Exercise

STRATEGY DEVELOPMENT INFORMATION							
Problem Statement*							
Strategy Name*							
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency*							
Partners*							

* Indicates overlap with FEMA Worksheet 6.2, Mitigation Action Implementation Worksheet

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Example Mitigation and Adaptation Strategies

Example Strategy #1: Berkeley Hazard Mitigation Plan

STRATEGY DEVELOPMENT INFORMATION							
Strategy Name*	Complete the ongoing program to retrofit all remaining non-complying Unreinforced Masonry (URM) buildings.						
Problem Statement*	The City of Berkeley has had a mandatory URM retrofit ordinance in place since 1990. 85% of URMs have been retrofitted but a few remain. URMs pose a significant hazard in a major earthquake that can lead to loss of life and the closure of local businesses.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation		Policy Development	Coordination	Education/ Outreach	
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency*	Planning and Building Department						
Partners*	Community groups or chambers of commerce						

Example Strategy #2: ABAG/BCDC Stronger Housing, Safer Communities

STRATEGY DEVELOPMENT INFORMATION							
Strategy Name*	Reduce flood risk through integrated watershed management						
Problem Statement*	The City of East Palo Alto experiences coastal flooding during extreme storms. One-quarter of the city and many single-family homes, are within the coastal watershed that experiences flooding now. These storms are anticipated to increase in the future causing more frequent and extensive flooding.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation		Policy Development	Coordination	Education/ Outreach	
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency*	Planning and Building Department						
Partners*	FEMA, developers						

Example Strategy #3: BCDC Adapting to Rising Tides Alameda County Project

STRATEGY DEVELOPMENT INFORMATION							
Strategy Name*	Conduct vulnerability assessments of critical infrastructure and land uses in areas exposed to sea level rise and liquefaction to identify strategies that can improve resilience to both hazards						
Problem Statement*	The City of Oakland is located along the shoreline and has critical infrastructure that is located in areas vulnerable to liquefaction and possible future sea level rise. There is not much information available on the susceptibility of this infrastructure.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation		Program/ Operation	Policy Development	Coordination		Education/ Outreach
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency*	Planning and Building Department						
Partners*	ABAG, Caltrans, MTC, BCDC, Special Districts, neighboring jurisdictions, County, private sector						

* Indicates overlap with FEMA Worksheet 6.2, Mitigation Action Implementation Worksheet

Strategy Idea Sources

2011 Regional Hazard Mitigation Plan

Hazards Addressed	Asset Classes Addressed	Source
Earthquake Landslide Wildfire Flood Security Dam Failure Levee Failure Tsunami Drought Agriculture Pandemic Flu	Infrastructure Health Housing Economy Government Education Environment Land Use	ABAG

Comprehensive list of strategies developed for previous Regional Hazard Mitigation Plan. Wide range of strategies, but little detail on implementation. Covers many hazard types and asset types. Some jurisdictions may be familiar with these strategies and have them included in their previous hazard mitigation plans.

<http://resilience.abag.ca.gov/wp-content/documents/ThePlan-G-2010.pdf>

Bay Area Regional Resilience Initiative

Hazards Addressed	Asset Classes Addressed	Source
Earthquake	Governance Housing Infrastructure Economy and Business	ABAG

This 2013 report identifies an action plan for the region to improve regional capacity for disaster resilience in four sectors. Many of the actions are regional in implementation, but there are several local strategies as well. Actions align with identified regional priorities adopted by ABAG's Regional Planning Committee.

http://resilience.abag.ca.gov/projects/resilience_initiative/

Stronger Housing, Safer Communities: Strategies for Seismic and Flood Risks

Hazards Addressed	Asset Classes Addressed	Source
Ground shaking Liquefaction Current and future flooding	Housing Community members	ABAG and BCDC, developed in coordination with AECOM

Contains 40 strategies for state, regional, and local governments to address seismic and flood hazards for current and future development. Strategies are responsive to risk statements based on vulnerability analysis of housing and community capacity. Each strategy contains 2-3 pages of implementation guidance. Also includes a table designed to guide jurisdictions towards financing options to implement the strategies.

http://resilience.abag.ca.gov/projects/stronger_housing_safer_communities_2015/

Adapting to Rising Tides Project

Hazards Addressed	Asset Classes Addressed	Source
Current Flooding Future Flooding	Community Land Use, Facilities and Services Transportation Utilities Shorelines	BCDC

Dozens of adaptation responses that describe actions and implementation options to address flooding vulnerability. Responses are organized by category: Overarching; Community Land Use, Facilities and Services; Transportation; Utilities; and Shorelines. Also includes a guide to orient the reader to the types of information provided on the cards, and a glossary to define terms and acronyms used in the responses.

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

State of California Multi-Hazard Mitigation Plan

Hazards Addressed	Asset Classes Addressed	Source
Earthquake Floods Wildfire Levee failure Landslides and other earth movements Tsunami hazards Climate-related hazards Volcanoes Other hazards (natural & manmade)		California Governor’s Office of Emergency Services

The plan does not contain a list of strategy action, but identifies several possible goals and mitigation actions that can be implemented at a local level. Each hazard section includes possible mitigation actions that can be adapted locally and developed into a strategy.

http://hazardmitigation.calema.ca.gov/docs/SHMP_Final_2013.pdf

Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Hazards Addressed	Asset Classes Addressed	Source
Drought Earthquake Erosion Extreme Temperatures Flood Hail Landslide Lightning Sea Level Rise Severe Wind Severe Winter Weather Storm Surge Subsidence Tornado Tsunami Wildfire	Structure and Infrastructure Natural Systems	FEMA

Comprehensive resource that communities can use to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters. Many of the strategies are fairly generic, and serve as a starting point for local innovation and planning projects.

http://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf

Resilient City Initiative

Hazards Addressed	Asset Classes Addressed	Source
Earthquakes	Existing Buildings New Buildings Lifelines Infrastructure	SPUR

San Francisco-based initiative to improve the resilience of the built environment. Topic-specific reports provide strategy recommendations for mitigating existing buildings, improving the seismic performance of new buildings, upgrading infrastructure, helping residents shelter in place, improving preparedness, and planning for disaster recovery.

<http://www.spur.org/featured-project/resilient-city>

Center for Climate Strategies Adaptation Guidebook

Hazards Addressed	Asset Classes Addressed	Source
Climate Change	Infrastructure Built Environment Natural Systems Health and Society Economic Activities	Center for Climate Strategies

Comprehensive compendium of strategies that address a wide variety of climate change issues, including sea level rise, drought, extreme heat, and changing ecosystems. Strategies are not very robust, but can serve as a starting point for locally-developed strategies.

www.climatestrategies.us/library/library/download/908

Getting Climate Smart Strategy Toolbox

Hazards Addressed	Asset Classes Addressed	Source
Climate Change	Water Management Agriculture Energy, Transportation & Urban Infrastructure Tourism & Recreation Public Health & Safety Oceans & Coastal Resources Fisheries & Aquatic Ecosystems	National Resources Defense Council

Similar to the previous resource, contains a comprehensive compendium of strategies that address a wide variety of climate change issues. Can serve as a starting point for locally-developed strategies.

<http://www.nrdc.org/water/climate-smart/files/getting-climate-smart-strategy-toolbox.pdf>

Adaptation Response Open House

Purpose

Participants gain familiarity with the components of an adaptation response and provide feedback on the draft adaptation responses that have been developed for the project area.

Three Components of an ART Adaptation Response

- 1 The **vulnerability** being addressed by the adaptation response. The inclusion of this in the response provides a direct link to the assessment findings, and is a transparent way to ensure that each adaptation action is relevant to the problem (i.e., the vulnerability) it addresses.
- 2 **Adaptation actions** (one or more). While some vulnerabilities can be addressed by a single action, most require multiple, often coordinated actions. Some actions can be taken at the same time, while others require a series of sequential steps that incrementally build towards resilience. A response should describe key characteristics of the action that are relevant to its implementation; for example, if it is an action requiring a long lead time to implement.
- 3 **Implementation options** for each action. These provide alternatives for initiating adaptation actions such as incorporating them into existing planning or processes or creating new initiatives. The options also should identify the agencies and organizations – public and private – that have a role in implementing the actions.

Refer to the adaptation response card below for more description of these components. Refer to the **ART Subregional Adaptation Responses** () for examples of how these components are used in a response.

Approach

Using an open house format, project participants visit multiple stations, each of which has a large format poster of draft adaptation responses prepared by staff for each sector (e.g., transportation, utilities, natural areas), set of assets or issues. With a project team member at each adaptation response station,

participants learn about, discuss and provide input (detailed and general) on actions, actors, implementation processes and other components of the responses. The open house is followed by a group discussion to share key feedback, questions and concerns.

Outcomes

1. On an individual level, participants gain a better understanding of what is included in an adaptation response, and agencies' and organizations' roles as implementers, partners, funders or interested parties.

The adaptation response approach is valuable because unlike a simple list of adaptation actions, responses include a substantial level of detail about roles and responsibilities, implementation options and timing and sequencing of actions. The open house provides a relatively rapid way to inform asset managers and project participants of the format and content of the adaptation responses developed for the vulnerabilities identified in the assessment.

2. The project team receives input on draft adaptation responses.

3. Collectively, the project team and participants can identify options for implementation, such as upcoming projects, for near-term coordination and action, as well as challenges on which to take further action, such as agencies responsible for critical infrastructure that have yet to be engaged in planning efforts.

4. The project participants are ready for next steps in the the project: evaluating adaptation actions and identifying and committing to taking next steps – within their own organizations and/or in coordination with others – for key planning issues and actions.

When to use this exercise...

This exercise is appropriate later in a planning project, after the assessment has been completed and the key planning issues for the project area have been defined. Furthermore, project participants should be at a point when they have developed good working relationships with each other and are familiar with the issues and specific vulnerabilities, because, among other things, they may be asked to discuss their own possible roles (and responsibilities) in the implementation of the draft actions within each response.

Logistics

The length of this exercise varies depending on the follow-up discussion. At minimum, 50 minutes is needed.

- Allow 40 minutes for the introduction to the exercise and the open house and 10 to 15 minutes for a group debrief.

If the exercise is followed by further in-depth conversation(s) about next steps for adaptation, allocate another 30 minutes.

This exercise can require several project staff to run.

- At least one project team member who is very familiar with the adaptation responses is needed at each station to introduce the material and answer questions. It is helpful to have another staff member assigned to each station to take notes.

1. Prepare

Preparing for this exercise requires developing adaptation responses for the vulnerabilities that underlie each key planning issue. To make it easier to follow the same format as the examples below, the ART Portfolio includes:

- An adaptation response card reference that defines each component of the responses, and
- Responses developed for the vulnerabilities that were identified at a sub-regional scale in the ART Project. These can serve as starting points for developing a set of responses that is tailored to your project needs.

The Design Your Project section of the ART Portfolio provides additional guidance for moving through this step in the planning process.

Adaptation Response Card Information

Vulnerability: One or two sentence description of the key planning issue and/or vulnerability(s) being addressed by the response

Actions	Action Characterizations	Implementation Options	
		Processes	Actors / Partners
The action or actions to address the identified vulnerability. Some responses include a series of related actions that could or should be taken together.	<p>Local, Regional, State, Federal: Scale(s) of implementation.</p> <p>Unlocking: Necessary to enable other actions.</p> <p>Dependent: Requires other actions first</p> <p>Do it Yourself: Land owner or manager could implement within existing laws/policies & existing funding sources.</p> <p>Multi-Benefit: Confers benefits beyond sea level rise and storm event resilience.</p> <p>Long Lead Time: Urgent due to long implementation timeframe, near-term impacts, complex planning process, or many actors.</p>	Mechanism(s) through which the action could be implemented. Some processes exist and are possibly ongoing, while others will be new initiatives. There can be more than one process by which to implement any given action.	Actors: Agencies and organizations that could be involved in implementing the action. Actors include lead agencies (often asset owners or operators), as well as regulators, funders, and other potential partners. Partners include neighbors, regulators and other interested parties that may not implement the action but would have a role.

Identify the types of feedback that you are looking for from participants. Some questions to pose could include:

- Do the actions make sense for the vulnerabilities that they are supposed to address?
- Are the role assignments (for actors) correct? Working with right partners?
- How do these actions fit into ongoing local and regional efforts?

Supplies

Supplies for this exercise include:

- Large format printouts of the adaptation responses that participants can easily read from a few feet away when they are posted on a wall or laid on a table. See above for descriptions of content for these poster-sized response “cards”. Try to divide the responses evenly to avoid overloading a station, while still having content logically grouped.
- Name tags for the stations
- Power point slides or a handout with: a description of an adaptation response; purpose of the exercise, station descriptions, amount of time for the exercise, and questions to be considering.
- Tape, pens and markers.

Depending on a variety of factors, the project team may want to follow this exercise (at the same meeting) with focused, small group discussion(s) about next steps for adaptation – within participants’ own organizations and/or in coordination with others – for moving forward on priority issues and actions. The suitability and success of this type of in-depth conversation depends on the comfort level of the participants with each other and the issues identified for their assets or management areas.

The primary purpose of this conversation is for participants to gain a better understanding of what is included in an adaptation response, and their agencies’ or organizations’ roles in implementation. There can be other benefits to having this discussion, such as increasing participants’ readiness to take action by helping them identify near-term, feasible tasks that they can initiate to get the ball rolling. Project participants can also come away with leverage for gaining support within their organizations for continued adaptation work. For instance, they may be able to develop clear next steps to pursue internally, and create a sense of urgency by showing that owners and managers of neighboring and/or critical assets and services are moving ahead and that there is a window of opportunity to coordinate with them.

To set up a follow-up discussion, the project team should identify one or two key vulnerabilities for which early action is needed, because impacts are already occurring and/or adaptation actions have a long “lead-time” before the benefits can be achieved. Example discussion questions could include:

- If we committed to solving these issues, what more would we need to know?
- Is this the right group of people? Who else needs to be part of the discussion?

What is the timeline? When would action need to be initiated? How long will it take to both plan for implementation and reap the benefits of action?

2. Do

1st

Introduce the purpose for the exercise, and explain that participants will be visiting different stations (at their own pace) over the next 45-60 minutes to learn about and discuss adaptation responses to address the vulnerabilities identified in the assessment. Review the components of an adaptation response (e.g., on a slide). Go over the questions that they should be considering and providing input on at each station.

- Do the actions make sense for the vulnerabilities that they are supposed to address?
- Are the role assignments (for actors) correct? Working with right partners?
- How do these actions fit into ongoing local and regional efforts?

Leave up the slide with the questions during the open house.

Ask participants to pick a station and get started.

2nd

At each station – especially for the first batch of participants – the station leader should orient participants to the format of the responses, and go over any components and terms that might be unclear. Allow participants to review, ask questions and provide comments at their own pace. Try to note their comments and encourage them to write feedback directly onto the large response card printouts because it will be challenging to keep track of and remember specific input after the meeting.

3rd

Give a 5-minute warning before its time to reconvene the group for the wrap-up. During the wrap-up prompt the group (if necessary) for their thoughts on the format and content of the responses by re-posing the initial questions.

4th

Time permitting, and assuming that the project team is prepared to lead further, in-depth conversation(s) about next steps for adaptation, pose one or two questions based on key vulnerabilities (from the open house) for further discussion. Explain that the goal is to agree on some shared objectives that can help participants move forward within their organizations and with outside partners on adaptation. Give participants 15-20 minutes to: clarify the issue(s) that these vulnerabilities cause for their organizations, the assets that they manage, and/or the communities with which they work; and to scope their near-term needs to be able to take action on these issues. Use the discussion questions to help initiate and focus the conversation:

- If we committed to solving these issues, what more would we need to know?

- Is this the right group of people? Who else needs to be part of the discussion?
- What is the timeline? When would action need to be initiated? How long will it take to both plan for implementation and reap the benefits of action?

Gauge different participants' levels of comfort, and if appropriate encourage participants to speak to specific, feasible actions that they can or will take on (e.g., talking with colleagues within their organization to develop a clearer internal long-term vision for an asset that they manage), and ask them to suggest timeframes for these efforts. Try to choose a reasonable point in the not-too-distant future for all or a subset of the group to meet and continue making progress on next action steps. Identify who needs to be brought to the table as well, and if appropriate, who from the project team or working group will reach out to them.

5th

In the final wrap-up, the project team should stick to very broad comments about the discussions, and avoid calling out participants about ideas or next steps that were mentioned, unless they volunteer this on their own.

Let participants know the next steps the project team will take to incorporate their input, and to share revised materials and continued work.

3. Follow-up

Review and incorporate the feedback from the open house into the adaptation responses. As needed, hold follow-up conversations with working group members and other stakeholders to gather additional or clarify feedback. Provide participants with revised materials (that address the assets that they manage or own) for their review and incorporate their comments prior to sharing these publicly.

Example Materials & Outcomes

Response Cards

When the open house exercise was used in one of the ART planning projects, staff presented the adaptation responses at four stations: Utilities, Structural Shorelines, Natural Shorelines, and Local Government. This organization allowed staff to group related vulnerabilities and responses that logically flowed together without overwhelming any one station with too many responses.

EXAMPLE OPEN HOUSE RESPONSE CARD

LOCAL GOVERNMENT													
11. Businesses and community land uses rely on power, water, access roads and other systems and services to function. If these systems or services are disrupted due to storm events and sea level rise, the businesses and land uses that rely upon them will also be disrupted.													
Action	Where to Implement	Actors	Process	Interested Parties or Adjacent Landowners	Action Characterization								
					Local	Regional	State	Federal	Dependent	DIY	High Priority	Multi-benefit	Unlocking
11.1 Review and update city, county and facility emergency plans to address sea level rise and storm event contingencies and secondary impacts such as power outages and transportation disruptions	City of Hayward, Alameda County, Region	City of Hayward Fire Department, Alameda EMA, ABAG, CalEMA	Emergency and Hazard Planning	Private landowners	✓	✓	✓					✓	✓
11.2 Prepare for flooding by stockpiling materials, establishing turn-key agreements for equipment rental, and pre-positioning emergency power generation capacity, portable pumps, and debris removal equipment	Public and privately owned facilities	Private land owners and asset managers	Operations	Private landowners	✓	✓					✓		✓
11.3 Develop policies or incentives to encourage/require access to auxiliary water or power sources, portable generators, or pre-negotiated rental or leasing agreements for portable sources	City of Hayward, Alameda County, State	City of Hayward Fire Department, Alameda EMA, ABAG, CalEMA	Emergency and Hazard Planning	Private landowners	✓	✓	✓					✓	✓
11.4 Identify specific facilities served by limited or sole access-ways that are vulnerable to sea level rise and storm events and prioritize their protection or develop alternative access to these facilities	City of Hayward future flood zone	City of Hayward Fire Department, Alameda EMA, ABAG, CalEMA	Emergency and Hazard Planning	Private landowners	✓	✓	✓					✓	
11.5 Consider relocating critical facilities or components that are necessary to maintain continuity of utility services to areas that are not at risk from sea level rise and storm events	City of Hayward, Alameda County	City of Hayward, EBDA, Caltrans, CalPine	Long-range planning	Private landowners, ratepayers	✓	✓							

Follow-up Discussion

An example that worked well in one of the ART planning projects addressed an environmental education and interpretive center located in a tidal marsh habitat. The center is already experiencing high tides that nearly reach critical equipment under the building, and in the long term (e.g., beyond 2050) the center and surrounding trails cannot be maintained in the current location. Following on the open house exercise, participants who included the manager for the center and its educational programming, as well as managers for the natural areas and some of the built infrastructure surrounding the center were asked:

How can we preserve regional environmental education and recreation in this area of shoreline?

They identified some relatively low-cost retrofits for the building that would allow it to continue to function as an environmental education center in the near and mid-term. To preserve the functions of the center longer term, they felt there was a need for a coordinated environmental education and interpretive program for the broader region with a comparable curriculum that would be implemented throughout. After brainstorming about this idea, they identified a couple of other leaders in the region on environmental education and interpretation to approach for assistance. A key point about this example is the manager of the center had been an engaged participant in the project, and had, through the course of the planning process, developed a clear understanding of the short and long term vulnerabilities of the center and felt comfortable discussing issues and options.