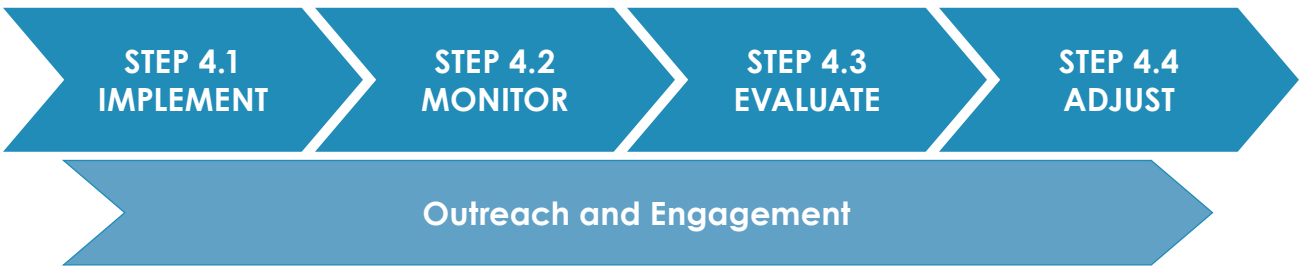
PHASE 4: IMPLEMENT, MONITOR, EVALUATE, AND ADJUST

In Phase 3, the project team and community built an adaptation framework of the community's vision, goals, and priority adaptation strategies. Phase 4 uses the adaptation framework to prepare an implementation program.

This section summarizes the most important step of adaptation planning, implementation. To ensure that implementation of each strategy is effective and continues to be effective, communities should monitor, evaluate, and modify strategies as needed based on their observed effectiveness, local changes, and new science. This section divides the Phase 4 process into four steps, shown in Figure 17.

- Prepare an implementation program to put adaptation strategies into action.
- Create a monitoring program to track implementation and ensure the monitoring program can be adjusted as needed.
- Establish an evaluation processes to assess how well and how long the vulnerability assessment and adaptation strategies serve the community; ensure that the evaluation process can be adjusted as necessary.
- Adjust adaptation strategies as monitoring and evaluation input is received.

Figure 17. Steps in Phase 4



Community and Stakeholder Engagement in Phase 4

Long-term implementation cannot be effective without close collaboration with the community. Outreach and engagement should be conducted through all phases of adaptation planning and should continue through implementation. Beginning with the scoping of the adaptation planning efforts (Phase 1) and continuing with the vulnerability assessment (Phase 2) and development of strategies (Phase 3), close collaboration bolsters community understanding and support for implementation. Implementation should actively and meaningfully involve community members and provide transparency in the monitoring and evaluation of effectiveness. This is particularly important in frontline communities who are disproportionately vulnerable to climate change, including tribal communities. This ensures that community members are partners if the results of monitoring and evaluation require a change in adaptation strategy. Involving the same representative groups formed during the previous phases can help with this objective.

In all the phases, equity is a critical component of these efforts. This means including opportunities for meaningful involvement from members of frontline communities and vulnerable populations who are disproportionately impacted by climate change and often underrepresented in community decision-making processes. Tribal communities are also often underrepresented in local government processes and should be intentionally engaged or partnered with, especially when a project impacts tribal resources. (Note: If the plan or project resulting from the adaptation process is a General Plan Amendment or otherwise subject to the California Environmental Quality Act, the lead agency must follow state regulations for tribal consultation and assessment of potential impacts to cultural resources as early as possible in the project.) It is important to rely on frontline, vulnerable, and tribal community representatives for their local expertise and to determine adaptation planning strategies and implementation options.

When community members understand the frequency and severity of climate-related hazards is linked to the effectiveness of GHG reduction and climate change adaptation strategies, it prepares them for the necessity of adjusting approaches to adaptation over time. Fostering this understanding and including the groups formed in assessing monitoring data and choosing next steps is critical to ongoing effectiveness. Each step of Phase 4 incorporates outreach and provides a list of sample actions. These outreach actions are primarily taken from the *Guide to Equitable Community-Driven Climate Preparedness Planning* by the Urban Sustainability Directors Network.

Step 4.1: Implement

In Phase 1, Step 1.1, the project team identified the end product or plan of the adaptation planning process. Phase 1 also presented the types of plans, programs, and implementation mechanisms common in adaptation planning. In Phase 3, the project team developed and prioritized adaptation strategies. Development of

adaptation strategies likely included identification of a potential lead department and/or partners tasked to implement a strategy, a time frame for implementation, and potential cost estimates. When starting Phase 4 and implementation, the first step is to prepare an implementation program and to confirm the implementation mechanism and responsible department of entity needed for each adaptation strategy. Some strategies will be implemented upon adoption of the plan prepared as a result of the adaptation planning process, while others will need to be further developed and/or be integrated into other plans or programs.

All adaptation strategies have temporal components that include time to implementation, timing of necessary action, and duration of effectiveness. These elements of time must be considered for all strategies and when devising the method of measure delivery.

For implementation strategies that will be further developed or implemented, the team should identify the planning document or other mechanism best suited to drive strategy implementation, as well as any documents that should be amended to ensure consistency. The answers to two questions can help clarify the choice of mechanism:

1. Which mechanism most closely overlaps the intent and topic area of a strategy?
2. Which mechanism is next slated for update or revision?

Regardless of how they are implemented, adaptation strategies tend to be in more than one plan, such as the general plan, local hazard mitigation plan (LHMP), climate action or sustainability plan, integrated regional water management plan, and capital investment plan. Other possible mechanisms for adaptation strategies are discussed in Phase 1.

- **General plans.** In 2017, OPR released updated General Plan Guidelines. These guidelines are a resource for understanding where climate adaptation strategies are best integrated into a general plan. Climate adaptation influences content in all chapters of a general plan; however, the element that often holds the most adaptation content is the safety or comparable element. Other elements of the general plan, including optional elements such as an "equitable and resilient communities" element, may also have adaptation content.[1]
  - The **safety element** is the primary location for addressing climate-exacerbated hazards and climate change impacts. This includes identifying community vulnerabilities associated with climate change (see the vulnerability assessment described in Phase 2) and developing strategies to address these vulnerabilities (Phase 3). The safety element should include a vulnerability assessment or a reference to where it is in another document. This element in particular must be consistent with the LHMP if the community has one. It also needs to be consistent with other elements of the general plan, such as land use, circulation, housing, conservation, air quality, and environmental justice.

- The **land use element** includes the planned future pattern of all community land uses and can include policy language that reduces the vulnerability of existing and new development.
- A **circulation element** can include policies ensuring appropriate ingress and egress for all neighborhoods and that major circulation corridors are not endangered by climate impacts and addressing other mobility-related vulnerabilities.
- **Housing element** policies ensure that all residential land use by type, location, and building standards are resilient to heat, poor air quality, and all other potential climate impacts. These policies can also address the availability of housing and the vulnerabilities of persons who are susceptible to climate change due to their living situation. The California Department of Housing and Community Development (HCD) has an abundance of technical assistance available to local governments.
- The **conservation** and **open space elements** include strategies to protect vulnerable ecosystems (habitat, sensitive and endangered species, other flora and fauna). They may also include policies to reduce vulnerabilities from hazards in natural areas (e.g., fire).
- The **air quality element** can address vulnerabilities from climate-influenced pollutants. For example, this optional element could address vulnerabilities from increased ozone due to warmer temperatures, and issues from increased particulate matter associated with drought or fire.
- The **environmental justice element** or content can specifically acknowledge that some subpopulations in a community are disproportionately vulnerable to climate impacts, particularly with respect to health outcomes. This element or content area relates to many other elements in the general plan.

City of Hermosa Beach General Plan and Climate Change

The City of Hermosa Beach General Plan, adopted in 2017, has a section in the safety element focused on climate change impacts and adaptation. This section addresses sea level rise, extreme heat, and other potential impacts, such as public health, precipitation, water, biological resources, agriculture, marine resources, and energy. The plan includes potential impacts of projected climate change and strategies to ensure the city is prepared for them.[2]

- **Local hazard mitigation plans.** LHMPs include both long-term and short-term hazard mitigation planning. They can include discussion of emergency preparation and response, such as notification systems and available resources for emergency response activities. These plans also should ensure that communities are prepared for escalating climate vulnerabilities. The LHMP should be consistent with a community's general plan safety element.
- **Climate action plans/sustainability plans.** Climate action plans (CAPs) or sustainability plans are broad strategic plans to address climate change or sustainability. They do not have a standard structure or form, unlike other mechanisms such as general plans. Climate change adaptation is often a component, although some may focus only on greenhouse gas reductions. They may include or refer to a vulnerability assessment (Phase 2). Some of their strategies often overlap with the general plan, LHMP, and other plans such as a bike and pedestrian plan. Many CAPs and related documents discuss implementation issues, including assigning responsible entities, funding, and indicators for monitoring.

City of Santa Cruz Local Hazard Mitigation Plan

When the City of Santa Cruz updated its LHMP for 2017–2022, it specifically included a section that addresses hazards such as wildfire, flooding, drought, coastal erosion, and landslides. The assessments in the "Climate Change Considerations" section relied on data from Cal-Adapt and other resources.[3]

San Diego County Multi-jurisdictional Hazard Mitigation Plan

In 2017, San Diego County, its incorporated communities, and three special districts adopted a multi-jurisdictional HMP. The plan includes a vulnerability assessment, a section on emerging hazards posed by climate change and sections on existing hazards including analysis of how climate change may exacerbate these issues. As the plan was being developed, planners held a series of workshops to specifically discuss the effects of climate change. Regional organizations such as academic and institutional agencies were key partners in developing the plan.[4]

- **Integrated regional water management plans.** Integrated regional water management (IRWM) plans address water concerns at a regional level. SB 1672 (2002) requires IRWM plans that address water supply and quality, flood protection, and other matters. The California Department of Water Resources' IRWM planning guidelines require the inclusion of climate change considerations in IRWM planning analyses. In an effort to assist practitioners, the Department of Water Resources developed a listing of climate change documents relevant to IRWM planning. The regional-level assessment, oversight, and strategies can deliver higher value investments and balance priorities among multiple jurisdictions. This is particularly important in settings such as the California Delta Ecosystem or the Salton Sea, where watershed issues fall under the authority of several local, regional, and state agencies.
- **Capital improvement planning.** A local government's capital improvement plan is an annual or biennial plan for financing community projects and is typically what funds community assets or infrastructure, such as bridges, water treatment facilities, or community centers and smaller projects such as new bike lanes or sidewalks. These projects may be directly vulnerable to climate hazards, may serve as shelters or gathering places or may provide evacuation routes during emergency situations. Having local community facilities and infrastructure that are climate resilient bolsters local adaptive capacity. In addition, integrating adaptation into the planning and design efforts for public projects nearly always saves a community money through avoided losses, even if the up-front costs of a new location or additional structural measures are slightly higher.[5] Climate-resilient features may also reduce regular maintenance and operation costs of some facilities (such as rooftop solar panels).

Adaptation strategies, regardless of the plan or program that contains them, need to be implemented to achieve their intended outcome. This requires assigning staff, developing programs or other measures, securing funding, and engaging the public. Many of these choices are described in Phase 3. It is important to confirm the remaining details to implement the strategy. This process builds on the prioritization of adaptation needs and strategies in previous phases, and outreach and funding are covered in subsequent sections. The way to implement adaptation actions will vary by location and jurisdictional context. Things to consider when developing the implementation approach are:[6, 7]

- **Build on existing processes.** Building on actions already proven effective in a community is a great place to start. Ideally, pursuit of this concept began in Phase 3, but further implementation includes integrating strategies into programs already in place from another plan, such as the general plan or LHMP. Bolstering or altering existing programs builds on internal strengths. Staff may already be

familiar with a particular type of policy or program, cutting down on training, the startup time, and associated costs.

- **Assess cost-effectiveness.** The project team should evaluate each implementation method for cost, down to the department and staffing requirements. This process also begins in earlier phases, such as Phase 3, but has a role here. In situations where multiple implementation options can achieve the same adaptation goal, cost/benefit assessment is a way to compare measures to determine the most cost-effective option or a sequence of measures that starts with the most fiscally feasible but potentially lower adaptation benefit in the short term. At its simplest, such an assessment looks at whether or not an action can be funded on an ongoing basis through the general fund. This case can be bolstered in when implementation yields future cost savings, offsetting the implementation cost. Strategies such as altering the building code for cooler (lighter color) roofs is an example that does not impose high costs directly on the local government. Other actions may be funded with establishment of a new fee system. Larger, structural projects are often funded through bonds. The measures that are more difficult to implement rely most on external funding or financing. In many cases, this is the most feasible option, but also the most tenuous.

City of Chula Vista Cost Effective Measures

Chula Vista, through use of the Climate Change Working Group (CCWG), adopted adaptation actions in 2011. The CCWG was made up of residents, businesses, and community representatives. In collaboration with city staff, this group brainstormed a lengthy list of potential measures, which it ultimately trimmed to 11 based on factors such as local jurisdictional authority and cost considerations. These considerations resulted in nearly all of the 11 actions being implemented. One such success was cool roofs. The CCWG recommended and city staff implemented a new cool roof ordinance. The measure was estimated to cost less than $30,000, an amount deemed feasible for the city budget.[8, 9]

- **Leverage community and private sector alliances.** Aligning strategies with local community groups and private sector entities is a good way to ensure ongoing effectiveness. It also is a way to limit cost burden by delegating aspects of implementation to an external entity. This can be formally established with an MOU or a similar formal partnership agreement. The following section describes outreach specifically, a critical part of ensuring that adaptation benefits are shared in all parts of a community and that the actions bolster social equity.
- **Establish partnerships regionally.** Geographic boundaries should not constrain adaptive actions, and some adaptive actions require regional collaboration. Regional compacts or less formal partnerships with regional entities can assist communities with technical assistance and potential funding. Regional partnerships also are a good way to engage in peer-to-peer learning with communities that share similar challenges. The Alliance of Regional Collaboratives for Climate Adaptation provides the context for many parts of the state to foster learning, allow for collaborative pursuit of funding opportunities, and develop private sector adaptation support.[10]

City of Oakland, Oakland Climate Action Coalition

The Oakland Climate Action Coalition (OCAC) formed in 2009 with 30 organizations, including those addressing issues such as sea level rise, environment, public health, and social justice. OCAC started with the intention of elevating voices seen as missing from Oakland's initial climate actions, and it has matured into a leading organization that provides a platform for the community promoting and supporting climate action. It has also been part of partnerships with regional and international entities (e.g., BCDC and the Kresge Foundation).[11, 12]

IMPLEMENTATION OUTREACH

When the adaptation planning is complete and the plan is approved, the transition to implementation can be celebrated with a fun, public event. Such an event is an opportunity to honor stakeholders and their role in the process and is the next step of implementation. The event should be planned with those already engaged in the process, but this is also an opportunity to identify stakeholders that have not been involved and could be important voices and partners during implementation. This includes communities most likely impacted by one or more points of vulnerability or affected by the strategies that have been prioritized for implementation.

Implementation strategies can and should build on the actions recommended in Phase 3. In this case, rather than asking community members to help brainstorm adaptation measures, community members can be asked for help supporting and bolstering implementation and supporting monitoring. During engagement, the project team can share ongoing progress of adaptation actions and their resulting benefits. Communities can be sought in the following roles:

- Collaborators in education.
- Participants and facilitators of tours of adaptation projects as they are implemented.
- Recipients of surveys to assess effectiveness and social acceptance.
- Receptors or generators of online updates of adaptation progress.
- Participants or leaders of pop-up booths at locations illustrating adaptive action or community events.

Communities can ensure ongoing support for adaptation by maintaining outreach efforts. Climate adaptation requires ongoing, long-term commitment despite the changes in elected leaders. When people are informed about and involved in adaptation strategy development, implementation, and monitoring, they are more likely to call on local leadership to continue support for that. In the best cases, local agency staff and local organizations are partners during the implementation process.

City of Oakland Community-Based Climate Adaptation Planning

The Pacific Institute report conducted in collaboration with OCAC, *Community-Based Climate Adaptation Planning: Case Study of Oakland, California*, identifies methods of engaging frontline communities in the implementation process—from the way that climate change is discussed to the methods that communities use to participate in implementation.[13] Two of these methods are: 1) an appointed task force of stakeholders from throughout the community who make recommendations about implementation, and 2) a community-initiated coalition, that is, a coalition of community groups who make recommendations collaboratively.

IMPLEMENTATION FUNDING

Strategies must be funded regardless of how they are implemented, or the planning mechanisms used. Funding and financing sources can include local general funds, bonds, taxes, assessments, fees, grants, private sector partnerships or investments, non-profit grants and partnerships, among others. The state has many grant programs to support location adaptation actions funded through cap-and-trade. The Adaptation Clearinghouse's "Investing in Adaptation" web page lists many funding opportunities by adaptation sector and has guidance on conducting fiscal analyses of adaptation strategies.[14] It is regularly updated as funding sources evolve. The California State Library also lists funding opportunities resulting from recent legislation.[15] *Climate Adaptation Finance and Investment in California* also has guidance on funding adaptation measures intended for local government staff. The *Regional Resilience Toolkit* includes steps for identifying and gathering adaptation funding sources.[16] Some federal sources, such as FEMA's Hazard Mitigation Grant Funding (HMGP) and Building Resilient Infrastructure and Communities (BRIC) programs can be used to fund and finance adaptation actions. Many communities across California have historically used federal funding for these activities. Non-profit funding sources may also be available.

Local agencies often rely on their general fund for partial or full funding of implementation since they control it and using it does not rely on local ability to receive grant funding or raise new capital. However, local agencies often have limited general funds and competing needs for its use.

In cases where a community does not have general funds, staff, or other funding resources to implement all adaptation strategies, it can be helpful to rank strategies by how important it is to enhancing climate resilience and by the local capacity to fiscally support implementation (refer to Task 1.2). Strategies can be classified based on whether current support of a strategy would require 1) no budget adjustment, 2) reallocation of funds, or 3) new and/or external funding.

City of Goleta: Coastal Hazards Vulnerability Assessment and Fiscal Impact Report

The City of Goleta's Vulnerability Assessment includes a fiscal impact report that not only details ways in which climate change may affect Goleta, but also specifically assesses the impact of climate change and adaptation measures on economic and fiscal resources. This includes the value of threatened assets and the expense associated with various adaptation measures and estimated city liability for vulnerabilities. This evaluation provides critical transparency to all community members. The report also includes identification of potential sources of funding to support the adaptation measures identified.[17]

Moulton Niguel Water District: Long Range Financial Plan Report

This assessment covers future water availability and the fiscal considerations needed to ensure water supply—from debt management, to changes in the cost of water, to future demand—and available funding sources such as the general fund and CIP financing. These considerations include assessments reaching 10 years into the future. Similar to Goleta, this report transparently addresses the provision of water for the community relying on the Moulton Niguel Water District.[18]

Blue Lake Rancheria Tribe Climate Change Adaptation and Mitigation

The Blue Lake Rancheria Tribe, located in Humboldt County, is rural and geographically isolated. Local climate change effects include heavy rains, high winds, flooding, and landslides across key transportation corridors, in addition to large wildfires. These hazards create vulnerabilities in the energy supply network, as the community connects to the larger PG&E grid and obtains diesel fuel from outside of the region, which can both be disrupted from climate change hazards. The Blue Lake Rancheria Tribal government determined that developing a microgrid system to service their community would be a high priority project to increase energy resilience in the community. The tribe partnered with the Schatz Energy Research Center and PG&E and received funding from the California Energy Commission Electric Program Investment Charge, to complete a low-carbon community microgrid powered by a 500-kilowatt solar photovoltaic array with associated battery storage. When the surrounding regional energy network goes down, the microgrid allows the tribal government offices, economic enterprises, supporting infrastructure, and certified American Red Cross Center to continue functioning as needed.[19]

OPR's *Climate Adaptation Finance and Investment in California* includes a chapter on funding and financing implementation with guidance for local governments regarding options for bonds and taxes. It also includes grant programs by sector. It is intended to provide a survey of issues, considerations and sources of funding that can help guide strategies and tactics for investing in adaptation and resilience in California.[20]

In times of economic downturn or limited local budget, collaboration with regional partners can result in joint planning and resource sharing activities, as well as cooperative purchasing agreements to support implementation. The Alliance of Regional Collaboratives for Climate Adaptation (ARCCA) provides ways for communities in many parts of the state to collaborate, limit costs, and achieve effective adaptation measure development and implementation.

AECOM partnered with Resources Legacy Fund to produce *Paying for Climate Adaptation in California: A Primer for Practitioners*, a report that synthesizes information local decision-makers need when thinking about funding and financing climate adaptation. The report offers a foundational understanding of existing constraints

and opportunities and recommends ways cities, counties, water districts, utilities, state agencies, private companies, and other entities can make adaptation and resilience investments.[21] The AECOM report categorizes funding opportunities into:

- **Grants and assessments.** Grants, such as planning grants that help fund acceleration of affordable housing production and streamline housing approvals, can be obtained for entities at all levels of government, and assessments rely on property owner. Both of these require high local capacity.
- **Taxes.** Taxes primarily require payment by property owners. Different taxes are subject to various rules and requirements but may be a good option for certain adaptation strategies.
- **Fees.** Fees rely on users to generate the funds to support adaptive measure implementation. In many cases, there are strict rules regarding where such funds may be spent.
- **Private involvement.** There are a variety of ways in which the private sector can be involved; however, there is less consistency between examples save for a common private investment for public benefit.

Resources such as Blue Forest Conservation's *Forest Resilience Bond*, the CEC's *Characterizing Uncertain Sea Level Rise Projections to Support Investment Decisions*, *Finance Guide for Resilient By Design*,[22] *Transit Resiliency Funding Opportunities*,[23] and others all provide guidance, suggestions, and ideas to guide funding to support adaptation strategy implementation. Funding is a dynamic component of adaptation planning. Many of the foundational funding sources are familiar, such as general funds; others, such as new grant programs or green bond financing, emerge on an ongoing basis. Many of the websites and resources summarized in this section, particularly from the State of California, such as the Adaptation Clearinghouse, allow communities to track the emergence of these resources.

Example: San Francisco Bay Restoration Authority Nine-County Parcel Tax

This tax of $12 per year per parcel provides $25 million annually for 20 years to support restoration of San Francisco Bay habitats. The tax passed in 2016 with 70 percent support to address sea level rise and extreme storms, bay access, habitat restoration, and wildlife protection.[24, 25]

In cases where an adaptation strategy requires construction of a physical asset typically included in a capital investment plan, the asset can be included in the annual or biennial planning process, which are better equipped for financing larger projects. An effective way to support implementation—whether using the capital investment plan or local general fund—is to demonstrate the fiscal benefits from loss avoidance and improved public safety. It is almost always less costly to address climate impacts or hazards ahead of time rather than responding after they happen.

Step 4.2: Monitor

Climate conditions continually change, as do science, community characteristics, regulations, technology, and other factors that affect adaptation needs. Monitoring is critical to ensure that the chosen strategies to address community vulnerability continue to be as effective as planned. For each adaptation strategy, one department should be designated as the responsible agency for carrying out monitoring activities, including storing monitoring data. In many cases, this also requires designation of a dedicated funding source for monitoring activities. The responsible agency can be a jurisdictional department, regional entity such as a council of governments, or a community group. If a community group, a specific memorandum of understanding should be established between a jurisdictional department or regional entity and the community group to ensure ongoing data collection and data quality. There should also be a designated department that gathers and compiles all the monitoring data from all the monitoring entities to conduct an overall assessment of effectiveness.

Monitoring is the easiest and most cost-effective when using an indicator that is already collected as part of day-to-day operations. During strategy development and prioritization (Phase 3), the indicator to be monitored should be identified. It should reflect the impact being addressed, the desired outcome, and the specifics of the individual strategy. Identified indicators should be collected at a prespecified interval—at least annually, although more frequent collection rates may be necessary (such as event frequency or tide height). Example indicators include signals of the impact being addressed, such as beach width, mean high tide, flood frequency and peak flow, or fire frequency and intensity; the desired outcomes, such as asthma rates, days missed from work or school, air quality, or climate hazard losses; and specifics of the strategy, such as structural condition of mitigation or days and frequency of closure or service disruption (roads or other assets).

MONITORING AND OUTREACH

The results of monitoring efforts should be reported regularly to the public to maintain awareness of effectiveness and local adaptation needs. Communities can publish a regular adaptation report to the public, place the information on an interactive website that is regularly updated, or report the results through other means. The cities of Encinitas, Burlingame, and Richmond all provide examples of municipal efforts for communicating implementation progress. This type of transparency is critical to keeping the community engaged in the ongoing challenge of adaptation. In particular, this data should be available and communicated to community members who are expected to be most susceptible to climate-related issues. Some sample actions are:

Example: City of Arcata King Tide Community Observation

The City of Arcata has developed a website where community members can participate in the collection of visual data on water levels during "king" tides. The website asks community members to take photographs of the bay, creeks, and streams and upload them to the website, creating collective visualization of high water levels.[26]

- Document lessons learned during the planning process and ensure that future planning processes take the lessons into consideration.
- Have a community advisory board lead monitoring and review of the plan, or partner with a university or college program to do this.
- Identify mechanisms for holding agencies and departments accountable.
- Use "open data" online platform approaches to sharing climate, project implementation, and equity information with community members.

Step 4.3: Evaluate

Strategies are evaluated because the increasing severity of climate change and changes in community characteristics cause continually changing levels of effectiveness. Monitoring is the first step in adjusting to these changes. The monitoring data should be analyzed and evaluated to identify if and how a strategy no longer meets community needs. This evaluation should focus on what the community sees as the goal of the adaptation strategy, so that effectiveness can be assessed based on community need. When a strategy is identified as losing effectiveness, a series of steps are needed to plot a path forward. State legislation may also trigger a re-evaluation of the vulnerability assessment and adaptation strategies.

When a strategy loses effectiveness, the vulnerability and susceptibility of the people, resources, assets, or operations it affects should be reassessed. It is most practical to keep the focus of the reassessment as narrow as possible—a new, comprehensive vulnerability assessment is not always necessary. When updating a vulnerability assessment—whether individual scores or the entire analysis—the first priority is to review any scientific updates and changes to community characteristics. The Intergovernmental Panel on Climate Change updates its periodic summary of climate science and global adaptive needs every five to seven years.[27] The state issues an updated *Safeguarding California Plan* periodically with updated science and state conditions, and conducts a new *Climate Change Assessment* every few years.[28] There are also many regional assessments emerging from universities and regional agencies or nongovernmental entities. All these reports may have updated science and other useful information.

Another source for new or improved data is datasets or studies prepared in the aftermath of climate-exacerbated hazards, such as fire or flooding. These resources often combine local social conditions and context with bio-geophysical factors that contributed to the experienced hazard event.

As community planners know, community characteristics change over time. When an adaptation strategy loses effectiveness, it is critical to assess whether or not changes in the community have altered the experienced climate change effects, increased the vulnerability of any populations or assets, or made any additional community members or assets susceptible. For example, if a growing community has increased its level of development and associated impervious surfaces, it may have also increased its flood risk. The community should assess if the escalating risk disproportionately affects any specific populations or locations. County health departments are a key community ally in identifying changes to the population characteristics and to overall health indicators.

EVALUATION AND OUTREACH

Community outreach and education programs about evaluation can be a very effective way to engage community members in efforts to shift course in adaptation strategies. Include the public by, at a minimum, disclosing evaluation outcomes transparently. This leads to a better understanding of the finite nature of any single adaptation strategy. It is also possible to include community organizations or committees in the assessment and evaluation of monitoring data. More direct participation fosters better understanding across more of the community, and it should include disproportionately affected or frontline communities in these efforts. Some sample actions are:

- Define and regularly measure a series of equity-related indicators.
- Develop a reporting system (e.g., online) to communicate results for the equity-related indicators through time.
- Ensure clear avenues for recourse and accountability of project implementation.

Step 4.4: Adjust

Evaluation of monitoring data following measure implementation may reveal the need for adjustment, which could trigger the strengthening of a strategy or an entirely new approach to the vulnerability. Each strategy should be evaluated carefully to assess the extent to which it can be bolstered to address increasing impacts of climate change and the extent to which it precludes strategies that may more effectively address the impacts. Such assessments should take place during the first couple of years of implementation of any strategy so that potential strengthening and compatibility with other strategies are known from the outset, making for smoother adjustments based on indicator evaluation. For example, strengthening a sea wall or flood wall may make retreat or accommodation strategies more difficult to pursue; however, in many cases, initially bolstering a physical barrier can give a community time to set up strategies that accommodate higher sea or flood levels. Once those are in place, the physical barrier should give way to the accommodation strategy (see Table 13). Evaluation of monitoring data can help communities determine when such transitions should take place.

Strengthening a strategy varies widely by strategy, from changing the speed of implementation, to altering its location, to revising the implementation mechanism. The changes to strengthen a strategy should be identified as part of the initial implementation, and the indicator being monitored should be tied to pre-identified points where strengthening may be required.

As well as evaluating strategies for the extent to which they can be strengthened, they should be evaluated for their compatibility with potentially more effective strategies. In many cases the strategies that are potentially more effective take longer or cost more to implement, making them better suited to be a longer-term strategy that can be implemented after priority strategies are put into effect. Choosing when to shift to the longer-term strategy is more easily managed when specific triggers for the shift are identified ahead of time (see Table 13).

TABLE 13. EXAMPLE OF BEACH EROSION ADAPTATION OPTIONS

RISK	ACTIONS	LEAD TIME	ADAPTATION OPTIONS
Beach Erosion	Protect	5–10 years	Beach and dune nourishment
		10–15 yrs	Raise and Improve sea walls
		15–20 yrs	Sand retention strategies
	Accommodate	5–10 yrs	Elevate structures
	Retreat	15–20 yrs	Relocate public infrastructure

Source: Environmental Science Associates, City of Del Mar Sea-Level Rise Adaptation Plan, prepared for the City of Del Mar, August 2016, updated May 2018, https://www.delmar.ca.us/DocumentCenter/View/3580/Revised-Adaptation-Plan-per-Council-May-21.

ADJUSTMENT AND OUTREACH

Communicating with the community and inviting its collaboration throughout the implementation process, both before and during adjustment, are critical to sustaining ongoing adaptation. A community should not be surprised by changes in approach, which should be communicated consistently as a normal part of long-term climate adaptation strategy implementation. Without appropriate inclusion of the community throughout the process, changing a strategy could be viewed as abandoning it or as a failure of implementation rather than as a successful outcome of good monitoring and evaluation. Sustained engagement with the community and transparency in monitoring and evaluation can help avoid such misunderstandings, which can lead to community dissatisfaction with adaptation actions. Additionally, community inclusion can supplement the selection process for the new or bolstered strategy.

Some sample actions are:

- Ensure that lessons learned and outcomes from review and monitoring of implementation are publicly available.
- Use data to inform plan updates and/or make any needed course corrections.
- Develop materials allowing for pop-up events to solicit feedback and ideas for strategy adjustment when needed.
- Collaborate with the community to update strategies and program implementation based on lessons learned from monitoring.

Phase 4 Wrap-Up

Adaptation planning work does not end when the plan is finalized. Communities must implement the plan, monitor and evaluate its effectiveness, and adjust the plan in response to feedback and changing conditions. It is important to determine funding, timing, and responsibility as part of this work. And as with all other phases of adaptation planning, community engagement is critical. Adaptation planning is a cyclical process, and the adjustment work in particular involves revisiting or redoing previous phases. With a robust and ongoing adaptation planning effort, communities position themselves to better resist a changing climate so that they can continue to thrive.