

Developing Evaluation Criteria

ADAPTING TO RISING TIDES PROGRAM

This guide helps with ...

Developing and using a set of criteria for evaluating and improving adaptation responses to address vulnerabilities and planning issues more effectively, and better achieve resilience goals for the project.

Definitions: Evaluation criteria

Evaluation criteria are a tool for exploring, in a transparent way, the benefits and trade-offs of different adaptation responses. In an ART-based planning process, these criteria enable the project team and working group to qualitatively evaluate adaptation responses against project resilience goals and the four sustainability frames (see sidebar), while considering various aspects of feasibility. If proposed actions in a response do not adequately address the goals or certain aspects of sustainability, the evaluation process reveals these gaps, and helps project participants identify ways to improve the responses. Evaluation criteria can also be used to compare and/or filter through multiple possible adaptation actions to identify those that would perform better.

Evaluation criteria serve another important role in an ART-based planning process by helping the project team gain traction on key planning issues with the working group. Options for responding

Sustainability Frames in ART

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

Increase the capacity to accommodate re-routed traffic on alternative routes, or build new routes, in areas not at risk from sea level rise and storm events.

GOVERNANCE

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

to these larger planning issues usually involve and affect multiple assets, and serve multiple objectives. The ART Program uses the evaluation criteria to provide a transparent structure for in-depth conversations about these complex options among working group members with very different interests and expertise. As one might expect, this evaluation process shows where differences in values and priorities exist among stakeholders. It also helps participants explore different assumptions about outcomes of adaptation actions, and recognize possible unintended consequences. In ART projects, these discussions have helped working groups develop more robust responses for key issues.

Developing a set of evaluation criteria

1. Review the project resilience goals and examples of evaluation criteria and how they were applied in adaptation and hazards mitigation planning projects.
2. Develop a draft set of evaluation criteria that reflect the project resilience goals, and can address the feasibility and sustainability of adaptation responses to the project's asset-specific vulnerabilities and key planning issues.
3. Work with asset managers individually to refine these criteria and evaluate adaptation responses.
4. Engage the working group in a discussion of draft adaptation responses for key planning issues using the evaluation criteria to structure the conversation.

1. Review

Project resilience goals can create a strong basis for transparent decision-making in an adaptation planning effort. At this step in the process – evaluating adaptation responses – it is critical that the project team returns to these goals, and develops a set of evaluation criteria that specifically reflect them.

Examples of evaluation criteria used in adaptation and hazards mitigation planning efforts are widely available. The table below has a comprehensive list of criteria that have been tested in a variety of planning projects in the San Francisco Bay Area. Those projects ranged in scope and scale, and, in some cases included unique assets, (e.g., Oakland International Airport).

These *qualitative* criteria were useful and sufficient for pinpointing how adaptation responses did or did not adequately address the resilience goals or certain aspects of sustainability. The criteria also revealed tradeoffs among different options for key planning issues. They would not, however, be appropriate to evaluating different design options at the project scale (e.g., for cost benefit analysis). This evaluation would likely require additional *quantitative* criteria to fully understand tradeoffs.

Resilience Goals in ART

In an adaptation planning effort that follows the ART approach, the project team and working group develop resilience goals for the project early on (in the Scope and Organize step). As a reminder, the resilience goals:

- Include the four sustainability frames;
- Provide a shared vision for the project area while reflecting the differences among the assets, services, agencies and organizations; and
- Inform the evaluation of adaptation actions later in the project.

Criteria Types	Description
Feasibility	<p>Funding: With existing or expected funding sources</p> <p>Administrative: With existing operations or procedures</p> <p>Political support: Likelihood of political support</p> <p>Community support: Supported by a strong advocate or local champion</p> <p>Technical: With existing technology or know-how</p> <p>Legal: With existing authorities or policies</p> <p>Current: Addresses current issues and/or provides current benefits.</p>
Social Benefits	<p>Access: Protects access to housing, jobs or services</p> <p>Life safety: Protects public health and safety</p> <p>Vulnerable residents: Protects especially vulnerable community members</p> <p>Cost burden: Protects against increased housing or transit cost burden</p> <p>Community: Preserves community function, and/or advances other community objectives</p> <p>Awareness: Increases public awareness</p> <p>Social capacity: Builds social networks and community capacity</p> <p>Shoreline access: Maintains shoreline access</p> <p>Recreation: Maintains recreational or educational opportunities</p>
Economic Benefits	<p>Jobs: Promotes or retains jobs</p> <p>Tax base: Maintains revenues from taxes, rates or fees</p> <p>Affordability: Maintains tax rate and/or ratepayer affordability (e.g., for utility services)</p> <p>Commuter movement: Maintains commuter movement</p> <p>Goods movement: Maintains goods movement</p> <p>Service and networks: Reduces service or network disruptions</p> <p>Infrastructure: Protects infrastructure investments</p> <p>Assets: Reduces asset damage</p> <p>Airport/port/other specific asset: Maintains airport services</p>
Environmental Improvements	<p>Habitats and biodiversity: Create or maintains appropriate habitat and biodiversity</p> <p>Water quality: Maintains or improves water quality</p> <p>Nature based: Promotes grey to green, nature-based solutions</p> <p>Water use: Reduces water use</p> <p>GHG: Reduces greenhouse gases (GHGs)</p> <p>Energy: Reduces energy use</p>
Governance	<p>Decision-making: Supports or creates collaborative, transparent decision-making</p> <p>Partnerships: Encourages broad public and/or private sector partnerships</p> <p>Information: Addresses adaptation information gaps and/or barriers to access</p>
Disaster Lifecycle	<p>Preparedness: Builds disaster preparedness</p> <p>Risk: Mitigates risk</p> <p>Response: Improves disaster response</p> <p>Recovery: Encourages resilient recovery</p>

The following are examples of how of some of these criteria were used to review adaptation responses for specific vulnerabilities and key planning issues.

Example 1: Evaluating individual adaptation responses

The table below shows a few examples of how different proposed adaptation responses were evaluated by planners and asset managers in past projects using the set of criteria. A “+” (green) indicates that the reviewer agreed with the criteria statement with respect to the proposed response. A “-” (blue) indicates that s/he disagreed with the statement, and “o” (beige) indicates that the response was neutral.

These responses address different vulnerabilities, so comparing them to each other is not useful. However, for each response, it can be helpful consider if aspects of the resilience goals or sustainability are not (well) addressed, and whether the response could be modified to improve or strengthen it in these ways. For example, the first response, “Review and update community emergency preparedness and response plans to address sea level rise and storm event impacts for residents and businesses,” performs neutrally with respect to all environmental benefits criteria and most of the social benefits criteria. Possibly the response could be improved to pull in additional social and economic benefits (e.g., increase public awareness, prevent water quality impairments) and better address project resilience goals.

Adaptation Response	With existing or expected funding sources	With existing admin., tech., or legal practices	Likelihood of decision maker support	Likelihood of community support	Promotes or retains jobs	Maintains commuter movement	Reduces service or network disruptions	Protects asset damage	Protects access to jobs or services	Protects public health and safety	Maintains barrier free shoreline access	Maintains rec. or educational opportunities	Increases public awareness	Creates or maintains green (nature-based)	Maintains or improves habitat and biodiversity	Supports collaborative decision-making	Encourages public or private partnerships	Captures or memorializes institutional knowledge	
Review and update community emergency preparedness and response plans to address sea level rise and storm event impacts for residents and businesses.	+	+	+	+	o	o	+	o	o	+	o	o	o	o	o	+	+	o	
Conduct an assessment of wastewater infrastructure including the pipeline, effluent pumping stations and the dechlorination facility to identify “weak links” in the system that either need to be monitored closely, repaired/improved, protected or relocated	+	+	+	+	o	o	+	+	o	+	o	o	o	o	o	+	o	+	
Create a system to facilitate the sharing of critical Caltrans asset information with partner agencies and organizations that are engaged in adaptation planning	-	+	+	+	o	o	+	+	+	o	o	o	o	o	o	+	+	+	
Develop an agreement between the flood control district and the city that articulates shared objectives as well as maintenance and planning responsibilities for addressing sea level rise and storm event impacts on the function of the surface roads	+	+	+	+	o	+	+	+	+	+	o	o	o	-	o	o	+	+	o
	Feasibility			Economic benefits			Social benefits			Environmental improvement			Governance						

Example 2: Comparing responses

For the ART Oakland/Alameda Resilience Study, project staff and working group members developed packages of phased adaptation responses to flooding for two geographies in the study area. [Projects > Local > Oakland/Alameda Resilience Study](#). This approach involved comparing the performances of different coordinated adaptation responses for current and near-term flooding challenges. In the example shown here, the working group considered three options for addressing a stretch of major highway (I-880) that is very vulnerable in the near-term to flooding from higher high tides with sea level rise. The options were:

1. Raise the roadway above the near-term flood levels (i.e. mid-century)
2. Transfer traffic to other modes (transit); or roadways
3. Take no action to specifically adapt this section of highway

The proposed criteria that project staff developed for this evaluation (see table on following page) were based on the four sustainability frames used in ART, and the project resilience goals developed by the working group:

- 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 life cycle—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 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

As with the previous example, the working group members each did their own (rapid) evaluation using “+” to indicate that they agreed with the criteria statement with respect to the proposed response, “-” that they disagreed with the statement, and “o” to indicate a neutral response. Their overall consensus responses are shown in the table below. The project team then engaged the group in a discussion of their answers, and the issues and ideas that came to mind as they did the evaluation. This led the group a few conclusions:

- While it was helpful to have a quick metric for answering each criteria (i.e., +/o/-), tallying or summing the answers was not helpful. Rather, considering each of the criteria provided a transparent and structured platform for review that helped the group have a productive conversation about adaptation responses.
- It was important that the responses addressed the same or similar timeframe (i.e., near-term issues). Otherwise, they would not have been able to make relevant comparisons among responses.
- “Do nothing” was not really an accurate or appropriate response to consider. Although, initially, this implies “business as usual,” once a tipping point is crossed in terms of acceptable disruptions of the roadway due to flooding, some actions will be taken. The responses will not be planned, and likely will be undertaken without consideration of sustainability or resilience goals.
- Considering only this stretch of highway did not tell the whole story. The efficacy of these responses would be significantly dependent on adaptation responses (or lack thereof) for other assets in the area.

Proposed Criteria		Elevate I-88o	Reroute Traffic	Do Nothing
Feasibility	1 Possible with existing or expected funding sources	+	-	+
	2 Possible within existing administrative, technical, or legal practices	+	-	+
	3 Has high likelihood of political support	o	-	+
	4 Addresses current issues and/or provides current benefits	o	-	o
Economic benefits	4 Promotes or retains jobs	+	-	-
	5 Maintains goods and commuter movement	+	-	-
	6 Maintains airport services	+	-	-
	7 Protects infrastructure investments	+	-	-
Social benefits	8 Protects access to jobs or services	+	-	-
	9 Maintains shoreline access	o	o	o
	10 Maintains recreational or educational opportunities	o	o	o
	11 Increases public awareness	o	o	o
	12 Preserves community function	o	-	o
Environmental benefits	12 Promotes grey to green (nature based solutions)	o	o	o
	13 Creates or maintains appropriate habitat and biodiversity	o	o	o
	14 Maintains or improves water quality	o	o	o
Governance	15 Supports or creates collaborative decision making	o	+	o
	16 Encourages broad public or private sector partnerships	o	+	o
	17 Addresses adaptation information gaps	o	o	o
Disaster Lifecycle	18 Builds preparedness	o	o	o
	19 Mitigates risk	+	+	-
	20 Improves disaster response	+	o	o
	21 Encourages resilient recovery	+	o	o

Example 3: Evaluating conceptual options

In the Hayward Shoreline Resilience Study (led by the ART Program), five key planning issues were identified from the sea level rise vulnerability and risk assessment, and three, draft conceptual landscape visions for the study area were developed to address these issues. [Projects > Local > Hayward Shoreline Resilience Study: Report](#) (📄) These visions incorporated coordinated and multi-objective responses intended to achieve different balances of grey and green infrastructure given the physical setting of the study area and surrounding land uses.

Working group members and ART staff used qualitative evaluation criteria, combined with research and working group expertise, to investigate the consequences of each of the conceptual landscape visions. The criteria identified how well each option met the study’s resilience goals to:

- Protect the health, safety, and welfare of those who live, work, and recreate in the Hayward Shoreline area.
- Prevent the disruption of key community services by protecting critical infrastructure.
- Protect the environmental value of the Hayward Shoreline area by preserving habitat, water quality, and endangered species.
- Build organizational and community capacity so stakeholders can work collaboratively to address future conditions.

As with the previous two examples, the criteria also asked about the technical and organizational feasibility of each option and the sustainability of the visions. Again, working group members rated each option as having positive, negative, or neutral effects on the criteria. In this case, the project team did not track the working group members' ratings, but rather had them compare their ratings with each other, and discuss different intended and unintended outcomes and consequences of the visions. Having this structure to evaluate consequences helped participants explore and weigh tradeoffs between the visions more thoroughly in an organized way.

Working group members had many questions about feasibility of both near-term and long-term adaptation responses that would require more detailed technical analysis to answer. For example, the study did not include the geotechnical analysis that would be necessary for the traditional levee or horizontal levee, which was identified as a next step for the study area. Also, some responses were outside the control of working group members and the scope of the Hayward Resilience Study, such as regulatory changes by state and federal agencies. Unanswered questions were further investigated through ongoing work in the Hayward study area by working group members and the ART Program.

The working group did not endorse a final proposed vision, but did explore the implications of each vision on the environment, the economy, social equity, and governance and found that some of the visions did better than others on meeting the objectives of the resilience goals. The working group agreed that individual agency actions, while necessary for the near-term, were insufficient for mid- and long-term impacts and issues, and if pursued exclusively, these actions would result in wasted effort and poor outcomes due in part to a lack of coordination between agencies.

2. Develop a draft set of evaluation criteria

Select and customize a set of evaluation criteria that are appropriate to the project assets and key planning issues. There is no right way to do this, but it is important that the final criteria:

- Address feasibility
- Include the same or similar language used in the project resilience goals
- Address all four sustainability frames.

To avoid making a list that is too lengthy (which will discourage working group members from using the criteria), remove redundant criteria, and consolidate criteria if possible. For example, in the Hayward study area, goods and commuter movement rely on the same infrastructure, so there was no need to separate this question into two criteria.

Test the criteria on a variety of adaptation responses for asset-specific vulnerabilities as well as key planning issues to see if they help identify tradeoffs or possible improvements.

3. Evaluate responses with working group members

Work directly with working group members to test and refine the criteria for evaluating adaptation responses for the assets that they manage or address in their work. Have them consider where responses do not adequately address the goals or certain aspects of sustainability, and, if possible, suggest changes that would help the responses perform better. Based on this one-on-one work, refine the evaluation criteria and the adaptation responses.

4. Evaluate and discuss responses to key planning issues

Use the evaluation criteria to structure an in-depth discussion with the working group about the larger, multi-objective adaptation responses that were previously developed for key planning issues. Explore different expectations and understandings of tradeoffs. In ART-led projects, almost an entire project meeting has been devoted to this discussion. [Example Agenda: Evaluating Responses](#) ()

Overall, the working group should compare their evaluation answers and discuss different values, priorities and expertise that might be reflected. Other questions that can (depending on the context) help facilitate and/or start the discussion include:

- Do the responses have unintended negative consequences on society (e.g., people where they live, work, commute or recreate), equity, the economy or the environment? (See the sustainability frames on page 1.) Can the responses be modified to avoid these consequences and still be effective in addressing relevant vulnerabilities or issues?
- Can we make the responses stronger such that they address a broader range interests (e.g., multi-benefit), better reflect expertise among the working group, and/or improve feasibility?
- Is there additional information we need to properly evaluate and compare the responses?
- What actions within the responses are we ready to carry forward? Who would lead? What support would be needed from others?

It is important not to approach this discussion with the expectation that the working group will reach agreement these complex issues and responses. The ART Program has found, however, that this discussion can be a starting point for different working group stakeholders to initiate new, or strengthen existing partnerships around key planning issues. These continuing collaborative efforts have resulted in development of more robust responses, as well as follow-through on implementation of adaptation actions.