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PRIORITIZATION TOOL GUIDEBOOK

Holistic Implementation of Adaptation and Transportation Resilience Strategies

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1

ABOUT THIS PRIORITIZATION TOOL



This section describes the history and purpose of the Prioritization Tool and this Guidebook.

WHY CREATE THIS PRIORITIZATION TOOL?

As part of the Holistic Implementation of Adaptation and Transportation Resilience Strategies Project, the San Diego Association of Governments (SANDAG) and its project partners prepared a suite of resources intended to fulfill the needs and opportunities identified in the [Regional Adaptation Needs Assessment](#) (Needs Assessment) (SANDAG 2020) and make adaptation planning more accessible to local planning staff, practitioners, and decision makers. The resources include the Prioritization Tool (Tool) and this companion Guidebook, the Evaluation and Implementation Toolkit (Toolkit), an Economic Guidance Document, and an Equity Guidance Document.

The goal of this Tool is to make the process of narrowing down potential adaptation strategies and priority actions more transparent. By providing a deliberate way of evaluating climate adaptation and transportation resilience strategies, this Tool helps to avoid the “black box” approach of prioritizing preferred strategies and supports informed implementation. In addition, the Tool facilitates stakeholder engagement by including an organized way to discuss trade-offs between strategies from a variety of perspectives. This structured discussion can also help identify gaps in a particular strategy and provide an opportunity to make the strategy more holistic based on the diverse values, priorities, and expertise of the stakeholders and community members involved. Ultimately, this Tool will help achieve consensus around priority strategies, which will improve the likelihood of successful implementation.

WHAT IS THIS PRIORITIZATION TOOL?

A multicriteria analysis or evaluation is a qualitative analytic approach that can provide insights into how communities and jurisdictions make strategic decisions when there are multiple objectives (or criteria) to consider, and when

the costs, benefits, or impacts of a particular strategy are difficult to quantify. This Tool takes the form of a multicriteria evaluation, where the criteria reflect the three pillars of sustainability (equity, economy, and environment), in addition to feasibility and robustness. Thus, each adaptation strategy will be evaluated based on criteria that fall within the following categories: Equity, Economy, Environment, Feasibility, and Robustness. This will enable project participants to qualitatively evaluate adaptation strategies against each other, to better understand co-benefits such as equity and economic considerations, and to balance other local priorities.

The Prioritization Tool is...

- ✓ A checklist of factors to consider when selecting adaptation strategies
- ✓ A method for transparently making decisions and identifying trade-offs

The Prioritization Tool is not...

- ✗ An algorithm or mathematical equation that will assign quantitative value to a strategy

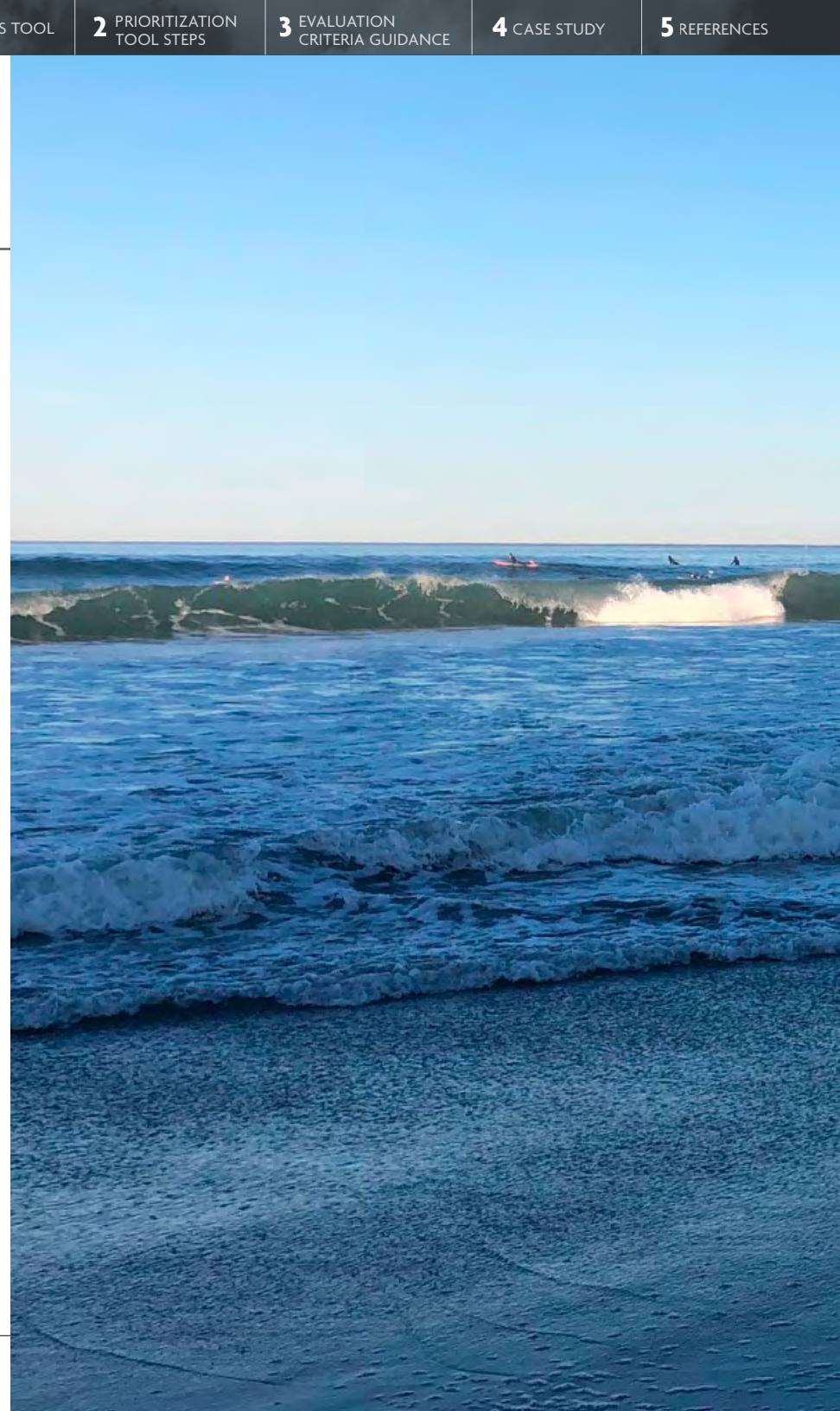
Rather than require extensive outside resources and information, this Tool was designed to rely on expert judgment. Expert judgment is an approach for gathering informed opinions from individuals with particular expertise. Expert judgment can be used to obtain a rapid assessment of a topic and is often used in many decision-making tools when there is not enough time or resources to undertake a full study. While expert judgment is a valuable technique, it can be subjective. Therefore, it is important to have a range of experts, local stakeholders, and community members involved in the Tool process. The results of the Tool should be presented with this context in mind.

WHO SHOULD USE THIS TOOL?

This Tool was prepared for planning staff and stakeholders involved in local and regional adaptation planning, natural resource management, and/or transportation and infrastructure planning in the San Diego region. Anyone who is tasked with deciding adaptation planning strategies, including what strategy to implement and why, will find this Tool useful. The Tool was designed to be applicable to all potential climate change impacts.

WHEN SHOULD THIS TOOL BE USED?

The Tool can support a range of planning processes that require identifying preferred adaptation strategies (e.g., General Plan, Climate Adaptation Plan, Capital Improvement Plan). Prioritization is identified as “Step 3.4 Prioritize” in the approach laid out in the [California Adaptation Planning Guide](#) (APG) (CalOES 2020). Therefore, before using the Tool, you should complete the prior APG steps, such as conducting a vulnerability assessment (Steps 2.1–2.4) and developing a list of adaptation strategies (Step 3.3). The project team should come to the Tool with a list of 5 to 10 potential adaptation strategies that they wish to evaluate and prioritize. The APG and the HIATRS Toolkit provide more information on how to draft adaptation strategies that lay a clear path to implementation and include examples. In general, the more specific the adaptation strategy, the easier it will be to evaluate using the Tool.



2

PRIORITIZATION TOOL STEPS



This section provides an outline of the Prioritization Tool steps.

Staff and stakeholders should use the Tool and do their own rapid evaluation. It is important to get feedback from outside of the core project team, especially from those representing frontline communities, because they will most likely evaluate the strategies differently. To develop an effective implementation approach, it is essential to get input on who could assist and what could possibly hinder the implementation of a strategy. The Tool takes the form of a Microsoft Excel worksheet. The Tool and this Guidebook should be used together to evaluate strategies according to these steps:

1 SELECT A PROBLEM/ISSUE TO ADDRESS

Choose a problem statement or key planning issue that you want to address through this process. Refer to your community's vulnerability assessment, as needed. See the Toolkit for guidance and resources on developing problem statements and key planning issues. It is important to select only one vulnerability to allow for relevant comparisons between adaptation strategies.

2 SELECT 5 TO 10 ADAPTATION STRATEGIES FOR PRIORITIZATION

To avoid being overwhelmed with too many options, select 5 to 10 adaptation strategies that address the vulnerability identified in the previous step for evaluation and prioritization. Refer to the Toolkit for guidance and resources on selecting adaptation strategies, as needed. Strategies should be selected and developed based on input from the community and stakeholders.

3 ASSIGN WEIGHTS TO CRITERIA

Some evaluation criteria may be more important than others in your community. The Tool is designed to allow weights to be assigned to each criterion to reflect local priorities. Remember, when assigning weights, they must all add up to 100%. The Excel sheet provides a box to verify this. Weights should be assigned based on input from the project team, relevant stakeholders, and the community and should reflect these values and goals. Using weights can be an important way to distinguish strategies and affect strategy scoring and ranking. The Tool begins with an equal weighting across all criteria of 5%. A criterion's weight can be increased (above 5%) if the community determines it is more important or reduced (below 5%) if it is less important.

4 EVALUATE THE PERFORMANCE OF EACH ADAPTATION STRATEGY ACCORDING TO CRITERIA

Section 3, Evaluation Criteria Guidance, provides detailed instructions on how to rate each criteria from 3 to 1, where 3 indicates that the strategy meets the criteria, 2 indicates that it has a neutral effect, and 1 indicates that it does not meet the criteria. Remember that the criteria were designed to require minimal outside information and instead rely on expert judgment.

During this step, keep in mind that there are two potential ways to evaluate criteria. First, one strategy could be evaluated at a time (considering all the criteria by moving along the row). Or alternatively, multiple strategies could be evaluated at a time (considering one criterion at a time by moving down the column). Evaluating multiple strategies by one criterion may help capture relative ratings/comparisons. However, there is no right or wrong approach, and in many cases staff and stakeholders will use both evaluation techniques to understand differences within and across strategies.

5 SCORE AND RANK THE ADAPTATION STRATEGIES

After a strategy has been evaluated across all criteria, the Excel document will automatically calculate a total score. Once all the strategies have been scored, complete the “Ranking” column by ordering strategies from highest to lowest score and inputting numbers 1 through X (X = the total number of strategies being evaluated) to reflect the placement or priority of each strategy (the Excel “sort” function can sort the strategies from highest to lowest total score). Note that the score in and of itself is not important; however, the relative scores indicate which adaptation strategies are preferred for implementation (these will have the higher scores and rankings). Higher scores typically represent more equitable, economically beneficial, environmentally beneficial, feasible, and robust strategies.

The scores also provide a sense of how well a strategy performed across the criteria. And while there are no fixed thresholds, strategies with a total score below 2 indicate that they performed neutrally or poorly for most criteria and likely should not be prioritized for implementation without significant reconsideration and modifications. Since a total score of 2 indicates a truly neutral impact strategy, strategies with scores around 2 should be reviewed for opportunities for improvement. A higher total score, closer to 3, indicates that a strategy performs favorably across the criteria and represents a holistic approach to adaptation. These strategies should be prioritized for implementation and may only need minor modifications. However, no matter how well a strategy scores, it should always be vetted by members of the public multiple times throughout the planning process.

SCORE INTERPRETATION GUIDELINES

TOTAL SCORE	<i>Less than 2</i>	<i>Equal to 2</i>	<i>Equal to 2</i>
NEXT STEPS	<ul style="list-style-type: none"> Performed negatively or neutrally across the majority of criteria Should not be prioritized without significant modification 	<ul style="list-style-type: none"> Performed neutrally across the majority of criteria Should be modified before prioritization 	<ul style="list-style-type: none"> Performed positively across the majority of criteria Should be prioritized for implementation

As one might expect, different people may score the same adaptation strategy differently. That's ok! The purpose of the Tool is to reveal these differences in values and priorities and facilitate a transparent conversation. Depending on how the adaptation project is structured, the project team should meet with

the advisory and/or working group consisting of key experts and stakeholders to discuss the results from the Tool and the merits of the various adaptation strategies, and highlight where there is agreement and disagreement. At first, the group may not reach consensus regarding the preferred adaptation strategies for implementation; however, the project team can ask questions to inform next steps, such as the following:

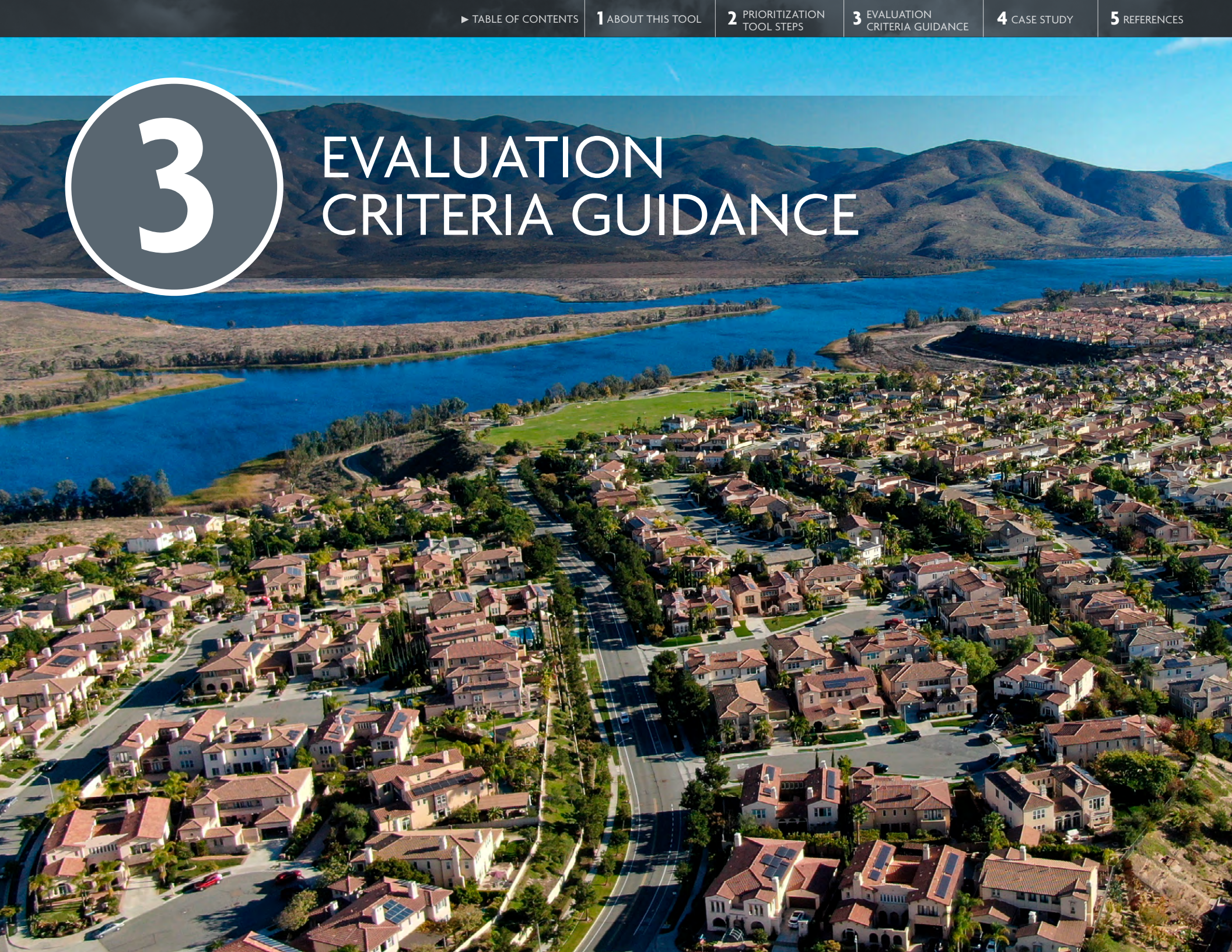
- Is there additional information we need to properly evaluate and compare specific strategies?
- Can we revise specific strategies so that they are more feasible and/or more clearly address particular priorities?
- How are the weights impacting the scores and does this accurately reflect the community's vision?
- Do we agree on the preferred strategies? If so, who would lead these strategies and what support from others is needed? If not, do we need to revisit the project goals to better understand which strategies best achieve the shared vision?

In this way, the Tool is a cornerstone of the outreach and engagement effort because it pinpoints important discussion topics. Discussion about the preferred strategies for implementation may take more time than initially expected and may require additional information and meetings, but acceptance by key stakeholders is crucial to getting strategies through to implementation. Communities that take ownership of strategies in the planning phase create political and fiscal buy-in. Thus, the results of the Tool and subsequent discussions help create the bridge from strategy development to implementation.

See further discussion on the interpretation of evaluation scores in Section 4, Case Study.

3

EVALUATION CRITERIA GUIDANCE



This section explains how the evaluation criteria were developed and provides guidance on how to consider strategies as having positive, negative, or neutral effects on the criteria.

HOW WERE THE CRITERIA DEVELOPED?

Multicriteria analyses score or rank strategies according to evaluation criteria. In this case, the evaluation criteria have been developed and standardized to enable a regionally consistent approach. The criteria can be used to assess the feasibility of implementing a strategy; the economic, environmental, and equity effects of a strategy; and the robustness of a strategy. Climate adaptation is a multidisciplinary practice; therefore, assessing co-benefits or trade-offs is important.

The evaluation criteria included in the Tool were developed based on similar evaluation exercises from around the world, including triple bottom line sustainability analysis (e.g., INVEST) (FHWA 2018). In addition, the equity and economic criteria incorporate best practices from other HIATRS project deliverables, the Equity and Economic Guidance Documents, where applicable. The project team also gathered input and feedback from jurisdictions in the San Diego region to ensure that the Tool and its criteria reflect the wants and needs of the region. This input emphasized the need for simplicity and ease-of-use, given the time and staffing constraints that many local jurisdictions face.

Furthermore, the criteria were designed to be consistent with State and Federal guidance on evaluating and prioritizing strategies, including the APG and Regional Resilience Toolkit (FEMA and EPA 2019). Factors recommended by the APG for consideration and evaluation include the following:

- Vulnerability score
- Administrative operability
- Cost
- Funding
- Bond funding
- Effectiveness/benefit
- Efficiency
- Co-benefits
- Environmental performance
- Equity
- Legality
- Responsiveness/appropriateness
- Timing
- Monitoring

The Regional Resilience Toolkit suggests looking at the following four “frames” when prioritizing strategies:

- Society and equity
- Economy
- Environment
- Governance

For organizational purposes, the 20 evaluation criteria in this Tool are divided into the following categories:



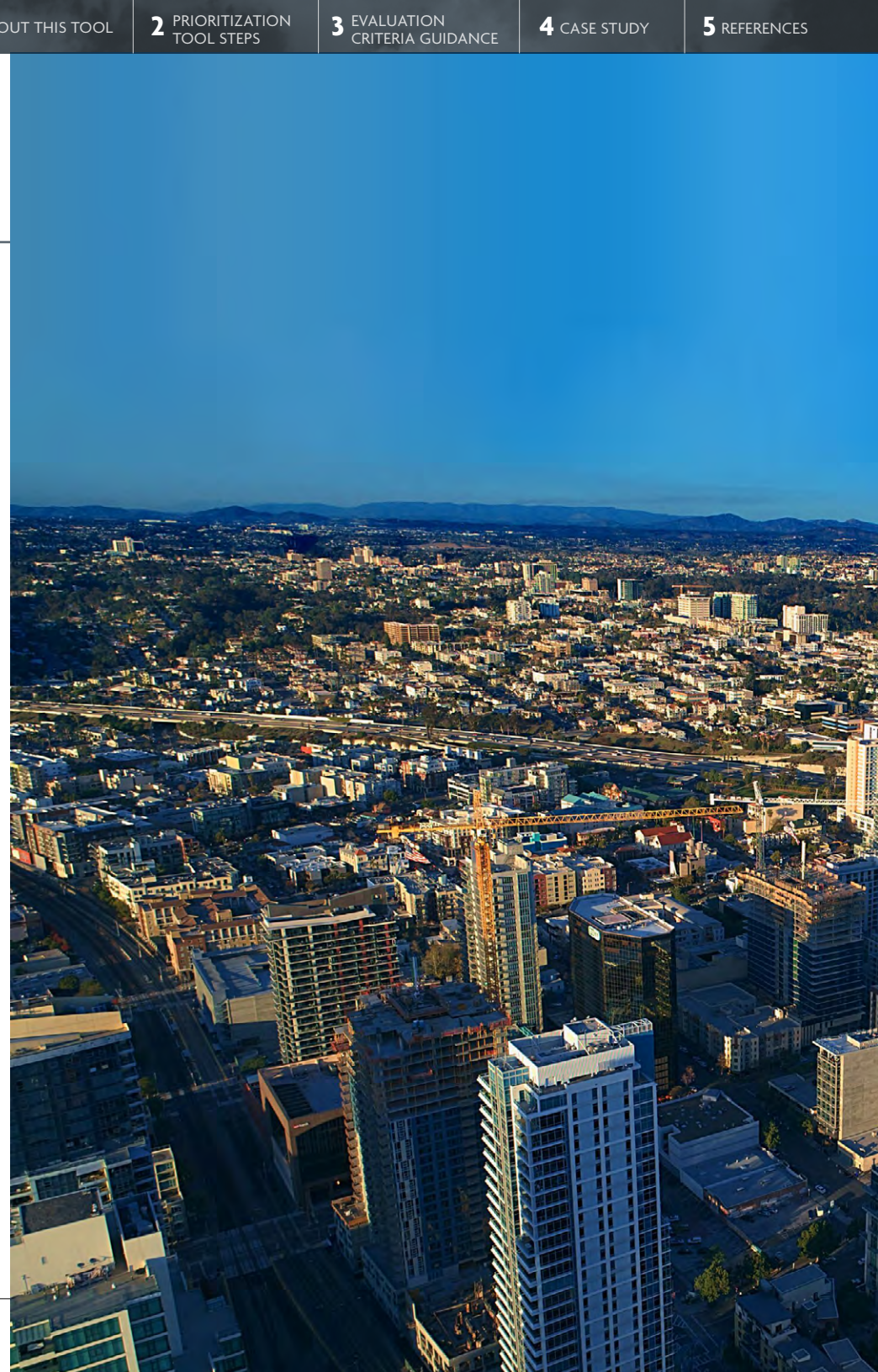
Note that not all categories have the same number of criteria; the criteria were carefully selected to evaluate strategies as comprehensively and efficiently as possible. Criteria in the Feasibility and Robustness categories are of critical importance for this Tool because they have the clearest nexus to implementation (i.e., what strategies can be successfully completed, adopted, and/or built and adapted over time as conditions change). However, the three pillars of sustainability were also considered, and the project team determined that there should be an emphasis on equity criteria.

While consistency within the region and with State and Federal guidance is important, there is no one-size-fits-all approach to adaptation; the criteria included in the Tool should be seen as recommendations, not rules. In some cases, a jurisdiction may choose to make modifications to the evaluation criteria based on their specific local goals and objectives. Not all criteria need

to be applied; rather, criteria should be chosen based on local context. Criteria should be relevant; otherwise staff and stakeholders will be discouraged from using it. By removing (or adding) evaluation criteria to the Tool, you can reflect your own jurisdiction's hazard profile and vulnerable communities. Weighting also provides an opportunity to tailor the criteria to match your jurisdiction's values. Regardless of modifications to the criteria, it is important that all strategies are scored against the same set of criteria to ensure a consistent evaluation (see example in Section 4).

HOW SHOULD THE CRITERIA BE EVALUATED?

The following sections provide guidance on how to consider and evaluate the strategies as having positive, neutral, or negative effects on the criteria (3, 2, or 1, respectively). To be clear, there is no 0/NA score. If a specific criteria is irrelevant to the strategy, it is assumed the strategy has a neutral effect on the criterion.





EQUITY

Not all climate impacts will be felt evenly across all segments of the population. The effects of climate change—including rising temperatures in urban areas, more polluted air, and the increasing frequency and intensity of extreme storms—will disproportionately affect overburdened and low-income people and communities who are already facing significant economic and social challenges. As described in the Equity Guidance Document, “climate equity” recognizes the disproportionate burden of climate change impacts on marginalized communities. The Equity Guidance Document states that the high-level goal of equitable adaptation is to “enhance marginalized communities access to the services, infrastructure, and livelihoods required to sustain their well-being and potential for improvement, rather than exacerbating their vulnerability.” In addition, intergenerational equity promotes a fairness amongst generations in the use and conservation of the environment and its resources. This is particularly pertinent for climate change because future generations will inherit the choices and actions made today. An equity-first approach to climate adaptation recognizes the disproportionate impacts of climate change due to factors such as structural racism, income and wealth, access to resources, representation in government, renter status, health status, age, neighborhood conditions, and gender.

The Equity Guidance Document provides additional information on incorporating equity into adaptation planning as well as a suite of questions to ask throughout the process to ensure that equity is appropriately incorporated into the various planning stages. The evaluation criteria described below is based on this guidance. **Table 1** provides a summary of equity evaluation considerations.

1 Incorporate distributive equity?

Distributive justice refers to how the benefits and risks of activities are distributed, i.e., what is being distributed and to whom. Distributive equity applies strategies evenly across a jurisdiction. It does not recognize issues of historic disinvestment, existing pollution and environmental harms, or existing economic hardships. Different theories have suggested different approaches to the distribution. For example, a utilitarian principle would prescribe a distribution that could maximize the utility of all, while a Rawlsian model of distribution would aim to help the least well off. Since the utilitarian calculus is blind to people’s income, race, and so on, the current distributions of burdens and benefits are not accounted for. **Strategies that treat all people and places the same and facilitate equitable access and distribution of benefits and burdens meet this criterion, while strategies that concentrate resources to a few specific people and places do not.**

2 Encourage recognition/structural equity?

Recognition/structural equity is the acknowledgment that historic injustices have led to structural inequalities, including but not limited to social, economic, environmental, and racial inequalities. Consider how the approach to adaptation recognizes structural inequalities, seeks to correct past harms, and prevents future unintended consequences to marginalized groups disadvantaged by structural inequalities (e.g., tribal communities, migrants, refugees, asylum seekers, and other historically impacted communities). Adaptation done well can help direct resources to communities that have experienced racism, chronic disinvestment, high pollution burden, high unemployment, and more. **Strategies that recognize and rectify structural inequalities in policies, procedures, and the distribution of resources meet this criterion.**

3 Incorporate procedural equity?

Procedural justice is about the conditions under which a decision has been reached and it is concerned with fairness in planning and decision-making processes. It is often measured by the degree of recognition, participation, and transparency in the decision-making process. Inequities are often imbedded in the decision-making process and can result in an unfair allocation of resources (distributive equity), exacerbating existing inequalities. Procedural equity recognizes this and involves creating outreach and engagement approaches that are fair and inclusive and consider the needs of the community and potential barriers to participation. Means to encourage procedural justice can range from public presentations or workshops scheduled at convenient times for the community (and may offer additional services, e.g., childcare, interpretation), surveys, questionnaires, interviews, or community committees. Planners should ensure they heard from a representative population. This means outreach participants should reflect the demographics in the community in race, gender, educational attainment, experience of disability, etc. **Strategies that have robust engagement that specifically include marginalized communities meet this criterion, while those without a history of engagement do not.**

4 Incorporate interactional equity?

Interactional equity recognizes interpersonal power imbalances and creates fairness between parties through honest information sharing, respect, and accountability. Note the language spoken in the community and/or whether non-technical language has been used. Additionally, think about power dynamics in engagement. Consider how the community has been involved in developing a particular adaptation strategy, especially marginalized communities, communities of concern, frontline communities, or other populations that may be disproportionately burdened by the impacts of climate change. It is critical that the communities that will be impacted by an adaptation strategy be involved from the onset. Evaluate strategies according to the degree to which the decision-making process is transparent and includes diverse voices, values, and viewpoints. **Strategies involving outreach and engagement centered on trust and sharing ideas, avoiding tokenism, and considering power dynamics between community and perceived authority meet this criterion.**

TABLE 1: SUMMARY OF EQUITY CONSIDERATIONS

PRIORITIZATION CRITERIA	<i>Agree (3)</i>	<i>Neutral (2)</i>	<i>Disagree (1)</i>
1. INCORPORATE DISTRIBUTIVE EQUITY?	Directs benefits and burdens evenly	Directs benefits and burdens to some, but not all, communities	Concentrates resources to a few specific people and places
2. ENCOURAGE RECOGNITION/STRUCTURAL EQUITY?	Rectifies inequalities for marginalized communities	Neither rectifies nor perpetuates inequalities	Creates new inequalities or reinforces existing harms
3. INCORPORATE PROCEDURAL EQUITY?	Involves a range of outreach events that includes a representative population and two-way communication	Informs community through informational meetings/events	Excludes communities from decision-making processes; the purpose of any outreach is to change the minds of community members
4. INCORPORATE INTERACTIONAL EQUITY?	Includes power-sharing, and the ability for community members to develop policy strategies and goals of the project; considers local language, culture and needs throughout the process, culture and needs throughout the process	Allows the public to pick from a menu of strategies, but not significantly define the needs and goals of the project and policies; occasionally addresses local context, but not consistently	Ignores and creates conflict with local language, culture, and needs



ECONOMIC

The economic criteria included in the Tool were chosen for their simplicity and their ability to capture a wide range of economic considerations without requiring significant information, resources, or staff time. After using the Tool and prioritizing adaptation strategies, it would be appropriate to perform a detailed economic analysis (such as fiscal impact analysis, benefit-cost analysis, and cost-effectiveness analysis), as described in the Economic Guidance Document. **Table 2** provides a summary of economic criteria considerations.



5 Improve employment and the economy?

Consider how a strategy will impact employment and the economy, including both within the community and the surrounding region. For example, a beach nourishment program that supports the maintenance of a wide, sandy beach can increase tourism-related jobs (e.g., restaurants, hotels) and generate increased sales taxes, hotel taxes, business license taxes, and more. Other strategies may spur technological innovation, thereby improving employment and the economy. **Strategies that would generate new jobs (either short- or long-term) and increase revenues meet this criterion, while strategies that would eliminate jobs and negatively impact the economy do not.**

6 Support regional transportation?

[SANDAG's 2021 Regional Plan](#) (2021 Regional Plan; in progress) includes a goal of access to affordable, reliable, and safe mobility options for everyone. A network of transportation infrastructure moves people and goods throughout the region and links them with neighborhoods, jobs, education, and recreation that are critical to the economy and quality of life in the San Diego region. Major regional transportation systems and routes include highways, major roads, or railroads that cross jurisdictional boundaries (e.g., Interstates 5, 78, 76, 805; the Los Angeles – San Diego – San Luis Obispo rail corridor; the North County Transit District bus yard or Metrolink Coaster Train stations). **Strategies that support regional transportation systems and provide access to affordable, reliable, and safe mobility options meet this criterion, while strategies that reduce goods and commuter movement do not.**



7 Maintain critical infrastructure and community assets? Impacts to critical infrastructure and significant community assets carry the potential for high community disruption and economic repercussions since they often require significant investments. This can include electrical systems, water and wastewater systems, major roads, parks, schools, and more. **Adaptation strategies that maintain critical infrastructure and community assets meet this criterion, while strategies that harm these systems and public services do not.**

TABLE 2: SUMMARY OF ECONOMIC CONSIDERATIONS

PRIORITIZATION CRITERIA	<i>Agree (3)</i>	<i>Neutral (2)</i>	<i>Disagree (1)</i>
5. IMPROVE EMPLOYMENT AND THE ECONOMY?	Creates new jobs and expands the local tax base	No impact on jobs or local tax base	Eliminates existing jobs and harms local tax base
6. SUPPORT REGIONAL TRANSPORTATION?	Improves movement of goods and/or commuters	No impact on the movement of goods and/or commuters	Reduces movement of goods and/or commuters
7. MAINTAIN CRITICAL INFRASTRUCTURE AND COMMUNITY ASSETS?	Protects critical infrastructure and/or community assets	No impact on critical infrastructure and/or community assets	Harms critical infrastructure and/or community assets



ENVIRONMENT

Everything that humans require for their survival and well-being depends, either directly or indirectly, on the natural environment. The environment provides the air we breathe, the water we drink, the food we eat, and renewable and nonrenewable resources on which we depend. Our health, our economy, and our security all require a high-quality environment. Therefore, protecting nature can protect people and deliver climate mitigation and adaptation benefits. **Table 3** provides a summary of environment criteria considerations.



8

Reduce greenhouse gas (GHG) emissions?

The 2021 Regional Plan identifies healthier air and reduced GHG emissions regionwide as a goal. Strategies that support both climate mitigation and adaptation represent a complete and comprehensive approach to climate resilience because they address both the cause and the impact of climate change, respectively. For example, trees and urban forests sequester carbon to reduce GHGs and minimize the impacts of increased temperatures and the urban heat island effect. As society adapts to one challenge, it needs to ensure it does not worsen the other. Therefore, strategies should balance the benefits of adaptation with the additional strain placed on other resources and should specifically be evaluated for how they affect GHG emissions. This is a particularly significant issue for the water-energy nexus; adapting to projected decreases in water supply can either be addressed through energy-intensive measures such as desalination or measures that maximize water conservation (and the energy needed to transport water). **Strategies that support climate mitigation efforts and reduce GHG emissions meet this criterion, those that have no impact on mitigation have a neutral effect, and those that contribute GHG emissions do not meet this criterion.**

9

Utilize a nature-based approach?

Experts have identified the significant role that California's natural and working lands can play in terms of both climate change mitigation and adaptation, and a 2020 executive order calls for the advancement of nature-based solutions to meet California's climate change and biodiversity goals (Executive Order N-82-20). For example, oyster and eelgrass beds, wetlands, and coastal dunes provide shoreline protection by decreasing wave energy and run-up, increasing infiltration, and buffering storm damage, while also providing ecosystem benefits. Strategies that employ nature-based solutions (also known as “green” or “soft” solutions) are often prioritized to receive grant funding. **Strategies that take advantage of natural processes and provide habitat, water quality, and biodiversity co-benefits meet this criterion, while strategies that rely on traditional engineering (also known as “hard” or “gray” solutions) that may inadvertently degrade the environment do not.**



TABLE 3: SUMMARY OF ENVIRONMENT CONSIDERATIONS

PRIORITIZATION CRITERIA	<i>Agree (3)</i>	<i>Neutral (2)</i>	<i>Disagree (1)</i>
8. REDUCE GHG EMISSIONS?	Reduces GHG emissions (sequesters carbon, reduces energy or water demand)	No impact on GHG emissions	Increases GHG emissions
9. UTILIZE A NATURE-BASED APPROACH?	Utilizes a nature-based approach and provides ecosystem benefits	Utilizes a mix of nature-based and gray approaches	Utilizes hard or gray approaches



FEASIBILITY

The degree to which a strategy is possible may be top of mind for many jurisdictions. Some strategies may be relatively easy to plan and implement, while others may involve significant hurdles. **Table 4** provides a summary of feasibility criteria considerations.



10 Within existing capacity?

Given many jurisdictions' constraints on staff time, resources, and technical expertise, the need for new or additional administrative, technical, or legal resources will influence the feasibility of a given strategy. Jurisdictions should consider their own constraints and prioritize strategies that can be planned and implemented with existing resources. Staff might also consider if the adaptation strategy is common practice and straightforward to implement and maintain with existing resources. **Strategies that can be fully planned and implemented in-house with current capacity meet this criterion, while strategies that require significant time and expertise from outside resources do not.**

11 Funded with existing sources?

The costs associated with adaptation strategies are highly variable and can be funded through a range of approaches. In recent years, there has been significant grant funding provided by the State and Federal government to further adaptation. However, obtaining grant funding is often an extensive process in and of itself, and grants can come with limitations in terms of what types of projects they can be used for and when. Therefore, the simplest approach to funding an adaptation strategy would be to align it with existing funding resources. This is another argument for integrating adaptation into existing plans and programs since this approach requires little to no additional funding. **Strategies that can be funded with readily available, existing funding sources meet this criterion; strategies that require new, but known sources have a neutral effect; and strategies that will require significant funding from unknown sources do not meet this criterion.**

12 Accomplish project objectives?

Here, staff should evaluate how well an adaptation strategy meets the project objectives. Consider how the strategy reduces the selected vulnerabilities and advances community goals. **Strategies that meet all the objectives meet this criterion, those that meet some or partially meet the objectives have a neutral effect, and those that do not accomplish the objectives do not meet this criterion.**

13 Consistent with jurisdiction's existing plans, policies, and/or programs?

Consider how the strategy fits into local policy, investment, and other planning cycles. To the maximum extent feasible, adaptation strategies should be designed to integrate climate change into existing policies, programs, and projects. Adaptation strategies that are consistent with other adaptation actions in the same sector or in other sectors can support each other. **Adaptation strategies that are consistent with or require minor modifications to existing local plans, policies, and/or programs meet this criterion, while those that introduce potential inconsistencies and would result in a standalone effort do not.**

14 Consistent with Federal and/or State laws and regulations?

Federal and State laws and regulations affect your choices for adaptation. For example, constructing sea walls to protect structures vulnerable to sea level rise may seem like an obvious solution, but the feasibility of this strategy is constrained by State law (the California Coastal Act), which limits the construction of seawalls. Staff need to consider how the adaptation strategy fits within the framework of Federal and State regulations. **Strategies that are consistent with Federal and State law meet this criterion, while those that are inconsistent do not.**

15 Political support?

Political support is important to ensure a strategy is championed over the long term. Political support and opposition can come from elected officials, senior management, and key stakeholders. Political support may be unknown for emerging strategies that have not been discussed with relevant stakeholders. For these strategies, the level of planning effort and administrative approvals may be used as a proxy. **Strategies with strong political support meet this criterion, while strategies with strong political opposition do not. If political will is unknown, strategies that are minor changes to jurisdictional business (e.g., tree planting requirements) also meet this criterion, whereas strategies that would require large planning efforts and environmental review do not.**

TABLE 4: SUMMARY OF FEASIBILITY CONSIDERATIONS

PRIORITIZATION CRITERIA	<i>Agree (3)</i>	<i>Neutral (2)</i>	<i>Disagree (1)</i>
10. WITHIN EXISTING CAPACITY?	Can be implemented with existing staff resources and expertise	Requires change in jurisdictional design, standard, or services, and would require new training or direction of staff resources; however, has been successfully implemented by early adopters with a clear roadmap	Would require extensive outside resources and expertise beyond current capabilities
11. FUNDED WITH EXISTING SOURCES?	Requires no new funding	Requires new but known funding sources	High one-time or ongoing cost New budget line item or requires outside grant funding from unknown sources
12. ACOMPLISH THE OBJECTIVES?	Accomplishes the objectives	Accomplishes some, but not all the objectives	Does not accomplish the objectives
13. CONSISTENT WITH EXISTING PLANS, POLICIES, PROGRAMS?	Consistent with existing plans, policies, programs	Not addressed by existing plans, policies, programs	Inconsistent with existing plans, policies, programs
14. CONSISTENT WITH FEDERAL AND/OR STATE REGULATIONS?	Consistent with Federal and/or State regulations	Not addressed by Federal and/or State regulations	Inconsistent with Federal and/or State regulations
15. POLITICAL SUPPORT?	Has strong political support or is generally consistent with existing goals and does not require approval by councils or commissions	Decision makers undecided/neutral; however, is not controversial and does not require additional planning work or environmental review	Strong political opposition or could require large planning efforts and environmental review



ROBUSTNESS

Adaptation strategies are considered robust if they address the problem and maintain their effectiveness under different climatic and socio-economic development scenarios. Like many other scientific and policy fields, predictions about the effects of climate change cannot be made with complete certainty, due in part to estimating future emissions and model limitations. However, planning decisions are routinely made based on uncertain assumptions (e.g., changes in land use and to what extent the population will use the transit system). Thus, while climate change adds a different type of uncertainty, it is by no means the only source of uncertainty in planning and investment decisions, and robust strategies should incorporate this uncertainty. In communities that do not prioritize climate-related efforts, robust strategies are also more likely to generate support because they involve co-benefits, are flexible, and address current challenges. **Table 5** provides a summary of robustness criteria considerations.



16

No regrets?

While the scientific community has reached a consensus that the earth's climate is changing, exactly how much change and the rate of change are difficult to pinpoint. Therefore, staff should consider the outcomes of implementing an adaptation strategy if climate change impacts do not occur or occur to a lesser extent than currently projected. No-regret measures are strategies considered worthwhile, independent of climate change considerations. For example, there are positive impacts of wetland restoration, even if sea level rise or increased storm hazards were not to occur. On the other hand, constructing a large seawall surrounding a community would not have similarly positive impacts should sea level rise not occur. Consider how the strategy will perform under a wide range of possible climate futures and what co-benefits would occur and how they align with a broader set of community goals (e.g., cost-savings, air quality improvement, water quality protection, stormwater management, increased public safety, recreation/open space, and public health improvement). **Strategies that will have a positive outcome whether or not climate change occurs meet this criterion, whereas strategies that may have a negative outcome if climate change does not occur do not.**

17

Flexible and/or removable?

In addition to uncertainty surrounding climate change impacts themselves, some strategies represent novel policies, programs, or projects. It may be unclear how exactly a strategy will perform and the ability to change in response to altered conditions is important. For example, the Cardiff Living Shoreline is a pilot

project implemented by the City of Encinitas to address chronic erosion and flood conditions along Coast Highway 101. Because this is the first project of its kind to be implemented in Southern California, the project was designed to be able to be modified should conditions change over time. Consider how easy it will be to adjust the strategy as conditions change over time and more information is known. **Strategies that can be altered or removed without significant damage or cost meet this criterion, while strategies that cannot be easily altered or removed do not.**

18 **Require action now?**

Some vulnerabilities are already concerns and are projected to get worse with climate change. Other vulnerabilities have long lead times for implementation, meaning that project-level planning, funding, and implementing or constructing adaptation strategies may take 30 years and need to be started soon to address future impacts. Staff and stakeholders must consider whether adaptation strategies are urgent planning priorities because they are either needed to address current impacts or because of long lead times. **Strategies that address current problems and have a long lead time need action now and meet this criterion, whereas strategies that address future problems and take a short time to implement do not.**

19 **Coordinate with adjacent jurisdictions?**

Just as the impacts of climate change do not begin and end at jurisdictional borders, neither should adaptation planning. Adaptation strategies implemented in one jurisdiction can have an impact on adaptation in neighboring jurisdictions—either positive or negative. Jurisdictions should consider the impacts of their adaptation choices on adjacent jurisdictions, both for direct neighbors and regionwide, as appropriate. Often, large-scale impacts require regional collaboration to ensure the most effective approach and to avoid maladaptation. **Strategies that dovetail with adaptation efforts in adjacent jurisdictions and support regional planning meet this criterion, while strategies that conflict with adaptation efforts in adjacent jurisdictions and undermine regional planning do not.**

20 **Address multiple hazards?**

Many strategies are cross-cutting and can apply to multiple hazards. For example, accounting for climate change impacts when designing and approving future projects and retrofitting existing projects can address both increased flooding and wildfire hazards associated with climate change. Addressing multiple problems or vulnerabilities and linking different sectors (e.g., water, energy, transportation) with a single strategy can also help increase funding options. **Strategies that address multiple hazards meet this criterion, whereas strategies that focus on a single hazard do not.**

TABLE 5: SUMMARY OF ROBUST SCORING DEFINITIONS

PRIORITIZATION CRITERIA	<i>Agree (3)</i>	<i>Neutral (2)</i>	<i>Disagree (1)</i>
16. NO REGRETS?	Positive outcome even if climate hazards never occur	No outcome if climate hazards do not occur	Negative outcome if climate hazards do not occur
17. FLEXIBLE AND/OR REMOVABLE?	Can be easily adapted to changing conditions	Accomplishes some, but not all the objectives	Does not accomplish the objectives
18. REQUIRE ACTION NOW?	Long lead time (30+ years)	Medium lead time (5 to 30 years)	Short lead time (0 to 5 years)
19. COORDINATE WITH ADJACENT JURISDICTIONS?	Improves opportunities for adaptation in adjacent jurisdictions	No impact on opportunities for adaptation in adjacent jurisdictions	Reduces opportunities for adaptation in adjacent jurisdictions
20. ADDRESS MULTIPLE HAZARDS?	Addresses more than two hazards	Addresses two hazards	Only addresses one hazard

4

CASE STUDY



This case study illustrates how to use the Tool according to the steps outlined in Section 2. While the community described in this example is not real, the vulnerabilities and community priorities described are like those found in San Diego County.

1 SELECT A PROBLEM/ISSUE TO ADDRESS

This case study addresses five extreme heat adaptation strategies in a community where extreme heat is already a concern and is projected to get worse with climate change. The greatest threat posed by extreme heat is health impacts caused by higher temperatures, which will also increase healthcare costs and the costs of business and government across most sectors (e.g., decreased worker productivity in construction). Extreme heat can be particularly problematic for children and older individuals, individuals with existing chronic illnesses, individuals who spend prolonged periods outside, and those who lack effective cooling in their homes or workplaces.

In this community, transit-dependent low-income community members are the most vulnerable to extreme heat. Trees and green spaces are a natural protection against heatwaves, while paved areas contribute to the heat island effect. If canopy cover and green acreage were similar across ZIP codes and/or census blocks in a jurisdiction, then all residents would have comparable protection. However, in this community, low-income neighborhoods have fewer trees and smaller green spaces. In response to heatwaves, households use fans or air conditioners, but for this low-income population, turning on an air conditioner might require a household to reduce expenditures somewhere else (e.g., food, healthcare). Furthermore, these households often depend on mass transit and waiting at a transit stop exposes them to more heat than would be felt using a private vehicle. For these reasons, the community has decided helping transit-dependent and low-income community members deal with current and projected extreme heat is a key planning issue.

This case study also assumes the following:

- The jurisdiction is cost-conscious
- Some community members and decision makers do not prioritize climate change, and little has been done for sustainability and adaptation planning previously.
- The public and decision makers have expressed an interest in improving parks and green space in previous planning efforts.
- There was a range of outreach activities during the general plan update that included a representative segment of the community (e.g. reflective of the demographics of the community including race, neighborhood, educational attainment, experience of disability, educational attainment, etc.). The project team presented a menu of strategies that represented best practices and, while they presented these strategies using non-technical language, community members did not develop their own and instead identified their priorities from this menu.

2 SELECT 5 TO 10 ADAPTATION STRATEGIES FOR PRIORITIZATION

The five strategies included for this case study were selected from General Plans in Southern California. These strategies below were selected for evaluation and prioritization based on input from the community and because they align with the community's previous interest in parks and green space:

1. Tree canopy standards: Modify public construction standards to require the installation of tree canopies consisting of drought-resistant native cultivars that increase overall shade in the public realm to provide areas of respite from high heat, reduce the heat

island effect, and mitigate the built environment's contribution to high heat days. This standard does not specifically relate to critical infrastructure, e.g., evacuation route.

2. Cooling center transportation plan: Work with public and private transportation providers to develop a plan to transport vulnerable transit-dependent, low-income populations to cooling centers during extreme heat events. The plan will be funded by specific grant funds dedicated to provide assistance for marginalized communities.
3. Incentivize cool roofs: Incentivize cool roofs for existing residential and existing/new commercial, industrial, institutional, and similar structures in the Case Study City. Develop user-friendly standards that clearly explain the process and requirements for incorporating cool roof systems in the Case Study City and train all relevant public counter staff in processes and requirements. Consider developing and implementing a white roof project, modeled after the City of New York's, in the communities most highly burdened by heat island impacts. This program is intended for any building getting a new roof and does not target specific community assets, e.g., library, hospital, etc.
4. Pavement material standards: Modify public construction standards to require light pigmentation in pavement materials in areas where local micro-climates show high negative impacts from radiant heat. Heat reflective colors can reduce heat absorption, diminish the heat island impact, and mitigate the built environment's contribution to high heat days. This standard applies community-wide.
5. Bus stop coordination: Coordinate with local transit agencies to ensure all bus stops on frequently used commuter routes include shade structures and the adequate movement of air to safeguard the health and comfort of transit users due to the potential increase in high heat days.

3 + 4 ASSIGN WEIGHTS TO CRITERIA AND EVALUATE THE PERFORMANCE OF EACH ADAPTATION STRATEGY ACCORDING TO CRITERIA

For the purposes of this case study, the discussion of assigning criteria weights and evaluating the performance of each adaptation strategy has been combined. However, weights should be assigned before strategies are evaluated so that they are not used to bias overall evaluation scores. In this way, deciding weights is independent of how strategies are evaluated.

Since the Tool includes 20 criteria and the sum of all the weights must equal 100%, 5% is the "default" weight for a criterion. In other words, if all criteria were considered equally important, they would have a weight of 5%. There are no strict thresholds to determine weights, and weights should be determined with input from all involved. Generally, a weight above 5% indicates that a criterion is a community priority, whereas criteria assigned a weight below 5% are less important. Planners can choose weights based on previous visioning activities and community outreach, or this Tool can be used as part of a stakeholder process where the public determines the weights.

In terms of evaluation, as discussed in Section 3, an evaluation outcome of 3 indicates that a strategy meets the criteria, 2 indicates that the strategy has a neutral effect, and 1 indicates the strategy does not meet the criteria. Planners and the public should use the guidance and summary tables (Tables 1–5) in Section 3 to determine how to evaluate a strategy.



ECONOMIC

Next, the project team evaluated the strategies in terms of economics. Criteria regarding employment and the economy is important to this cost-conscious community, as was the criterion for maintaining critical infrastructure and community assets since they involve considerable local investment.

Many of the strategies involved developing new standards or regulations (tree canopy, cool roofs, and pavement material), while other strategies involved preparing a plan or investing in infrastructure (cooling centers and bus stops, respectively). Strategies related to development standards were considered to have a neutral effect on the economy – they may be considered more

burdensome to developers, but they also would result in a more resilient investment. Strategies that required more resilient development (tree canopy standards and pavement material standards) and strategies that would lead to building new structures to address vulnerable community assets (bus stop coordination) performed well for the maintaining critical infrastructure and community asset criterion.

Table 7. Case Study Results - Economic

ADAPTATION STRATEGIES	PRIORITIZATION CRITERIA					
	ECONOMIC					
	5		6		7	
	Improve employment and the economy?		Support regional transportation systems?		Maintains critical infrastructure and community assets?	
Evaluate	Weight (%)	Evaluate	Weight (%)	Evaluate	Weight (%)	
	5%		3%		6%	
Strategy 1: Tree canopy standards	2	5%	2	3%	2	6%
Strategy 2: Cooling center transportation plan	3	5%	2	3%	2	6%
Strategy 3: Incentivize cool roofs	2	5%	2	3%	2	6%
Strategy 4: Pavement material standards	2	5%	2	3%	2	6%
Strategy 5: Bus stop coordination	3	5%	3	3%	3	6%



ENVIRONMENT

In this case study, the project team was most interested in promoting nature-based solutions as a reflection of past planning efforts and thus weighted Criterion 9 highly. GHG reduction is also important to the community, which has targets in their Climate Action Plan that they must meet, so the team kept the default weight for this criterion (5%).

Evaluating strategies for these criteria was relatively straightforward for the team and the evaluations reflect this, with strategies receiving several 3s and 1s. Strategy 1 (tree canopy standards) performed well across both environment criteria because it supports both climate mitigation and adaptation using

natural processes. In contrast, Strategy 2 (cooling center transportation plan) performed poorly because it increases GHG emissions and involves traditional engineering solutions to adaptation.

Table 8. Case Study Results - Environment

ADAPTATION STRATEGIES	PRIORITIZATION CRITERIA						
	ENVIRONMENT						
	8		9				
	Reduce GHG emissions?		Utilize nature-based approach?				
Evaluate	Weight	Evaluate	Weight				
			5%				8%
Strategy 1: Tree canopy standards	3	6%	3	8%			
Strategy 2: Cooling center transportation plan	1	6%	1	8%			
Strategy 3: Incentivize cool roofs	2	6%	1	8%			
Strategy 4: Pavement material standards	2	6%	1	8%			
Strategy 5: Bus stop coordination	2	6%	1	8%			



FEASIBILITY

The team then evaluated strategies in terms of feasibility, beginning by selecting weights for the four criteria in this category. After discussions, the team chose to weight Criteria 11 and 15 at 8% and 4%, respectively, because the community is cost-conscious and concerned about strategies that require outside resources and because there is mixed support for climate strategies, both among decision makers and the community. Because the community does not have existing plans or programs that address climate change and inconsistencies are unlikely to occur, Criteria 13 was deemed less important, and the weight was reduced accordingly. Similarly, the Case Study City is neither involved in regional, State, or Federal climate adaptation working groups nor pursuing pilot adaptation projects, Criteria 14 was deemed less important, and the weight was reduced accordingly.

In terms of the evaluation, the project team found that evaluating Criterion 12 required significant discussion to reach consensus that the project objectives are to support parks and address vulnerable populations. Strategy 1 (tree canopy standards) performed well across the feasibility criteria since the Case Study City already manages an urban forest and the modifications suggested in the strategy could be achieved with existing staff capacity and funding as well as are consistent with existing plans and programs. Because strategies were selected from General Plans in Southern California, no strategies were determined to be outright infeasible. Many of the strategies were given a neutral evaluation for the feasibility criteria. Because the strategies performed somewhat equally, weighting the criteria helped to further differentiate scores.

Table 9. Case Study Results - Feasibility

ADAPTATION STRATEGIES	PRIORITIZATION CRITERIA											
	FEASIBILITY											
	10		11		12		13		14		15	
	Within existing capacity?		Funded with existing sources?		Accomplish roject objectives?		Consistent with existing plans, policies, programs?		Consistent with Federal and/or State regulations?		Political support?	
Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	
			8%		6%		1%		1%		4%	
Strategy 1: Tree canopy standards	3	5%	3	8%	3	5%	3	1%	3	1%	3	4%
Strategy 2: Cooling center transportation plan	2	5%	1	8%	3	5%	2	1%	3	1%	2	4%
Strategy 3: Incentivize cool roofs	2	5%	3	8%	1	5%	2	1%	3	1%	2	4%
Strategy 4: Pavement material standards	2	5%	3	8%	1	5%	2	1%	3	1%	2	4%
Strategy 5: Bus stop coordination	3	5%	2	8%	2	5%	3	1%	2	1%	2	4%



ROBUSTNESS

Because climate change is not a priority issue and there are also some climate skeptics in the Case Study community, the project team was interested in no-regrets and flexible strategies and weights for these criteria were increased above 5%. In addition, because the community is already starting to experience some of the impacts of extreme heat, the weight for the action now criterion was increased to reflect this urgency.

Tree canopy standards was the only strategy that scored well in no-regrets, as it has multiple non-climate benefits, including improving air quality and improving walkability. Improving bus stops scored neutrally as its primary objective is responding to extreme heat, however, improving bus stops has mild targeted co-benefits for transit riders and wouldn't have negative effects without extreme heat events. The remaining policies represent development standards that would cost the building community and city developers money, which would be an unnecessary cost if climate change did not occur, and therefore received a "1". Conversely development standards, including tree canopy scored well in the flexible category because they are implemented on a project

by project bases and could quickly be updated. The cooling center transportation plan received a "2" because it is not incrementally implementable nor adjustable like the standards. In addition, the cooling center transportation plan is not a built piece of infrastructure, like bus stops that received a "1".

In terms of timing, tree canopy and bus stops received a "3" because they address existing and projected heat issues. All other strategies received a "2" because they are not necessary now and have medium lead times, thus are not urgent priorities. Regarding coordination with adjacent jurisdictions, bus stop coordination and cooling center transportation received a "3" as they are inherently regional and support people moving between jurisdictions; all other strategies received a "2" as they would not interfere with regional and partner efforts. Lastly, only tree canopy standards received a "3" as addressing three or more hazards because, in addition to addressing extreme heat, trees can also improve air quality and reduce flooding. The transportation plan could inform evacuation, which is needed for flooding hazards in the Case Study City and therefore received a "2". All other strategies only address extreme heat and thus received a "1".

Table 10. Case Study Results - Robustness

ADAPTATION STRATEGIES	PRIORITIZATION CRITERIA									
	ROBUSTNESS									
	16		17		18		19		20	
	No regrets?		Flexible and/or Removable?		Require action now?		Coordinate with adjacent jurisdictions?		Address multiple hazards?	
Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	Evaluate	Weight	
		8%		6%		6%		1%		1%
Strategy 1: Tree canopy standards	3	8%	3	6%	3	6%	2	1%	3	1%
Strategy 2: Cooling center transportation plan	1	8%	2	6%	2	6%	3	1%	2	1%
Strategy 3: Incentivize cool roofs	1	8%	3	6%	2	6%	2	1%	1	1%
Strategy 4: Pavement material standards	1	8%	3	6%	2	6%	2	1%	1	1%
Strategy 5: Bus stop coordination	2	8%	1	6%	3	6%	3	1%	1	1%

5 SCORE AND RANK THE ADAPTATION STRATEGIES

After the project team evaluated all adaptation strategies across all criteria, they reviewed the total scores computed in Excel and then ranked the strategies from highest to lowest scores.

In this case study, only Strategy 1 (tree canopy standards) was deemed ready for prioritization and implementation, as it scored well above a 2 and clearly outperformed the other strategies evaluated. Strategy 5 (bus stop coordination) was also deemed a priority; local planners could revise the strategy to increase the use of green infrastructure, thereby improving its nature-based evaluations. The project team decided not pursue Strategies 2-4, as they performed the least well and, after further consideration, the project team found that they could not improve the “no regrets” evaluation.

Sometimes the hardest part of adaptation planning is getting started. Even though some community members and decision makers in the Case Study community do not prioritize climate change and little has been done for adaptation planning previously, the Tool enabled the project team to identify co-benefits and move forward with adaptation strategies that address a current challenge for a vulnerable population. In this way, the Tool proved a powerful resource for outreach and engagement, as well as implementation, to build resilience. Adaptation is an ongoing process, and now that the community is familiar with the Tool, it can be used to structure decisions around adaptation planning over time. There’s no hard and fast formula for determining which adaptation measures should be prioritized and implemented to mitigate climate change risks. However, as demonstrated in this Case Study, the Tool provides a mechanism to understand trade-offs and values amongst stakeholders so that implementation is less controversial.

Table 11. Case Study Score Totals and Rankings

ADAPTATION STRATEGIES	SCORE TOTAL	RANKING
Strategy 1: Tree canopy standards	2.59	1
Strategy 2: Cooling center transportation plan	1.97	3
Strategy 3: Incentivize cool roofs	1.87	4
Strategy 4: Pavement material standards	1.87	4
Strategy 5: Bus stop coordination	2.12	2

5

REFERENCES

Adapting to Rising Tides Bay Area Program. 2016. “Developing Evaluation Criteria.”

<http://www.adaptingtorisingtides.org/howto/evaluation/>

California Natural Resources Agency. 2018. “Expanding Nature Based Solutions.”

<https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions>

CalOES (California Office of Emergency Services). 2020. “California Adaptation Planning Guide.”

<https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf>

Debels, P., Szlafsztein, C., Aldunce, P., Neri, C., Carvajal, Y., Quintero-Angel, M., Celis, A., Bezailla, A., Martiez, D. 2009. “IUPA: a tool for the evaluation of the general usefulness of practices for adaptation to climate change and variability.”

<http://repositorio.uchile.cl/handle/2250/120109>

FEMA and EPA (Federal Emergency Management Agency and U.S. Environmental Protection Agency). 2019. “Regional Resilience Toolkit.”

https://www.epa.gov/sites/production/files/2019-07/documents/regional_resilience_toolkit.pdf

FHWA (Federal Highway Administration). 2018.

<https://www.sustainablehighways.org/>

Prutsch, A. Felderer, A., Balas, M., Konig, M., Clar, C., Seurer, R. 2014. “Methods and Tools for Adaptation to Climate Change. A Handbook for Provinces, Regions and Cities.” Environment Agency Austria, Wien.

<https://climate-adapt.eea.europa.eu/metadata/guidances/methods-and-tools-for-adaptation-to-climate-change-a-handbook-for-provinces-regions-and-cities/11292669/view>

SANDAG (San Diego Association of Governments). 2020. Regional Adaptation Needs Assessment.

<https://digital.sandiego.edu/npi-sdclimate/13/>

UK Climate Impacts Programme at Oxford. 2013. “Decision-making for Adaptation.”

<https://www.ukcip.org.uk/decision-making-for-adaptation/>

Weiland, S., Tröltzsch, J., Capriolo, A., Den Uyl, R., Jensen, A., Giordano, F., Hildén, M., Karali, E., Mäkinen, K., Nielsen, H., Penha-Lopes, G., and Russel, D. 2014. “BASE Evaluation Criteria for Climate Adaptation (BECCA).”

<http://base-adaptation.eu/base-evaluation-criteria-climate-adaptation-becca>