Advanced Policy Analysis

California's Climate Adaptation Water Strategy: An Analysis of Implications for Individual and Community Rights and Responsibilities

A Study Conducted for the California Climate Adaptation Strategy Working Groups

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Table of Contents

Executive Summary ... 3
Section 1: Climate Adaptation as a Challenge for the State and its People ... 5
Section 2: Findings ... 8
Literature Review ... 8
Adaptation Equity: Maximizing the Welfare of the Least Well-Off ... 8
The Challenge of Assessing State Vulnerability ... 9
The Challenge of Creating Profiles of Vulnerable Populations ... 11
Vulnerable Populations in Australia ... 13
Vulnerable Populations in Alaska: Recommendations of the Climate Adaptation Working Group for Culture and Health ... 15
Policy Choices Should be Informed by the Principle of Equity ... 15
Literature Review: Concluding Thoughts ... 17
Water Working Group Strategies Examined ... 17
Water Working Group: Concluding Thoughts ... 20
Interviews ... 20
Overarching concerns regarding adaptation, water, and vulnerable populations ... 20
The best unit of analysis in the study of adaptation concerns: "community" or "individual" ... 23
What are the best "new messengers" and how does one measure their success? ... 24
What is a good public participation process and how does one measure its success? ... 27
California's Native Tribal Governments: Concerns about State-to-State Negotiations ... 29
Metrics for Evaluation of an Equitable Adaptation Policy ... 29
"Lessons Learned" from the AB 32 Environmental Justice Advisory Committee ... 30
Interviews: Concluding Thoughts ... 33
Avenues for Further Research: Identifying Climate Adaptation "Hot Spots" ... 33
Concluding Thoughts on Findings ... 33
Section 3: Criteria for Evaluation and Policy Options ... 34
Criteria for Evaluation ... 34
Environmental Justice Criterion ... 34

Other Criteria 34
Policy Options Described and Evaluated 36
A. Feedback Loops 36
B. Direct Assistance 40
C. Let Present Trends Continue 44
Section 4: Recommendations 46
A. Feedback Loops 46
1. Regional environmental justice advisory committees. 46
2. An environmental justice ombudsman at the California Resources Agency. 46
3. Public education that is strategically targeted to vulnerable communities... 47
B. Direct Assistance 47
1. A "lifeline rate" in a tiered water rate system for low-income rate-payers, with higher-income rate-payers paying a surcharge that directly subsidizes the "lifeline" program. 47
2. Funding, or assistance with access to funding, to help isolated communities develop infrastructure to improve water access and adaptive capacity. 48
3. State-sponsored innovation incentives to tap local deep knowledge of climate variability and previously implemented adaptation measures. 48
Conclusion 48
Appendices 49
Appendix A: A Taxonomy of Climate Change and Adaptation 49
Appendix B: A Taxonomy of Environmental Justice 50
Appendix C: List of Interviewees 51
Appendix D: Interview Questions 53
Appendix E: Department of Water Resources: Ten Draft Adaptation Strategies (Outline of Water Working Group Section of the CAS) 54
Appendix F: Draft Strategy for Addressing Environmental Justice in California's Climate Adaptation Strategy (CAS) 62
Appendix G: Sierra Nevada Alliance's Pledge to Seven Principles for Adaptation 65
Resources Cited 66

Executive Summary

The inevitable consequences of climate change will put some of California's people and communities more at risk than others. Because of location and a limited capacity to adapt, vulnerable populations may face profound and disproportionate harm. California's Climate Adaptation Strategy planners are seeking ways to address this potential harm.

The California Adaptation Strategy (CAS) Working Groups are seeking to address the impact of climate change on the state's vulnerable populations. This analysis therefore asks how California can create a policy environment for equitable adaptation processes and outcomes. This analysis begins with a literature review on equity issues in adaptation planning, then examines the Water Working Group's draft climate adaptation strategies, and then presents the results of twenty-six expert interviews. Two key concerns in the development of adaptation policy that arise in this analysis are feedback loops between vulnerable communities and policymakers and direct access to resources to enable greater adaptive capacity.

While this analysis looks closest at the Water Working Group's strategies, it is anticipated that many of the findings will apply to the overall strategy.

The Scope and Methodology of this Analysis

This analysis was conducted over four months (January 1 to May 6, 2009) by a consultant to the California Climate Adaptation Strategy. Due to confidentiality factors, it was written outside the state employee CAS drafting process, without reference to the draft strategy. The methodology for this analysis consists of a literature review focusing on adaptation policy papers, including the Department of Water Resources (DWR) white paper "Managing an Uncertain Future," and twenty-six interviews with experts on California water policy as well as experts with a broader perspective on environmental justice, climate policy, and environmental disaster preparedness.

This analysis assesses the adaptation planning process as a whole, and the water adaptation planning process in particular, for possible ways to improve adaptation processes and outcomes from an equity perspective.

Criteria for Evaluation

- This analysis weights most heavily the criterion whether a policy option addresses the **environmental justice** concerns with adaptation: improving the state adaptation plan to better reflect the needs of vulnerable populations, improving the ability of vulnerable populations to make better adaptation decisions, and improving the adaptive capacity of vulnerable populations.

Other criteria include:

- Having measurable value for helping people adapt.
- Efficiency.
- Political feasibility and clarity (including clarity of the worthwhile nature of costs).
- Flexibility, given conditions of uncertainty.

Policy Options

Based on the literature review and expert interviews, this analysis examines the following climate adaptation policy options for addressing the needs of vulnerable communities in the water sector, evaluating them by the abovementioned criteria:

- Feedback loops to connect vulnerable populations with adaptation policymakers.
- Direct assistance measures to augment the adaptive capacity of vulnerable populations.
- Letting present trends continue in the face of great uncertainty related to climate change impacts.

Conclusion

An overarching theme of this analysis is the local nature of adaptation impacts, and therefore the need for local-level attention to planning. This analysis recommends policy options for transmitting local knowledge to state-level planners, and transmitting state-level adaptation information to the local level among vulnerable populations. This analysis also recommends ways the localized limitations on adaptive capacity could be addressed by the state. Feedback loops and direct assistance programs can help the state in addressing the needs of vulnerable communities in its adaptation planning.

Section 1: Climate Adaptation as a Challenge for the State and its People

Throughout this process [of developing national climate strategies and programs and mitigation and adaptation policies], nothing is more important than to remember and understand the perspective of the climate victim.

- Romina Picolotti, Secretary of Environment and Sustainable Development, Argentina, in Foreword of Climate Change and Human Rights: A Rough Guide *(ICHRP 2008).*

Access to safe water is a fundamental human need and, therefore, a basic human right.

- Kofi Annan, United Nations Secretary-General, in World Water Day press release (UN 2001).

Introduction

On November 14, 2008, Governor Arnold Schwarzenegger issued Executive Order S-13-08 directing the California Resources Agency and associated agencies to develop a state adaptation plan for climate change impacts. Working groups of agency staff have since been working on a draft California Climate Adaptation Strategy (CAS), taking an eight-sector approach, due for completion in June 2009. While there will be impacts on all people from climate change, adaptation planners from all sectors have expressed concern about addressing the needs of those who will be most adversely impacted by climate change. This analysis is a contribution to the CAS drafting process.

The Goal of this Analysis

This analysis is intended to provide recommendations to help address the needs and improve the adaptive capacity of populations which are most vulnerable to climate change impacts, focusing on the water sector. The measures under consideration were evaluated primarily for their value in addressing environmental justice concerns.

In this analysis, *vulnerability* is defined generally as geographic exposure to climate change impacts combined with lack of adaptive capacity. *Adaptive capacity* is defined generally as the ability to moderate, benefit from or cope with climate change impacts. Environmental justice (EJ) is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. See *Appendix A* for more detailed

definitions of *vulnerability* and *adaptive capacity*. See *Appendix B* for a more detailed definition of *environmental justice*.

The Scope and Methodology of this Analysis

This analysis was conducted over four months (January 1 to May 6, 2009) by a consultant to the California Climate Adaptation Strategy. Due to confidentiality factors, it was written outside the state CAS drafting process, without reference to the draft strategy. The methodology for this analysis consists of a literature review focusing on adaptation policy papers, including the Department of Water Resources (DWR) white paper "Managing an Uncertain Future," and twenty-six interviews with experts on California water policy as well as experts with a broader perspective on environmental justice, climate policy, and environmental disaster preparedness. This analysis assesses the adaptation planning process as a whole, and the water adaptation planning process in particular, for possible ways to improve adaptation processes and outcomes from an equity perspective.

The literature on climate adaptation and equity issues is relatively thin, and relatively new. The literature largely consists of theory, descriptions of ongoing climate crises and responses, and proposed research questions. One main focus of the literature is the challenge of assessing vulnerability to climate change, given that it is a dynamic characteristic with many interacting factors. Generally, these emerging studies emphasize the need for further research. The most relevant pieces arising from the literature for the California case are the benefits to the state from a participatory adaptation planning process, tapping into the knowledge of vulnerable populations, and the benefits to the state of augmenting the adaptive capacity of those populations in advance of climate impacts. This analysis distills these two pieces as "feedback loops" and "direct assistance."

The twenty-six interviews were conducted by the author over two months. Two were held in-person, and the remainder by phone. The interviews were typically 30 to 40 minutes long, and were semi-structured, based on a set of seven main questions. Interviewees were asked about overarching adaptation concerns; the unit of analysis for adaptation planning; comparable international cases; public education ideals; public participation ideals; (where relevant) the lessons learned from the AB 32 environmental justice input process; and further references on the topic (see *Appendix D*).

On the question concerning comparable international cases, Australia was mentioned most often, but on the whole the interviewees were either unfamiliar with international cases or felt that California faces unique challenges, due to the structure of state systems and the lack of a federal

mandate for water management. Based on these responses, the present analysis does not explore in depth the international comparative cases, but only lightly touches on the Australia case. The Alaska case is also presented in brief, as it was mentioned as a case from which California might learn with regard to the challenges of adaptation planning in tandem with indigenous nations.

The recommendations presented here are intended to contribute to an ongoing discussion among state adaptation planners, and are in no way to be considered an exhaustive list of possible measures to address equity in climate adaptation.

The Structure of this Analysis

Section 2 provides a summary of findings from a literature review, including the white paper which serves as a draft of the Water Working Group portion of the CAS, a synthesis of twenty-six expert interviews, and proposed avenues for further research. Section 3 presents criteria for the evaluation of proposed policy options and briefly explains and evaluates the proposed options. Section 4 discusses the recommended policy options.

Section 2: Findings

Literature Review

The literature on climate adaptation, as a subject separate from the more examined issue of climate change mitigation, is small but growing. (See *Appendix A* for definitions of *adaptation* and *mitigation*.) Documentation on adaptation policy is amassing on the international, national, and state levels. Increasingly this documentation includes information on vulnerable populations that are at risk of disparate impact from climate change.

Adaptation Equity: Maximizing the Welfare of the Least Well-Off

Equity, in the climate adaptation context, is the fair distribution of costs and benefits among interdependent parties (Paterson 2001). There is no widespread consensus on the explicit meaning of this principle, which involves normative judgments within different cultural contexts. Nevertheless, it can be approached as deriving from a rational argument. Rather than creating policy on the utilitarian principle – maximizing the welfare for the most people, ignoring historical inequity— policy can be created on the equity principle— maximizing the welfare of the least well-off (the Rawlsian justice approach). The principle of equity can be applied in terms of both processes and outcomes: process equity regards access to decision-making processes, while outcome equity regards the distribution of net benefits. From the rational basis of comparing the impact of policy on the least well-off compared to the most well-off, policy approaches can be evaluated as being more or less equitable. In the present analysis, policies should be considered equitable if they redistribute costs and benefits in such as way as to decrease preexisting resource imbalances between the least well-of and the most well-off.

Past literature on climate change and equity focuses on the need for fair distribution of costs within and between generations, and concerns the control of greenhouse gases more than adapting to oncoming, inevitable climate changes. It addresses the issue of how, within this generation, impacts from a lack of greenhouse gas (GHG) mitigation measures will fall more heavily on the nations least responsible for GHG accumulation— among the poorest nations, and, in future generations, the impacts will fall more heavily on those who bear no responsibility for past GHG accumulation. These studies weigh out the costs and benefits of GHG emissions reductions between those most and least responsible for GHG emissions (Barnett 2006). Wealthier nations more responsible for GHG accumulation are assigned more responsibility for the costs of emissions reductions (under the

"polluter pays" principle), leading to policy measures such as carbon taxes and cap-and-trade. However, there is an emerging literature that focuses on the distribution of costs in terms of loss of life, geographic places, and species, and also focuses on how past imbalances in resource distribution shape vulnerability to climate change (Barnett 2006). Even if present efforts at carbon taxes and cap-and-trade are successful at distributing the costs of GHG emissions reductions equitably, other costs caused by climate change would remain wholly unaddressed. Meanwhile, while the international, top-down approach to GHG control makes sense for reducing an aggregate GHG output, this top-down approach to adaptation does not make sense. Climate change impacts—and therefore adaptation decisions—will mostly occur in a decentralized fashion, so a bottom-up approach is more appropriate (Agrawala & Fankhauser 2008).

The impacts of climate change, while they do not exclude anyone on the basis of race or socioeconomic status, do not fall equally on all people. The distribution of vulnerability is borne inequitably, with the highest vulnerability belonging to those least able to adapt. There are benefits to climate change, such as longer growing seasons at higher altitudes, but the most vulnerable populations are not likely to see these benefits.

The question of defining exactly who is most vulnerable to climate change impacts is a subject of study and debate. Evidence shows that climate impacts on livelihood systems increase the vulnerability of the poor (Huq and Khan 2006). For example, climate change will cause shifts in economies such as the substitution away from water-intensive crops, or increased prices leading to falling demand and then job loss, or the loss of entire sectors, such as recreational skiing after the snow pack disappears, will impact livelihood systems and push some households past a threshold into a state of vulnerability. The question of how to properly identify vulnerable populations is discussed below in *The Challenge of Creating Profiles of Vulnerable Populations*.

Generally, addressing the adaptation needs of vulnerable populations in the face of climate change is a critical issue for the state, and not just for ethical reasons. Vulnerability is in large part socially and economically determined due to inequitable distribution of resources, and as climate change exacerbates vulnerabilities, there will be social and economic consequences. The state has a compelling interest in ensuring access to adaptation assistance for vulnerable populations, particularly the poor.

The Challenge of Assessing State Vulnerability

One researcher asserts that just as climate impacts can be considered "public bads"—the corollary of a public good, being non-rival and non-excludable—life-

support commons such as adaptation assistance should be considered public goods (Baer 2006). As a public good, adaptation policy should address the adaptation needs of all without barrier, regardless of race, socioeconomic status, age, sex, sexual orientation, gender identity, language ability, physical ability, culture, citizenship status, nationality, or other relationship to the state (having a criminal record, receiving public assistance, being institutionalized, etc.).

Whether or not the state treats adaptation assistance as a public good, the state should take into account the state's costs from adaptation policies which do not address equity.

Besides the ethical considerations, costs to the state from inequitable adaptation policy include economic risks (e.g., markets suffering from impacts on labor) and political risks (e.g., a politician's loss of credibility, or the public's loss of faith in public policy). Economic costs include the compensation and other assistance that would be sought by those displaced from homes or jobs by climate change who would have been able to manage without entitlements under proper state planning. There are also costs associated with lawsuits brought by representatives of communities facing disparate impacts from state policies, such as the lawsuit now being prepared on the basis of potential negative impacts from California's new low-carbon fuel standard.

State planners must speculate on all the many kinds of costs associated with failing to address the adaptation needs of vulnerable population, but they must also face the facts that uncertainty is high about adaptation costs in general, and that, even if costs were better known, there are no accepted metrics for assessing the effectiveness of adaptation policy. Nevertheless, one recent study of climate change adaptation economics asserts that "governments have a role to play in providing adaptation as a public good where private [adaptation] actions might not occur due to externalities or other failures" (Agrawala & Fankhauser, 2008).

In the case of California, "other failures" may include the state's relatively high level of inequality as measured in its wide disparities in income distribution. The literature review revealed that California's inequality of income distribution, measured in the Gini coefficient, is more inequitable in terms of income distribution than the U.S. as a whole. [1] More notably, California's growth in income distribution inequity has historically outpaced that of the U.S. as a whole, with the trend particularly pronounced in the 1990s (Royer 2000). This measure of income distribution does not reflect the state's wealth, but it is a key measure in reflecting

[1] The Gini coefficient is a number from 0 to 1 showing the equality or inequality of income distribution in an economy. In theory, 0 is absolute equality, and 1 is one person having everything and everyone going without. In practice, it varies from about 0.2 to about 0.7. (The Null Device 2009). In 2006, the Gini coefficient of the U.S. was 0.464, and California's was 0.466 with a 0.0024 +/- margin of error (more unequal than the U.S. overall) (U.S. Census 2007).

society's inequality, particularly in trends over time. In terms of income, California's more vulnerable populations may be becoming more vulnerable over time. This could contribute to the state's overall greater vulnerability to shocks from climate change.

Other state vulnerabilities may include:

- Lack of political will to assess adaptive capacity and address shortcomings (e.g., political opposition to the state monitoring of ground water levels).
- Economic dependency on natural resources that stand to be damaged by climate change (e.g., water-intensive agribusiness such as beef, rice, and cotton).
- Barriers to social cohesiveness (e.g., demographic heterogeneity, disparities between rich and poor, and the lack of public transportation, venues for public gatherings and other services fostering collective action in rural areas, etc.).
- Lack of infrastructure to support the population's adaptive capacity (water transportation and treatment facilities, banks to transfer direct financial assistance to a population suffering after a climate crisis event, public transportation for urban populations needing to get to cooling centers, etc.). (Paavola 2006).

The State of California Climate Action Team (CAT) has commissioned forty reports to provide data on the adaptation needs of the state, including research on population vulnerabilities. These were intended to be published prior to the drafting of the CAS. At this writing, all are available, but were not released in time to be thoroughly examined for this analysis. Two were released early enough to be used in the present analysis: *Environmental Health and Equity Impacts from Climate Change and Mitigation Policies in California: A Review of the Literature* (Shonkoff, et al., 2009), and *The Impacts of Sea-Level Rise on the California Coast* (Hebeger, et al., 2009). These reports' findings are referenced below. With the remainder of the CAT reports available, the state should now be able to better prioritize and address its vulnerabilities.

The Challenge of Creating Profiles of Vulnerable Populations

Community vulnerability to climate change is determined by its location with respect to climate impact risks, and adaptive capacity. This includes the community's ability to anticipate, cope with, resist and recover from climate impacts (Shonkoff, et al., 2009; Blaikie, et al., 1994).

The CAT report on environmental health asserts that vulnerable communities will see significant health and economic consequences of climate change, and "without

proactive policies to address these equity concerns, climate change will likely reinforce and amplify current as well as future socioeconomic disparities in the impacts of climate change and the abilities of different groups to adapt to it" (Shonkoff, et al., 2009, p. 1).

Some intrinsic factors known to contribute to a person's lack of adaptive capacity include chronic medical conditions, low socio-economic status (and therefore lack of access to resources to help cope with conditions), and old age (Shonkoff, et al., 2009). Extrinsic factors, those external to the person, contributing to lack of adaptive capacity include segregation or isolation in places without access to avenues of escape from conditions (such as "heat islands" in urban centers, where people may not have transportation to cooling centers) (Ibid). Other factors creating vulnerability are dependence on jobs which may be affected adversely by climate change, particularly those with agricultural jobs. Those relying on subsistence fishing and farming are also more vulnerable. Natural resource-dependent households tend to sell off productive assets (e.g., livestock) in times of hardship, decreasing their long-term adaptive capacity (Adger, Paavola, & Huq 2006).

The CAT study on sea-level rise, which analyzed the overlay of climate impact areas with poor households and communities of color down to the county level, points out the need for further research. The research team details the need for more study of all vulnerable subpopulations, "including children, elderly, homeless, physically disabled, and people with limited mobility (e.g., incarcerated residents and healthcare facility patients), accurately measuring and analyzing the potential human costs of sea-level rise and adaptation measures" (Heberger, et al., 2009, p. 89).

Upon request, one researcher who compiled information on vulnerable communities for this CAT report clarified the research team's choice of the abovementioned categories for further study:

> We named those subpopulations as part of identifying the need to research the vulnerabilities of other social groups […] using common sense and anecdotal knowledge of events like [Hurricane] Katrina. […] One first step of such research would be to look at the literature on vulnerabilities to see what groups have been documented as having unique vulnerabilities. […] From my view the burden of proof should be on finding that the group is not vulnerable, so that we don't assume safety when actually there is just a lack of research.
>
> (E. Moore, personal communication, May 4, 2009)

As research begins to better identify vulnerable populations in California, it must be noted that the identification of these populations is a delicate process because resources will be assigned based on priorities that emerge from the process. To the extent possible, vulnerable populations should help define these priorities, to help

address the concern that certain vulnerable subpopulations may be left with inadequate state assistance due to a flawed research design.

It is also important to note that vulnerability is a dynamic characteristic, so any assessment of vulnerable populations must be an iterative process, taking into account climate changes, population movement, economic downturn or recovery, and other factors affecting adaptive capacity. In the long term, California may see an influx of climate refugees as sea-level rise and erosion make the Pacific Islands less habitable, and as drought and heat drive populations northward from Mexico and Central America. These population movements may exacerbate state vulnerabilities, in particular stressing the adaptive systems of urban centers, where new immigrants tend to settle due to access to the cash economy and services (Brown 2008). In addition to new immigrants entering the cities, increasing food and water scarcity in rural areas will accelerate the existing trend of rural-urban domestic migration (Brown 2008). Existing urban populations that were evaluated as relatively adaptable may be pushed past a critical threshold of vulnerability by the pressures of increasing population density.

Vulnerable Populations in Australia

Climate change impacts are decentralized, and so responses to impacts are also decentralized, making it difficult to find good comparative cases to help prepare California's adaptation planners. As noted above in Section 1 (*The Scope and Methodology of this Analysis)*, California faces a unique set of challenges, particularly from the institutional perspective. There is no federal mandate for water management (as there is in some other countries facing drought), and the state's system for water management is dissimilar to other systems found in countries facing similar climate impacts. However, Australia was frequently mentioned by state agency workers planning for climate change as a case that may have lessons for California.

Australia began creating a federal climate adaptation plan in 2005. A January 2009 submission to the UN High Commissioner for Human Rights on the relationship between climate change and human rights presented a description of some of its most vulnerable populations.

Briefly, the populations identified in this document are:

- People over 65 years of age, at risk for higher mortality due to heat waves.
- Populations sensitive to alterations in infection disease patterns.
- Rural populations exposed to droughts, resulting in increased mental health problems and suicide rates.

- Indigenous populations, in part due to their relative isolation and lack of infrastructure, in part due to their "strong cultural connections between the health of their country, their belief systems and their mental and physical well-being." (Australian Government 2009, p. 2)

In 2007, the Council of Australian Governments endorsed the *National Climate Change Adaptation Framework*, presenting action plans for agriculture, biodiversity, fisheries, forestry, settlements and infrastructure, coastal, water resources, tourism and health sectors. The need for equity is explicitly stated in the framing of the implementation plan:

> In developing implementation approaches, governments will recognise the importance of equity and cost-effectiveness and pursue adaptation actions with multiple benefits.

This plan established the Australian Centre for Climate Change Adaptation, tasked with assessing the country's vulnerability, including adaptive capacity. The plan also emphasizes the need for research partnerships across sectors and between regions, and public education concerning adaptation planning. This framework, just as the CAS, begins by addressing water adaptation concerns at some length. The public health sector plan is very brief, but includes the following strategies:

- The development and implementation of a National Action Plan on Climate Change and Health.
- The development and implementation of an early warning system for heat waves.
- An increased national research focus on climate change and health.
- The development and implementation of a plan to address the impact of climate change on sporting and recreational activities.

Assessments of the impacts on vulnerable settlements, including remote and indigenous communities, are explicitly included in the five year plan for integrated regional vulnerability assessments. As in California, many of the environmental justice issues that have arisen so far in Australia concern climate mitigation efforts, not adaptation. However, Australia's ongoing findings on adaptive capacity should be monitored by California adaptation planners, particularly concerning the impacts of drought. The mental health impact of Australia's prolonged drought is one that California planners might begin to take into account. New anxiety disorders related to climate change are being documented among children and adolescents, and there may be an increase in suicides among rural populations (Anthes 2009).

Vulnerable Populations in Alaska: Recommendations of the Climate Adaptation Working Group for Culture and Health

Alaska's climate change impacts differ from California's, but the state's stakeholder process, particularly in the integration of indigenous populations in planning processes, may hold some lessons. The Governor's Sub-Cabinet on Climate Change, formed in 2007, has an Adaptation Advisory Group which includes the following working groups:

- Public Infrastructure
- Health and Culture
- Natural Systems
- Economic Activities

The Health and Culture (HC) Working Group has published the following draft policy options on its web site (Alaska HC 2009):

1. The establishment of an Office of Climate Change Coordination, tasked in part with coordinating responses between the state, Alaska Native villagers, rural Alaskans, and other vulnerable populations.
2. Surveillance and control of emerging risks from changes to patterns of disease and pollution and to sanitation needs.
3. The commencement of a Community Health Impact Evaluation Initiative, to prepare for changing health risks.
4. Adaptation of sanitation facilities to prevent the outbreak of disease in rural areas.
5. Coordination with tribes and other stakeholders to document and mitigate the impact of climate change on archaeological, historical, and cemetery sites.

A theme within these initiatives is the need for partnership with tribal leadership and other stakeholders in developing adaptation plans. Adaptation working group minutes[2] indicate that adaptation planners are engaged in vibrant ongoing negotiations with representatives of Alaska Native groups, and illustrate the contentious process that may have contributed to the proposal of HC Working Group Policy Option 1. California might learn from the efforts of Alaskan adaptation planners, and consider the potential benefits of a mechanism for central coordination of adaptation responses by different vulnerable communities (see this analysis' Recommendation A.2. regarding an environmental justice ombudsman).

Policy Choices Should be Informed by the Principle of Equity

[2] Available here: http://climatechange.alaska.gov/aag/aag.htm

Addressing the inequitable distribution of resources to improve adaptive capacity in the face of external shocks, climate change-related or not, will contribute to better climate adaptive capacity in all cases. In that sense, continuing to build all state policy to incorporate equity concerns is good climate adaptation policy. At the same time, policy makers should design climate adaptation policy with equity concerns explicitly taken into account.

The following table suggests policy options which are less and more helpful to vulnerable populations in coping with climate change. These options are not mutually exclusive, are differentially beneficial and feasible, and all carry trade-offs. All of these options have potential benefits for vulnerable populations. However, the right column's options are designed with a focus on the principles of avoiding harm, reducing risks, reducing vulnerability, and supporting individual and community rights and well-being.

It is useful to consider the resemblance of the left column to current policy approaches used by the state as compared with the right column.

Table 1: Weaker and Stronger Adaptation Policy from the Perspective of Vulnerable Populations

Less Helpful to Vulnerable Populations	More Helpful to Vulnerable Populations
Emphasizing mechanisms for compensation	Emphasizing mechanisms for **risk prevention and reduction**, including monitoring and early warning systems, based on the precautionary principle *‡
Prioritizing technology and investments ("hard" measures) in adaptation planning (measures which emphasize efficiency)	Prioritizing **livelihood diversification, land reforms, public education, and other "soft" measures** in adaptation planning (measures which emphasize equity)†*
Focusing separately either on carbon footprint reduction or on increasing adaptation capacity	Focusing on **strategies with co-benefits for carbon footprint reduction and increasing adaptation capacity** (e.g., resource use efficiency), thereby addressing the vulnerability of both present and future generations *
Supporting insurance for risks that can be avoided through better individual and community choices around adaptation (e.g., supporting insurance for crops that will not be supportable by the land after predicted oncoming changes, paying out based on household loss)	Supporting **insurance for risks that are widespread in a geographic region and cannot be eliminated or reduced through better individual or community choices** around adaptation (e.g., supporting climate impact insurance that would be paid out in a predetermined amount based on a key change in local environmental indicator [geographic loss]) *
Focusing primarily or exclusively on averting harm to a vulnerable population	Focusing simultaneously on **averting harm to a vulnerable population and addressing the context of conditions** (i.e., economic and social living conditions) contributing to a population's vulnerability *

Assigning responsibility for defining "vulnerable populations," managing risks and creating adaptation plans exclusively or primarily to state agencies	Assigning responsibility for defining "vulnerable populations," managing risks and creating adaptation plans **both to state agencies and to local entities**, fostering a collaborative planning process that taps into local knowledge; also, **providing funding or assistance accessing funding for local entities** to do this work *‡
Planning with a metric of success based on outcome fairness, emphasizing predicted measures of net loss (basing decisions on endpoint vulnerability, i.e., net climate change impacts after the fact) ‡	Planning with a **metric of success based on procedural fairness**, including participation by most vulnerable populations and use of local knowledge of risks and adaptive measures (basing decisions on starting point vulnerability, i.e., vulnerability in advance of impacts, given systemic factors limiting adaptive capacity) ‡
Focusing on reducing impacts strictly from a sectoral vulnerability approach (i.e., agribusiness)	Focusing on reducing impacts from a **livelihood vulnerability approach** (i.e., agribusiness worker) in addition to or in place of the sectoral approach ‡
Emphasizing long-term impacts of climate change	Emphasizing **immediate or near-term impacts** of existing (slowly increasing) climate variability, taking into account the increase in long-term vulnerability caused by immediate impacts (e.g., when the temporarily poor are stripped of capital in a weather event and become permanently poor) ‡

* p. 95, Dow, Kasperson, and Bohn 2006
‡ p. 188-191, Huq and Khan 2006, also, see *Appendix A* for expanded definitions of endpoint and starting point vulnerability.
† p.13, Agrawala and Fankhauser 2008

Literature Review: Concluding Thoughts

The literature on adaptation to climate change and its implications for vulnerable populations is new, and relatively scarce, but several overarching themes emerge. These themes include the need for increased research to establish baseline and generate ongoing data on vulnerabilities, the need for a collaborative research process that reaches across sectors and relays local knowledge to adaptation planners, and the need for measures to improve adaptive capacity.

Water Working Group Strategies Examined

The mission of the Department of Water Resources (DWR) is "to manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments." In November 2008, the DWR released a white paper titled "Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water." This report recommends ten strategies to help local and state water managers avoid or reduce

climate change impacts to water resources in the State of California. (See *Appendix F* for the full text of the draft strategies outline, provided with the permission of DWR.)

Interviews of state employees, researchers, and community advocates revealed a number of concerns (Table 2) regarding the state's future plans for water adaptation, and in some cases concerning the white paper specifically. These concerns should be considered in the ongoing drafting process of California's Climate Adaptation Strategy for water.

Not all ten strategies are addressed below: during the course of interviews some strategies did not come up or were noted as being relatively less important when considering disparate impacts on vulnerable populations.

One particular strategy came up more often in interviews: the use of the Integrated Regional Water Management (IRWM), a local water management approach aimed at sustainable water stewardship (mentioned in Strategy 1, 2, 5, and 10). The main concern was the lack of preparation by poorer communities to participate in this approach. Strategy 10, for example, points to state funding for research pilot projects on watershed adaptation being restricted to "regions that have adopted IRWM plans that meet DWR's plan standards and have broad stakeholder support" (DWR 2008, p. 29). Although Strategy 1 explicitly calls for actions "to provide a continuous and stable source of revenue to sustain the programs described herein" (DWR 2008, p.10), communities operating under severe resource constraints are in need of particular assistance in accessing state funding. For example, a small, rural, poor local government may not be able to complete the process required for accessing state funding which it needs to create an IRWM (including the time-consuming stakeholder participation process and other steps needed to meet DWR standards). That may in turn preclude a vulnerable community from being included in the IRWM approach, and therefore from being included in the scientific modeling of possible watershed impacts.

Overall, a participatory planning process inclusive of the viewpoint of vulnerable communities could be a beneficial part of any of the ten strategies. Otherwise, specific feedback on the strategies follows:

Table 2: "Managing an Uncertain Future:" Concerns

DWR White Paper Proposed Strategy	*Relevant Concern*
Provide sustainable funding for statewide and Integrated Regional Water Management (Strategy 1)	Small, rural, isolated communities should be provided state support to develop their own IRWM plans
Demand-side management: Aggressively increase water use efficiency. (Strategy 3)	There is a need for ratepayer relief measures for low-income households when water rates adjust upward; however, these measures must be developed without encouraging maladaptation (bad adaptation choices) by households. Additionally, there is a need for the state to encourage utilities to provide more direct installs of water saving devices in low-income households, such as low-flow toilets, which the households couldn't afford themselves
Floods: Practice and promote integrated flood management (integrating it with watershed and fisheries management, etc.) (Strategy 4)	It is expected that there will be flood "sacrifice zones:" there should be plans to develop a policy by which people can be equitably compensated and sustainably resettled
Monitoring: Preserve, upgrade and increase monitoring, data analysis and data management. (Strategy 8)	The state should consider how vulnerable populations will gain access to information on environmental conditions as they shift State monitoring regimes should be designed to help foster public participation from vulnerable populations (who in turn could provide local information that may improve monitoring regimes)
Sea-Level: There is a need to plan for and adapt to sea-level rise. (Strategy 9)	Small, rural, isolated communities on the coast and in the Delta should be provided state support to develop their own sea-level rise adaptation plans (as with IRWM)

By and large, community advocates who have seen the DWR draft adaptation strategies did not express alarm about them. If anything, there was more concern that the process would remain participatory and that community concerns would be

taken into account in future drafts of the plan than concern about any particular strategy.

Water Working Group: Concluding Thoughts

The abovementioned concerns may have already been addressed in the current confidential draft of the adaptation plan. If so, when the final adaptation plan is released for public comment, other concerns not mentioned here will undoubtedly arise. At that point, the concerns about a meaningful public participation process will come to the foreground.

Interviews

The following section reflects input from twenty-six semi-structured interviews with relevant experts. Interviewees included Climate Adaptation Strategy Working Group members, other state employees working on climate policy, consultants and academics working on state-commissioned reports or otherwise working in an advisory capacity to the state on climate policy, campaigners from water advocacy groups and other NGOs working on water issues in California, a consultant on water issues to a state assemblymember, climate change specialists from the Red Cross, and other individuals with key perspectives, including a former CPUC chairperson and a representative of a private water wholesaler. See *Appendix C* for the list of interviewees with titles and affiliations.

The interviews were structured around seven main questions: overarching adaptation concerns; the unit of analysis for adaptation planning; comparable international cases; public education ideals; public participation ideals; (where relevant) the lessons learned from the AB 32 environmental justice input process; and further references on the topic. See *Appendix D* for a more complete list of the primary interview questions.

As noted above in Section 1 (*The Scope and Methodology of this Analysis)*, responses concerning comparable international cases informed selections of case studies for the literature review, but otherwise were not substantial enough to be included in this analysis.

Overarching concerns regarding adaptation, water, and vulnerable populations

The interviewees were asked which climate impact came to the top for them when thinking about climate change and vulnerable communities. The responses are not intended to be a comprehensive list of possible climate change impacts, or a list of

what is predicted to be the largest impacts on vulnerable communities, but rather to show the common areas of concern among experts, largely reflecting where research has already been done. Note that empirical studies projecting California's climate impacts are being generated as part of the forty CAT reports, including reports focusing on sectors including public health and safety (see Section 2, Literature Review, *The Challenge of Creating Profiles of Vulnerable Populations* for more on the findings of these reports).

The most frequent first response was sea-level rise, followed by the increased cost of goods and services across the board due to local and global climate change impacts. Heat waves, reduced water quality, and other impacts along with corresponding health impacts were also mentioned frequently. Additionally, many interviewees had concerns about the process by which climate adaptation might take shape in vulnerable communities, and shortcomings in existing practices and policies.

The following is a recounting of issues mentioned most often by interviewees, addressed roughly in order of more to less directly life-threatening.

Outcome Issues

Naturally, the direst possible consequence of climate change is the loss of life. This comes to mind for experts along with recollections of outcomes from Hurricane Katrina. So, the limits on adaptive capacity to avoid a direct threat to life arise as a top concern. Related responses include:

> "The people with the most resources to adapt will be the least challenged to adapt"
> (Brown, personal communication, April 13, 2009).

- Loss of lives, displacement of people, particularly poor people and people of color.
- Traditional public health impacts (aggravated in vulnerable populations by lack of health insurance, lack of access to healthcare by people with no English skills, low literacy, low socio-economic status), e.g. from new disease vectors, drought, natural disasters and their aftermath, etc.
- Sea-level rise affecting Delta and Bay Area low-income communities.
- During a heat event, the exposure of farm workers and people in urban centers to health risks from climate impacts, particularly the elderly indoors without air conditioning.
- Forest fires and their impact on health, including air and water quality.

Some populations will not necessarily face a direct threat to life by a storm surge or other climate crisis, but may be challenged to access the minimum vital core of products and services needed for survival. Related responses include:

- Water availability and water rates; investor-owned utilities raising rates in isolated or poor communities; lack of water infrastructure in unincorporated areas.
- Rising prices of goods and services across the board due to local and global climate impacts.
- Heat wave impacts on energy costs and availability.
- Households with shallow wells losing water access as groundwater is depleted.
- Sewage treatment, drinking water quality and end water supply impacts (particularly as lowered water levels result in less recharging and higher pollution levels).

Some sectors of the economy may be threatened, in turn impacting the livelihoods of vulnerable populations. Related responses include:

- Relocation of jobs.
- Impacts on fishing communities.
- Impact on small agribusiness, productivity of agribusiness on the whole.

Process Issues

The state is necessarily prioritizing strategies for addressing first order climate impacts. Nevertheless, second-order impacts, such as those resulting from inadequacies in the planning process, also cause concern among experts. The lack of planning to address existing disparities in access to services is a particular concern for some. Related responses include:

- Lack of access to emergency services by vulnerable communities; emergency workers being less responsive to calls from "bad" neighborhoods.
- Lack of participation by vulnerable communities in planning, lack of short-term planning.
- Lack of use of local knowledge of impacts and adaptation measures already tried (what worked and what didn't).
- Continued reliance of state economy on water-intensive agribusiness; what its downturn could mean for the poor.
- "Sacrifice zones" – less valuable land may be where the low-income housing is located, and people determined to be "better off" if relocated, while more attention is paid to saving more valuable land and capital (e.g., airports).
- Lack of state monitoring of ground water levels and lack of public

> "People for whom everyday survival is an issue—[for them] planning five years out isn't possible" (Oliva, personal communication, April 14, 2009).

> "EJ [vulnerable] communities don't know they have a problem until they start pumping sand" (Firestone, personal communication, April 9, 2009).

education around the need to monitor ground water levels: DPH monitors quality, but not water levels, while those with wells may not know they need to monitor their own water level.

- Lack of data analysis on vulnerable subpopulations beyond the county-level analysis of household income and race (performed by the Pacific Institute); inadequacy of census data for identifying scaled down "hot spots" of vulnerability.
- Lack of down-scaled models for climate change impacts to help local policy makers plan.

The best unit of analysis in the study of adaptation concerns: "community" or "individual"

Discussions of adaptation concerns identify different units of analysis depending on the issue or strategy. The author comes from an international human rights background where the unit of analysis is the individual, but most climate adaptation literature discusses community impacts. This question helped clarify the terms in which interviewees address climate change impacts.

Units of analysis for climate change, depending on the study, may be nations, cities, communities, economic sectors, utility districts, watersheds, populations, subpopulations, households, or, less often, individuals. Several interviewees pointed out that people on the political left tend to discuss climate change in terms of communities, highlighting the importance of systems and institutions, and those on the right tend to discuss climate change in terms of individuals, highlighting the importance of personal innovation and responsibility. As stated above, human rights or individual rights approaches use the individual as the unit of analysis. In a public health analysis, the unit is typically the community. In a legal analysis, U.S. law emphasizes individual rights and provides less of a basis for community or collective rights.

When discussing their primary overarching adaptation concerns, interviewees find "community" more useful, particularly with regard to water management, since it is highly unusual to pipe water to one household or one individual. With regard to demand-side water management, however, efforts to influence water-user behavior are more effective when the urgency and relevancy of a problem is targeted at the individual.

In some cases it is unclear which unit is most relevant. One interviewee from a rural community noted that "with ten people per square mile… the community and the individual are one unit" (L. Wills, personal communication, April 9, 2009).

A possible drawback for using a community approach is that the unit of analysis is limited by geography and/or demography, which may leave out vulnerable populations. For example, a strict household income and race analysis may not identify as vulnerable those who are institutionalized, living with a disability, elderly or underage, not possessing English skills, etc. On the benefit side, a community approach can provide ways to identify and address the needs of a geographic or demographic population with significant collective risks, and address those needs systematically from an institutional perspective.

One drawback for using an individual approach is that it highlights individual agency, neglecting the role of environmental discrimination, poverty, racism or other geographic or demographic factors. One benefit of an individual approach is that it creates a more inclusive analysis, perhaps addressing the needs of a population marginalized along lines other than those of typical community analysis parameters such as race or household income.

What are the best "new messengers" and how does one measure their success?

While most interviewees are not professionally tasked with working on public education campaigns, it was useful to hear their impressions of what makes such a campaign successful in a vulnerable community context. Together with the Red Cross approach to disaster preparedness in vulnerable communities, these suggestions provide an outline for a practical approach to public education about climate adaptation.

The interviewees were asked about "new messengers" for climate adaptation information, i.e., how, other than through scientific reports and shocking stories on the nightly news, climate change information could be transmitted to vulnerable populations in ways that would help them adapt.

The Red Cross approach, generally, consists of three steps: instructing people on how to make a disaster preparedness kit, how to make a disaster plan, and how to stay informed about disasters. Two years ago the San Francisco Bay Area chapter of the American Red Cross launched a program called **Prepare Bay Area** which has increased Bay Area disaster preparedness from 4% of households in 2006 to 24% (Mackie, personal communication, April 30, 2009). The key elements of this program's outreach to vulnerable communities include:

- Providing brief (one hour) preparedness trainings free of cost.

- Doing trainings exclusively in partnership with other organizations, such as local governments, fire departments, consulates, churches, community organizations, etc.
- Doing the trainings and publicity about the trainings in places where the community already gathers (for example, the Chinese New Year's Parade).
- Using community members trained in advance to deliver the Red Cross presentation.
- Providing trainings in English, Spanish, Chinese, and Japanese through native speakers.

Prepare Bay Area provides courses specially designed for vulnerable communities. Their course for low-income communities explains how to compile a disaster preparedness kit without buying additional provisions (for example, setting aside a cup of cold cereal in a baggy every time you open a new box). They also provide courses designed to address the needs of seniors and the disabled. Prepare Bay Area's manager noted as a proud achievement the program's work with eight local consulates, where they reach new arrivals by showing videos on earthquake preparedness in the lobby where people are waiting in line. For example, a Spanish language video is shown at the Mexican consulate. A Red Cross volunteer from that particular immigrant community is present to answer any questions brought up by the video. Additionally, if a disaster occurs that impacts a particular immigrant community, such as a fire, the consular general will come out and signal the community that the Red Cross is there to help, and that there will be no immigration repercussions from accepting its help. The Red Cross never asks for identity documents; it records the names of residents provided by heads of household for the distribution of aid.

On the international level, the Red Cross/Red Crescent is creating public education materials specifically about climate change adaptation. In these initiatives the emphasis is on using local voices to describe the climate change impacts, for example, in videos featuring local people talking about changes to their livelihood as fishermen or as farmers. The element of using local voices has been notably effective when paired with using local humor or other references that build trust between the person delivering the adaptation message and vulnerable communities (Suarez, personal communication, April 9, 2009).

One interviewee's organization—the California Urban Water Conservation Council—commissioned a market survey in 2007 in part to learn more about water user attitudes about water conservation messages. This study found that children's voices are trusted the most, while politicians' voices are trusted the least. The study found that traditional advertising campaigns were likely to be less effective than a "two-step flow strategy" wherein information reaches "opinion leaders," here meaning students, who then transmit the information to their constituents, here meaning parents (IAR and WRI 2007). Water conservation is a critical adaptation

measure, so, at least with this measure, adaptation planners should take heed of opportunities to work through schools and otherwise use intergenerational communication.

In general, interviewees recommended a variety of strategies to use intergenerational communication as a means to transfer information about risk management or changing behavior around resource use. One expert pointed out that parents in low-income households may not have time or energy to participate in public workshops, but they will find time for their children.

It should be noted that, though children may be effective at delivering information about water conservation and other demand-side issues, they may not be the best messengers to deliver all the information a household may need to help it make adaptation decisions.

Interviewees noted the following as characteristics of good outreach campaigns (concerning environmental risks generally, as well as water concerns in the face of climate change specifically):

- An intergenerational approach, tapping into youth groups and school curricula.
- A market research process, including the input of representatives of vulnerable populations through focus group sessions, and the input of cultural anthropologists and community media outreach experts (e.g., the Spin Project, Spitfire Strategies), to determine the best approach to outreach in a particular community.
- A multi-faceted approach (traditional media as well as community-based outreach—churches, schools, community centers, marketplaces, chambers of commerce).
- A constructive approach with small, easily-identified solutions within an individual's reach which emphasize the individual benefit attached (i.e., turning off dripping faucets will bring financial savings and improve your household's climate adaptability).
- A personal, compelling approach that connects to a person's desire for well-being, daily concerns (work, recreation).
- A plan of action with which a targeted individual can respond, such as information about local workshops or community planning processes; caution against causing alarm in vulnerable communities without giving steps for recourse.
- An avenue for providing feedback to those doing outreach (particularly in the context of public presentations).
- A competitive bidding process for management of outreach campaigns that privileges organizations with local knowledge (doesn't just assign contracts to the biggest and easiest to get public relations firms).

- Local voices of those who are already witnessing and adapting to climate change (e.g., the Red Cross videos which feature farmers substituting towards more drought-resistant crops and fishermen who are experiencing changes in the kinds of fish they catch); use of personal stories and local history, including the older generation's experience with adaptation practices from previous climate crises.
- Accurate use of scientific data (misinformation can be worse than no information)

It should be noted that, with the exception of the Red Cross, the respondents were not necessarily public education professionals, and a good process would employ techniques to determine the best way to reach each particular community. The above suggestions are just to provide an outline of possible strategies in the context of climate adaptation outreach.

What is a good public participation process and how does one measure its success?

Numerous interviewees pointed to the current (2009) State Water Plan as an example of a good public participation process. Workshops for public input were held prior to the plan being drafted, there was an advisory committee, and public comments were solicited on each section of the draft as well as the full draft. Comments could be submitted in a variety of ways (online, in writing, in person at workshops) and during many different stages of the draft development process.

Interviewees were asked about what a good "stakeholder process" would look like in the context of state planning. A process could be more exclusive, focusing on stakeholders who have decision-making power in a community, or it could be more inclusive, recruiting wide representation from diverse communities. Most interviewees felt that both approaches were useful, but at different stages of planning. The more exclusive approach was cited as a good beginning stakeholder process, broadening to include wider representation after initial planning is complete. At any stage in a stakeholder process, there is always a tension between efficiency and validity.

A key concern that came up in interviews was the state practice of rushing the public participation process, and taking a "decide and defend" stance, rather than having an open and transparent process, incorporating stakeholder input prior to the drafting of a policy. It was strongly urged that stakeholders be included in the preliminary visioning of any state policy, including in the present California Climate Adaptation Strategy.

According to interviewees, some hallmarks of a good public participation mechanism (in any state process, climate change planning or any other planning), include:

- Well-functioning subgroups and linked processes (with no agency or subgroup acting in isolation).
- Engagement of the proactive elements in a community (and encouragement of the motivated to motivate others).
- Engagement of those with expertise and local knowledge needed by state planners (strategically difficult: risk of excluding and therefore offending people).
- Tangible compensation for substantial ongoing participation (assistance to offset resource intensity of participation process must be included in budget).
- An iterative process with continual information flow, check-ins, updates, mid-term deliverables (meeting monthly rather than every six months, for example).
- Monitoring for the implementation end of policy, not just input during initial policy development.
- A sustainable funding source tied to the public participation process.
- Transparency to the public, jargon-free documents explaining process of input.
- Many avenues of input, including night-time meetings, smaller "kitchen table" meetings, online input, written input, etc.
- Many avenues of promotion in target community, including radio, newspapers, websites, e-mail and postal mail.
- Meetings held regionally in decentralized locations (within a maximum of three hours' drive of target community).
- Good time and attention management at meetings: keeping them short, intense, educational, with follow-through mechanisms.
- Input being timed previous to the drafting of policy: meeting outcomes can't be predetermined (risk of alienating participants, causing cynicism and disengagement).
- Meaningful changes in state plans in response to public input.
- A process that builds trust and understanding, utilizes and builds on existing relationships with stakeholders.
- Flexibility in the process (as conditions change).
- Sufficient time for stakeholder notification and participation.
- A process that gets at "trapped knowledge" (e.g., getting at the experiences of the older generation in North Richmond, where there are memories of adapting to flooding in the past, what worked and what didn't).
- Stakeholders should always be defined as any non-state entities "that can benefit or be impacted," *excluding* state entities (in some processes, the respondent found that state agencies were listed as stakeholders), (Williams, personal communication, April 16, 2009)

- Where appropriate, a tiered input process, beginning with experts from stakeholder groups participating in a drafting process, and then getting broader input on the draft.

California's Native Tribal Governments: Concerns about State-to-State Negotiations

The Director of the Yurok Environmental Program shared her perspective on the role of tribal governments in the negotiation of state climate change policy

She noted that the state is taking leadership over the federal government in climate mitigation and adaptation planning. Tribes are worried that they are not being given the access to policy decision makers that the federal government provides them, while remaining highly vulnerable to impacts of both climate change and state policy. Specifically, she advised the state to use federal agency protocols when approaching tribal governments. Federal agency consultations with tribes are held separately from the stakeholder interest group process. She expected visits by state representatives, but instead the Yurok Tribal Government received invitations to sit alongside stakeholders such as recreational fishermen at hearings in Sacramento, traveling at their own expense.

Other interviews indicated that the current (2009) State Water Plan consultation process included unprecedented outreach to tribal governments. Advocacy organization representatives in the Sierra and San Joaquin Valley said that they were hearing good things about the Water Plan participation process from their tribal government contacts. Even with an unprecedented effort, however, the Yurok Environmental Director believed that it was insufficient. For example, the nearest state consultation for the North Coast water plan was held at a location five hours' drive south of the Klamath Valley, ostensibly not on the North Coast.

Metrics for Evaluation of an Equitable Adaptation Policy

Academics were asked what metrics they might prefer for evaluation of an adaptation policy in terms of equitable processes and outcomes. The difficulties in measuring impacts would have to be addressed in order to effectively evaluate an adaptation policy. This will require extensive research. Respondents indicated that, first, baseline data must be established before any evaluation can be done. Secondly, evaluation instruments must be developed alongside policy measures.

The primary research question concerns how to isolate the impact of an adaptation policy from other factors acting on a vulnerable population. A mitigation policy aimed at reducing a certain measurable greenhouse gas is easier to evaluate for effectiveness at reducing that gas: establish the baseline level, enact the policy, measure the post-policy level. Equity impacts are far less measurable. This should not, however, prevent adaptation planners from taking equity concerns into account in devising policy.

"Lessons Learned" from the AB 32 Environmental Justice Advisory Committee

Assembly Bill 32, the California Global Warming Solutions Act of 2006 (AB 32), required the formation of an Environmental Justice Advisory Committee (EJAC) to give input into the drafting of the Air Resources Board's (ARB's) scoping plan for climate change mitigation.

The CAS Working Groups have not proposed that such a committee be convened for the adaptation planning process. However, Working Group members have expressed interest in reviewing "lessons learned" from the AB 32 EJAC input process. Therefore, this study has collected some recommendations derived from the AB 32 EJAC input process which might be helpful if the state decides to create such a committee (or committees) to inform the CAS.

Thirteen of the twenty-six interviewees had a perspective on the EJAC input process based on some level of direct involvement. The views presented here do not represent the views of all people most directly involved (for example, only two EJAC members and one person from the ARB were interviewed), and should be taken as a kind of "360" perspective on the process, as it was seen by different people working on environmental justice and state climate planning with some relation to the EJAC input process.

The drafting of an environmental justice component into the AB 32 bill was described as "a breakthrough," and the requirement of an advisory committee was believed to be "well-intentioned." One said that this input process was as good as it could have been, given preexisting factors, including the adversarial mindset of participants on both sides. Another called it a "nightmare" of a process.

When considering the EJAC recommendations in the context of the CAS, there is a key difference to consider: AB 32 was relatively well-funded and backed by law. One representative of an environmental justice organization said that the EJ community would only become involved in the CAS if state legislation and funding were involved (personal communication, April 9, 2009). At present, this is not the case, and so, as a matter of strategy, the EJ community is unlikely to budget its limited

resources to participating in CAS planning. However, when adaptation planning "has teeth," their participation can be expected. If an advisory committee or committees are formed thereafter, the following points, brought up by interviewees, might be useful to consider.

Table 3: EJAC Lessons Learned

EJAC Shortcoming	*Suggested Improvement for Future, Should EJ Advisory Committees be Formed*
EJAC was designed in a vague way (AB 32 did not state who would convene EJAC or how) with a broad mission of general oversight: hard to coalesce around the overall mitigation policy and decide on action.	**Designate the convener of the committee and manner by which the committee will be convened** in order that it could be convened quickly at the outset; **articulate the committee's specific, clear mission and best method for giving input at the outset**
The ARB was not receptive to EJAC's input.	**Educate agency members on the basic principles of environmental justice** (i.e., through trainings) to help foster their buy-in to the incorporation of that perspective
The ARB felt that EJAC slowed the process too much.	Improve communication and expectations around timelines; set **an initial timeline that allows for sufficient time for the committee to participate meaningfully**. A sufficient environmental justice process "takes a lot of time."
EJAC was a "talking head" group, with "empty meetings," whose "process was ignored," with its input not meaningfully incorporated.	The design of the committee's role should include **increased consultation in designating core issues and strategies, as well as the power to sign off on final plans**. **A minimum of two committee members should participate in the state decision-making body**; these should be elected by a majority decision of the committee. The committee should be formed with the **goal of mining the local or community-level knowledge** that would meaningfully improve the adaptation planning process.

The representation at a state level was inadequate for some regional stakeholders, e.g., although the scoping plan had huge EJ implications in the forestry sector, no tribes from forested regions were represented; only air and water quality activists were in the room.	Instead of having a state-level advisory committee (or, *only* a state-level committee), convene **regional committees**; committee members should not be appointed by state employees, but should arise through a **community nomination** process.
There were no state resources to support the EJAC process; no state employee was tasked to ensure the proper functioning of the committee.	**A state employee should be tasked with ensuring the proper functioning of the committee or committees**, i.e., an EJ representative (as is done at Cal/EPA) to act as an ombudsman: note that this person must be sufficiently respected by both sides.
A public record was not kept of the input process, e.g., EJAC kept and circulated its own minutes, and had to recreate the public record of workshops and written input by contacting individuals they knew participated.	**A public record of public input should be kept by the state** such that the committee could access it in a timely manner
The EJAC had to fight to get access in order to give input to the health impact assessment; when given access, the study design and outcomes were already decided; the "decide and defend" approach from ARB disempowered the EJAC and other stakeholders.	When the committee is formed, **prior to plans being drafted, negotiations should take place as to which parts of the plan would benefit from EJ input, and the manner of input should be decided.** **Health impact and other evaluation tools should be devised in parallel with adaptation strategies, and with input from EJ community.**
The EJAC committee lacked diversity of perspectives, contributing to its lack of political clout.	While the committee should include representatives of EJ advocacy groups, perhaps as the majority, **it should also include representatives of other sectors concerned with equity** (e.g., labor, sustainable business, public health science), if only to provide a "minority report" to balance out the majority EJ advocacy perspective.

Interviews: Concluding Thoughts

The twenty-six interviews summarized above yielded many key insights about ways the state might approach adaptation planning. Practical recommendations for improving on past planning processes include using targeted outreach to vulnerable communities, and using local knowledge to create policy and local voices to educate vulnerable populations. Another theme that emerges is the need for integration of a bottom-up, decentralized feedback process, with sufficient resources assigned to allow for an inclusive, valid public participation process.

Avenues for Further Research: Identifying Climate Adaptation "Hot Spots"

At this stage of adaptation planning, questions outnumber answers. The literature and the expert interviews indicate many avenues for further research. More fine-tuned vulnerability assessments are the most pressing research priority. The following describes a possible research design to more accurately define the profile of a vulnerable population:

- Establish baseline data for health indicators and other indicators related to climate change impacts in geographically vulnerable areas, and analyze these data along demographic lines as a way to begin identifying populations with starting point vulnerability, i.e., who stand to fare poorly in advance of climate impacts due to systematic factors causing adaptive capacity limitations (see *Appendix A* for more a more expanded definitions of starting point vulnerability).
- Create panel data sets, following households in communities identified as having starting point vulnerability. These households would have to meet a minimum threshold of starting point vulnerability, including geographic factors along with pervasive adaptive capacity limitations.
- Create a participatory research design to incorporate local knowledge into the process of identifying vulnerable populations.

Concluding Thoughts on Findings

Climate change impacts on the most vulnerable communities may be assessed and mitigated through systematic state action. These actions must include the dedication of resources to preliminary research to establish baselines and explore evaluation tools for adaptation measures, alongside the development of adaptation measures. The decentralized nature of climate change impacts calls for the need for a decentralized approach to developing adaptation plans and addressing limitations on adaptive capacity.

Section 3: Criteria for Evaluation and Policy Options

Criteria for Evaluation

Environmental Justice Criterion

The primary and most heavily weighted criterion for evaluation of recommended measures is **whether this option addresses the environmental justice concerns**: improving the state adaptation plan to better reflect the needs of vulnerable populations, improving the ability of vulnerable populations to make better adaptation decisions and improving the adaptive capacity of vulnerable populations.

Environmental discrimination is a historical reality in California, resulting in the legislation passed between 1999 and 2001 requiring the California Environmental Protection Agency (Cal/EPA) to take specific actions to address environmental justice concerns within its agencies (EJCW 2005). Since that time, the California Bay-Delta Authority (CALFED) brought environmental justice concerns formally into its planning process, but with limited success. Excepting of the Department of Public Health, most of the agencies providing the leadership for the California Climate Adaptation Strategy (CAS) are relatively inexperienced with the integration of environmental justice concerns into their planning processes. Nevertheless, Working Group members are concerned about addressing environmental justice needs in the CAS, as shown by their request of the present analysis.

Other Criteria

- Having measurable value for helping people adapt.

  There is a question as to the symbolic versus measurable (real) meaning of a policy option in terms of helping people adapt to climate change. The measurability of success of a policy option is an indicator of its “realness” in terms of adaptation value. The chief measurement of the success of a measure to help people adapt is the change in behavior to show understanding of adaptation needs, for example, in evaluating a measure to improve water user efficiency, the metric might be the decrease of water use by a household after a targeted public education intervention.

- Efficiency

The "bang per buck" of a measure must be considered. Some measures may provide the public with opportunities to participate in decision making processes without generating measurable changes in adaptive capacity. Other measures may provide concrete, measurable improvements but, as in the case of desalination plants, be prohibitively expensive to implement, costly in terms of environmental impacts, energy intensive, and increasing the fixed costs associated with water, and therefore end-user rates.

- Political feasibility and clarity

A measure is more politically feasible if a politician or civil servant can generate a critical threshold of support for the measure among key stakeholders, or among the general public. The ability to show the worthwhile nature of costs (in comparison to other measures or inaction) is part of political feasibility.

- Flexibility (given conditions of uncertainty)

Adaptation planners are facing a number of widely varying possible future scenarios. The climate could change suddenly and unpredictably, while other factors influencing vulnerability for different populations could do the same. A flexible measure is not hard-wired to particular technologies or other instruments which may only function properly in one of many future scenarios.

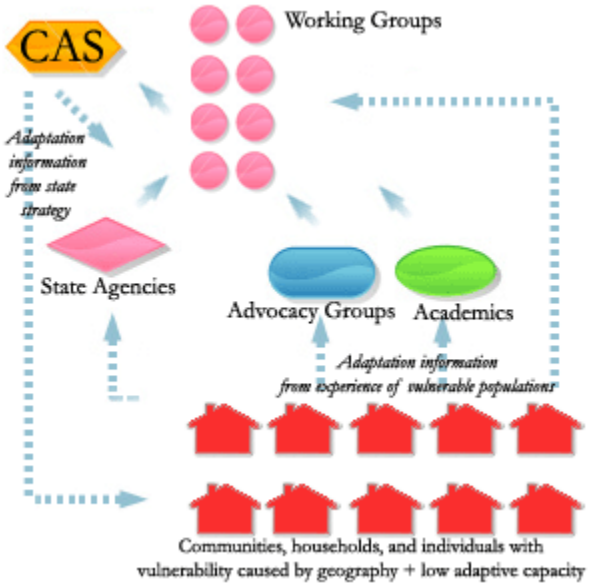
Policy Options Described and Evaluated

The following section presents the policy options that emerged from the literature review and expert interviews, and evaluates them according to the criteria defined above.

A. Feedback Loops

The following figure shows some of the ways adaptation information could theoretically pass through feedback loops in the state adaptation planning process.

Figure 1



The solid arrows indicate ways that information is currently flowing in the adaptation planning process. The working groups are generating the content for the CAS. The CAS working groups are comprised of individuals from state agencies. These working groups are receiving input from advocacy groups and academics.

The dotted arrows indicate ways that adaptation information could theoretically flow, or if it is already flowing, could be fostered to flow more freely. The literature

on adaptation indicates that adaptation planners need to take into account the local, deep knowledge of vulnerable populations in order to plan appropriately. Ground-level information could enter the planning process through state agencies which work with vulnerable communities (for example, through the Department of Public Health, which was cited in interviews as having a more robust stakeholder participation process than other departments). This information could pass to planners through advocacy groups which are engaged in safeguarding the rights and advancing protections of their constituencies. Information could also be gathered by academics through a collaborative, community-based research process, and then passed on to adaptation planners. Additionally, communities could have an avenue to directly contribute feedback to the adaptation planners, without the mediation of state agency workers, advocates, or academics. The latter is the most resource-intensive mode of feedback, but is potentially valuable: in the course of discussion, even advocates who consider themselves legitimate representatives of vulnerable communities expressed concern that they are not capable of representing all parts or concerns of their constituencies. Subpopulations which are under-resourced in terms of connections to state, advocacy, or academic organizations may only be able to contribute feedback through a direct person-to-planner avenue. Typically, the main way this is done is through the public comment process. Eliciting feedback from communities which are not informed about how public comment processes work may require more affirmative steps by the state.

Currently, the state is investing in data collection about climate vulnerability to contribute to the adaptation plan, and logically so. Nevertheless, resources should also be invested into researching optimal ways to transmit information about adaptation back to vulnerable populations, starting with transmitting information to intermediaries such as local resource managers and public health workers. At present, the state lacks the capacity and data on vulnerability to systematically tailor the delivery of information about adaptation to vulnerable populations. These populations may not have access to the Internet, or may not be able to take the time to attend public hearings about the planning process. Planners must generate avenues for the information about adaptation to be transmitted to vulnerable populations as directly as possible. The information that is more technical will need repackaging for delivery, to be understood and thereafter to contribute to better adaptation planning at the household level. As with tapping into local knowledge to inform the adaptation process, getting adaptation planning information back to the local level is resource-intensive. However, public education about adaptation could be made more cost-effective if tied to the data gathering efforts which are already taking place.

Considering the findings of the literature review and author interviews, the author defined the following policy options for improving the existing feedback loops: regional environmental justice advisory committees, an EJ ombudsman at the Resources Agency, and targeted outreach.

1. **Regional environmental justice advisory committees.**

   These committees would provide an accessible avenue of consistent feedback to adaptation planners, providing local knowledge regarding climate change impacts, existing or historic adaptation measures, and vulnerable populations. The dynamic nature of impacts, adaptation and conditions creating vulnerability make it critical for local voices to be heard by adaptation planners in an ongoing fashion. The regions would be defined by California's geography: North Coast, Central Coast, South Coast, Mountains, Central Valley, and Desert.

   Environmental Justice Criterion: This policy option makes a strong contribution to procedural fairness and therefore better outcomes for vulnerable communities in the adaptation planning process.

   Other criteria:
   - Real value for helping people adapt: The assistance in helping people adapt would only be measurable in terms of actual changes in adaptation decisions, something that would be difficult to measure (or attribute to a particular avenue of influence).
   - Efficiency: Given the difficulty in measuring the success of these measures, efficiency would also be hard to ascertain.
   - Political feasibility and clarity: While there is precedent for this kind of measure, such committees have inspired some cynicism in those involved in the process. If the measure is well-funded and the committees' functions are made clear, political feasibility may be more possible.
   - Flexibility (given conditions of uncertainty): This measure is very flexible. Such committees, decentralized among California's regions, could be key to informing agencies across sectors about changing conditions on the ground, and so help other programs adapt to changing conditions.

2. **An environmental justice ombudsman at the California Resources Agency.**

   The appointment of a staff member trusted and respected by his or her colleagues at the Resources Agency as well as representatives of vulnerable populations would help provide consistency in the management of public feedback to the adaptation planning process where environmental justice concerns arise. Ideally, this person would play a key role in the feedback from vulnerable populations (perhaps through the regional EJACs) being added to the public record and meaningfully incorporated into the planning process.

Environmental Justice Criterion: This policy option contributes to the first option, strengthening its effectiveness in completing the feedback loop between vulnerable communities and state planners.

Other criteria:

- Measurable value for helping people adapt: As above, measuring changes in adaptation-related behavior as a result of improved feedback access is challenging.
- Efficiency: Efficiency would also be hard to ascertain.
- Political feasibility and clarity: An examination of the process leading to the appointment of an EJ ombudsman at Cal/EPA would provide guidance on evaluating this option for feasibility.
- Flexibility (given conditions of uncertainty): This office would by nature be flexible in its responses to different future adaptation scenarios.

3. **Public education that is strategically targeted to vulnerable communities.**

Adaptation planners have voiced concerns that the most vulnerable are also the hardest to reach with information about risks in a way that would inform better decision making around adaptation. This measure suggests a state-facilitated outreach strategy which tailors public education about community risks to the target populations, rather than relying on scientific reports accessible primarily through websites to inform vulnerable communities.

Environmental Justice Criterion: While public education is not necessarily a measure that advances environmental justice, if it is done in a collaborative way, it could lead to a continuous feedback loop, where state planners, for example, conduct outreach that in turn informs them of adaptation initiatives on the ground in vulnerable communities.

Other criteria:

- Measurablevalue for helping people adapt: This option may be more measurable along this criterion than the first two feedback loop options.
- Efficiency: As this may be more measurable, it may be easier to show potential efficiency. However, public education is as resource-intensive (or more so) than the above two options.
- Political feasibility and clarity: There is precedent for this kind of outreach, and done in partnership with organizations such as the Red Cross, could be politically very popular.

- Flexibility (given conditions of uncertainty): This is by nature a flexible policy option. However, its flexibility in part hinges on the process of scientific research being appropriately repackaged for public consumption. If this process lags, public education may not be changing in step with state adaptation information.

4. A "litmus test" approach.

Instruments have been developed for measuring the impact of climate mitigation measures on vulnerable communities, like "litmus tests" for environmental justice. Such instruments could potentially be used by adaptation planners to try to assess whether their plan adequately addresses environmental justice concerns in a given case or community. However, this measure appears unlikely to be helpful, as any "one size fits all" approach would fall short when evaluating the decentralized impacts of climate change and idiosyncratic needs of vulnerable communities associated with different adaptive capacities. A collaborative planning process incorporating a regional perspective with local representatives would better address environmental justice concerns.

Environmental Justice Criterion: This option could contribute to the adaptation planning process, though in a top-down manner.

Other criteria:

- Measurablevalue for helping people adapt: The state's handling of the information produced by such a test would have to result in changes to policy to improve adaptive capacity.
- Efficiency: Hard to ascertain.
- Political feasibility and clarity: Because this has precedent, it may be more feasible than other feedback loop options.
- Flexibility (given conditions of uncertainty): A single test being applied to many unique situations would be less flexible than participatory research or other feedback loop options.

B. Direct Assistance

A key element of vulnerability is lack of adaptive capacity. The state alone among actors can play a role in reaching all stakeholders through policy, and can therefore directly improve the adaptive capacity of vulnerable communities through assistance programs. The precautionary principle calls for the state to build adaptive capacity among vulnerable communities. Given that the majority of adaptation decisions will take place on the household level, adaptive capacity building should aim to increase the ability of the most vulnerable to manage climate

change risks on their own. State-sponsored or facilitated direct assistance to vulnerable communities may be the most efficient way to address the needs of these communities and simultaneously reduce state vulnerability. Direct assistance measures are more outcome oriented, and less process oriented, and so are generally more measurable and therefore potentially more politically feasible.

1. **A "lifeline rate" for water.**

   This would be a rate in a tiered water rate system for low-income rate-payers, with higher-income rate-payers paying a surcharge that directly subsidizes the "lifeline" program. At this time, it is employed in some but not all water districts in California. It safeguards access to the vital core survival need of water by low-income households. Such households would be protected from having to trade off paying for water and other essential goods, thereby increasing their adaptive capacity. This lifeline rate may itself be tiered to account for ranges in income within the low-income category.

   Environmental Justice Criterion: This would address the adaptive capacity of one vulnerable subpopulation in a critical way. It would not aid those who are dependent on groundwater.

   Other criteria:
   - Measurablevalue for helping people adapt: This would potentially have measurable adaptation benefits for a particular population.
   - Efficiency: Over time this could be efficient when considering potential state costs from health issues caused by water scarcity in low-income households.
   - Political feasibility and clarity: Given their measurability in monetary terms, these are relatively clear measures. However, given budget constraints, the ongoing economic recession and the current bond funds freeze, funding for these adaptation measures may be politically difficult.
   - Flexibility (given conditions of uncertainty): This measure is less flexible than the feedback loop options, and less flexible than other direct assistance options.

2. **Funding or assistance with gaining access to funding for isolated communities to help develop infrastructure to improve water access and adaptive capacity.**

   In the DWR adaptation plan, Integrated Regional Water Management (IRWM) plans are featured heavily. Without sufficient financial assistance

or other assistance to help poor, rural, isolated communities create their own plans for IRWM, the state's water adaptation plan is weakened. Other planning and infrastructure issues in under-resourced communities may require state assistance in advance of expected climate change. These measures could prepare vulnerable communities to manage floods, sea-level rise, changes to water quality, drought, and other expected impacts which may call for new infrastructure or upgrades and maintenance on old infrastructure.

Environmental Justice Criterion: This measure directly addresses the adaptation needs of many vulnerable populations. However, the aggregate number of vulnerable individuals assisted may be smaller than with options targeting urban communities.

Other criteria:

- Measurablevalue for helping people adapt: This option would produce measurable adaptation benefits. This may be the most measurable option, as costs are relatively predictable.
- Efficiency: Over the long term (more than fifty years), in light of expected losses from lack of infrastructure, this option may be the most efficient.
- Political feasibility and clarity: Given budget constraints, the ongoing economic recession and the current bond funds freeze, funding for this option may be politically prohibitive in the short term. Over time, if costs can be shown to be worthwhile, this may become relatively feasible.
- Flexibility (given conditions of uncertainty): These measures are less flexible other measures, tying a community to particular engineering and technology solutions.

3. **State-sponsored innovation incentives to tap local deep knowledge of climate variability and previously implemented adaptation measures.**

One of the uncertainties associated with climate change impacts is the capacity for populations to adapt through innovation and technology. Competitions for improving community preparedness for other environmental challenges, such as forest fires, are conducted in California. The vast wealth of local and deep (accumulated within local culture over long periods of time, intergenerationally) knowledge about adaptation could be key to some communities' survival. For example, elders in North Richmond may possess important knowledge of what works and doesn't work when faced with severe flooding, having long ago faced such challenges. Innovation incentives sponsored by the state could help tap such

trapped pools of knowledge and lead to important new strategies for addressing local adaptation needs.

Environmental Justice Criterion: This measure would help the state learn about local initiatives for adaptation in vulnerable communities. These may be ongoing efforts which could help inform adaptation planners across the state on how to better address the needs of such communities. To the degree that innovations could help improve all vulnerable communities, this could be a powerful option from the perspective of environmental justice.

Other criteria:

- Measurablevalue for helping people adapt: Rooted in local knowledge, this could yield very concrete adaptation benefits.
- Efficiency: An innovation competition could be very efficient, depending on how it is designed. However, it may not yield useful innovations immediately, and over time may or may not prove to be efficient.
- Political feasibility and clarity: Given its emphasis on individual initiative, this could be very politically popular.
- Flexibility (given conditions of uncertainty): This is a very flexible option.

4. **Insurance subsidies for vulnerable households.**

This policy option would involve working with private insurance firms to offer discounts on insurance policies against climate change impacts for households that are designated as being disproportionately vulnerable to these impacts because of location and lack of adaptive capacity. This option is not advised, given the danger of encouraging maladaption, creating perverse incentives to continue behavior (e.g., staying in a location that will eventually be uninhabitable) that cannot continue under predicted climate change scenarios.

Environmental Justice Criterion: This measure would augment the adaptive capacity of households which are likely to buy insurance.

Other criteria:

- Measurablevalue for helping people adapt: The value of this option would depend on the uptake of the program and the accuracy of climate change impact predictions.
- Efficiency: The cost of this program in the face of great uncertainty would give it the appearance of being highly inefficient.

- Political feasibility and clarity: An examination of the challenges faced by the introduction of earthquake insurance would yield some prediction of the political feasibility of climate change insurance.
- Flexibility (given conditions of uncertainty): This option is flexible depending on the adaptability of insurance regimes to changing climate change futures.

C. Let Present Trends Continue

It is becoming increasingly politically infeasible for the state to do nothing in the face of oncoming climate change, nor is this a path that California state politicians, on the whole, advocate. However, most of the trends presently in motion concerning climate change and the adaptation of vulnerable communities will persist despite the state's adaptation efforts. Therefore, letting present trends continue should be considered as a policy option. It is framed here in terms of the trade-offs involved in planning.

Climate change is predicted to carry some benefits for California (e.g., longer growing seasons at higher altitudes). Additionally, there will be some benefits to inaction in terms of resources saved that would otherwise be spent on preparation for low-probability events far in the future. Resources managers and local leaders may well choose to allocate resources to immediately looming problems and be making the most responsible decision, choosing between a concrete problem and one with a high level of uncertainty attached.

Another benefit of inaction is that vulnerable populations, already operating with constrained resources, would not be pressured to expend their limited resources (and mental anxiety) on adaptation concerns over more immediate survival concerns. There is the danger of alarming communities without giving them adequate avenues for progressive action, or based on highly speculative science, possibly creating a paralyzing scare effect or a "crying wolf" effect, leading to inaction when a more certain impact is predicted. Badly timed or insufficient information transfer could be worse than no information transfer at all.

These benefits, however, will be small and/or short-lived in comparison with the aggregate losses caused by first-order climate impacts and their derivatives. In one research team's assessment, the "full costs" of climate impacts due to inaction, including lost opportunities and compounding long-term effects, are "likely to be incalculable" (Dow, Kasperson, & Bohn 2006, p. 93). The loss of lives, land, and livelihoods in a scenario without adaptation preparation will create compounding vulnerabilities, touching every part of the population without exception.

Less tangible costs related to inaction around climate change impacts include the loss of political legitimacy of policymakers. Coupled with this is the potential erosion of democratic, participatory state processes, as more people coping with impacts become cynical and disengage, or are forced by deprivation or displacement to disengage from these processes.

Environmental Justice Criterion: This option puts vulnerable communities in grave, long-term and compounding danger.

Other criteria:

- Measurable value for helping people adapt: This option has none.
- Efficiency: Given its high cost, this option is inefficient.
- Political feasibility and clarity: Though a clear measure, inaction is increasingly politically infeasible.
- Flexibility (given conditions of uncertainty): Inaction is by definition inflexible in the face of differing adaptation futures.

Section 4: Recommendations

A. Feedback Loops

This analysis indicates that the following policy options would best assist the Climate Adaptation Strategy Water Working Group address the need for feedback loops. Recommendations are categorized as short term (1-2 years), mid-term (3-5 years), or long-term (6-10 years).

1. Regional environmental justice advisory committees.

A transparent, decentralized and accessible adaptation planning process could be a valuable short-term measure, done in tandem with the creation of regional environmental justice advisory committees.

These committees would provide an accessible avenue of consistent feedback to adaptation planners, providing local knowledge regarding climate change impacts, existing or historic adaptation measures, and vulnerable populations. These committees, if formed, should heed the lessons from the AB 32 EJAC process (see Section 2). Ideally, these committees would not just help identify and give voice to vulnerable communities in the adaptation planning process, but also play a role in formulating outreach strategies. Also, they would be incorporated early into the planning process, and have some "sign off" power on adaptation plans. Their existence should be supported by sustainable funding, dedicated state agency staff time, and a timeline that allows for notification and participation of vulnerable communities.

While this may initially face political opposition, it is not infeasible, particularly if designed explicitly with reference to the lessons learned from past experiences with involving environmental justice representatives in the planning process.

2. An environmental justice ombudsman at the California Resources Agency.

This would be a measure to be implemented in tandem with the regional EJACs, and so also in the short term. The appointment of a staff member trusted and respected by his or her colleagues at the Resources Agency as well as representatives of vulnerable populations would help provide consistency in the management of public feedback to the adaptation planning process where

environmental justice concerns arise. Ideally, this person would play a key role in that feedback being added to the public record and meaningfully incorporated into the planning process.

3. Public education that is strategically targeted to vulnerable communities.

In the short term, while vulnerable populations are being defined, public education should be designed to target **resource managers,** along the lines of the work of the Sierra Nevada Alliance. This organization gives presentations and supports the work of resource managers to include adaptation principles in their planning. See *Appendix G* for the "Sierra Water and Climate Change Adaptation Pledge," which the Sierra Nevada Alliance reports has been signed by fifty resource management organizations.

In the mid-term, subsequent to the identification of vulnerable communities, the state should invest in assessment and implementation of culturally/locally appropriate outreach mechanisms for public education to foster better household adaptation decisions. These strategies should be formulated with input by representatives of vulnerable communities through focus groups, and ideally also provide avenues for feedback to adaptation planners through the public education process. The implementation of these outreach mechanisms would be a long-term goal.

B. Direct Assistance

This analysis indicates that the following policy options would best assist the Climate Adaptation Strategy Water Working Group address the need for direct assistance to vulnerable populations. Recommendations are categorized as short term (1-2 years), mid-term (3-5 years), or long-term (6-10 years).

1. A "lifeline rate" in a tiered water rate system for low-income rate-payers, with higher-income rate-payers paying a surcharge that directly subsidizes the "lifeline" program.

This policy option is selected here because it has the attractive potential to directly augment the adaptive capacity of poor households, although limited to those on piped water systems. It should be implemented in the short term.

2. Funding, or assistance with access to funding, to help isolated communities develop infrastructure to improve water access and adaptive capacity.

This policy option would be implemented over the long term, pending the alleviation of the state bond freeze and other key factors which are barriers to infrastructure projects attached to events of high risk and low probability. As climate change impacts become more evident, this option will potentially become more feasible.

3. State-sponsored innovation incentives to tap local deep knowledge of climate variability and previously implemented adaptation measures.

Implemented in the mid-term, this policy option would establish competitions to tap into local, deep knowledge about adaptation practices. This option would best be implemented after the identification of the most vulnerable communities, possibly in tandem with the targeted public education campaigns. This option has the appealing quality of encouraging individual initiative, and also potentially benefiting the adaptation plans of other vulnerable communities.

Conclusion

This analysis seeks to advance the state-level discussion of climate adaptation and its implications for vulnerable communities. While climate adaptation has found its way into federal level climate-related legislation (for example, the presently pending Waxman-Markey "American Clean Energy and Security Act of 2009"), and climate change is incorporated as a factor in state-level planning in most sectors, the adaptation discussion is still relatively new, compared with climate change mitigation. Equity issues in mitigation have been studied; equity issues in adaptation have only received concerted academic study in the past four years. A review of the emerging literature on adaptation and equity yielded a set of insights that in turn were in many ways reinforced by twenty-six expert interviews. Among the themes arising in the literature and interviews was the need for a decentralized approach to assessing and mitigating climate change impacts on vulnerable communities, given that these impacts are decentralized, and adaptive capacity varies by numerous factors and over time at the local level. The adaptation literature and input from experts led to this analysis' recommendations of improved feedback loops and direct assistance to augment the adaptive capacity of vulnerable populations. Such policy options could potentially help the state make better adaptation policy and increase the overall adaptive capacity of the state.

Appendices

Appendix A: A Taxonomy of Climate Change and Adaptation

Climate Change: Any change in climate over time, whether due to natural variability or as a result of human activity. (IPCC Fourth Assessment Report 2007)

Mitigation: Actions to slow or constrain climate change. (Leary 2006, p. 155)

Adaptation (1): Actions to realize gains from opportunities or to reduce the damages that result from climate change (Agrawala & Fankhauser 2008, p. 11).

Adaptation (2): "Adjustments in individual, group, and institutional behavior in order to reduce society's vulnerabilities to climate." (Pielke 1996, p. 159)

Adaptive Capacity: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. (IPCC Fourth Assessment Report 2007)

Vulnerability (1):

End Point Vulnerability: A residual of climate change impacts minus adaptation; in this sense, a means to grasp net climate change impacts after the fact. (O'Brien, et al, 2004)

Starting Point Vulnerability: A state generated by multiple environmental and social processes exacerbated by climate change; in this sense, a means to grasp the distribution of climate change impacts, primarily to identify measures to reduce vulnerability in advance of impacts. (O'Brien, et al, 2004)

Vulnerability (2): The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes; A function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. (IPCC Fourth Assessment Report 2007)

Key uncertainties: Those uncertainties that, if reduced, may lead to new and robust findings. (IPCC Third Assessment Report 2001)

Robust findings: Findings that hold under a variety of approaches, methods, models, and assumptions, and that are expected to be relatively unaffected by uncertainties. (IPCC Third Assessment Report 2001)

Appendix B: A Taxonomy of Environmental Justice

Environmental Justice: "Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work" (Environmental Protection Agency, Office of Environmental Justice Website). The phrase "environmental justice" officially entered the federal lexicon with President Clinton's 1994 Federal Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

Environmental Discrimination: "Corporate and governmental actions and decisions that result in the disproportionate of people of color and low-income people to environmental dangers that threaten their physical, social, economic, or environmental health and well-being." (EJCW 2005)

Human Rights: "[T]he rights a person has simply because he or she is a human being. Human rights are held by all persons equally, universally, and forever. Human rights are inalienable: you cannot lose these rights any more than you can cease being a human being. Human rights are indivisible: you cannot be denied a right because it is 'less important' or 'non-essential.' Human rights are interdependent: all human rights are part of a complementary framework. … [H]uman rights [are] those basic standards without which people cannot live in dignity." (Amnesty International USA Human Rights Educators Network 1998)

The relationship of human rights and environmental protection: "The protection of the environment is ... a vital part of contemporary human rights doctrine, for it is a sine qua non for numerous human rights such as the right to health and the right to life itself. It is scarcely necessary to elaborate on this, as damage to the environment can impair and undermine all the human rights spoken of in the Universal Declaration and other human rights instruments" (ICJ, opinion of Judge Weeremantry 1997).

Appendix C: List of Interviewees

The following list names the twenty-six individuals interviewed (and two consulted) for this analysis in March and April 2009. Note that time constraints prevented the inclusion of insights from 38 additional experts who were recommended as valuable contributors. The following list generally represents experts recommended by John Andrew at DWR, volunteers from the Working Groups, and academic contacts, and others solicited independently.

Climate Adaptation Strategy Working Group Members

1. Marion Gee (Water Working Group; Sierra Nevada Alliance)
2. Bruce Gwynne (Agriculture Working Group; Staff Environmental Scientist, California Department of Conservation)
3. Greg Oliva (Public Health Working Group; Senior Policy and Program Advisor, California Department of Public Health)
4. Amber Pairis (Biodiversity Working Group; Climate Change Advisor, California Department of Fish and Game)
5. Linda Rudolph, MD, MPH (Public Health Working Group; Deputy Director, Center for Disease Prevention and Health Promotion)
6. Leah Wills (Water Working Group; Water for California)

Other State Employees Working on Climate Policy

1. Andrew Altevogt (Climate Change Program Manager, coordinator of California's Climate Action Team, California Environmental Protection Agency)
2. Michael Colvin (Policy Analyst, Policy and Planning Division, CPUC – California Public Utilities Commission)
3. Cynthia Truelove (Senior Policy Analyst, Water Issues, CPUC)
4. Fran Spivey-Weber (Vice Chair, State Water Board)

Consultants and Academics Working on State-Commissioned Reports or Otherwise Advising the State on Climate Policy

1. Chione Flegal (Member, EJAC – Environmental Justice Advisory Committee for the AB32 Scoping Plan; Senior Associate, PolicyLink; Climate Change Advisor, Environmental Justice Coalition for Water)
2. W. Michael Hanemann, Ph.D. (Chancellor's Professor, UC Berkeley)

3. Angela Johnson-Meszaros (Co-Chair, 32 Environmental Justice Advisory Committee; Director of Policy and General Counsel, California Environmental Rights Alliance)
4. Eli Moore (Research Associate, Program on Community Strategies for Sustainability and Justice, Pacific Institute)
5. Manuel Pastor, Ph.D. (Professor of Geography and American Studies & Ethnicity, University of Southern California).
    - Referred to Pastor by Dan Mazmanian, Ph.D., (Bedrosian Chair in Governance, USC; Director, Bedrosian Center on Governance and the Public Enterprise) – consulted; author did not complete full interview.
6. Seth Shonkoff, MPH (PhD student, Dept. of Environmental Science, Policy & Management, UC Berkeley)

Campaigners from Water Advocacy Groups and Others Working on Climate Policy

1. Chris Brown (Executive Director, California Urban Water Conservation Council)
2. Laurel Firestone (Co-Executive Director and Attorney at Law, Community Water Center, Visalia, CA)
3. Kathleen Sloan (Director, Yurok Tribe Environmental Program)

Political Representatives

1. Kate Williams (Principal Consultant for Jared Huffman, State Assemblymember from Marin and former NRDC lawyer, sponsor of water-related legislation)

Specialists from the Red Cross

1. Madelyn Mackie (Emergency Preparedness Program Manager, SF Bay Area, American Red Cross)
2. Nicole Mlade (Head of International Policy and Relations, American Red Cross)
3. Pablo Suarez (Associate Director of Programmes, International Red Cross/Red Crescent Climate Centre; Boston University Dept. of Geography and Environment)

Others with Key Perspectives on California's Climate Policy

1. Loretta Lynch (Former CPUC President 2000-2002, Commissioner until 2005)
2. Chuck Schulock (Retired [2009] Founder and Chief of the Office of Climate Change, California Air Resources Board.)

3. Greg Zlotnick (Special Council for the Office of Delta Policy and Imported Water, Santa Clara Valley Water District; former elected member of Santa Clara Valley Water District board)

Also consulted: Monique Wilber (author of 2005 white paper "Californians Without Safe Water," commissioned by DWR) – consulted on her report recommendations; author did not complete full interview.

Appendix D: Interview Questions

State Employees (CAS working group members and others working on resource management):

1. What are your overarching concerns with the direct climate impacts California is facing? What are your concerns specifically with regard to disparate impacts on vulnerable populations?
2. Have you found any international cases helpful in preparing for California's adaptation efforts?
3. What is your preferred unit of analysis in adaptation planning (individual or community)?
4. What are some "new messengers" that you expect would be effective at transmitting adaptation information to vulnerable populations?
5. What are some examples of successful public participation in climate change planning?
    a. In any state planning process?
6. What reports or experts should I not miss consulting with on the water and/or equity issues I'm addressing?
7. (If aware of the process) What was your perception of the AB 32 EJAC input process? In what ways was it successful/unsuccessful?
8. What other people or reports should I not miss consulting?

Academics:

9. What are your preferred metrics for measuring successful adaptation ($, land loss, people displaced?)

Community organizers:

10. What would an optimal process be for getting information out to vulnerable populations?
11. What would an optimal community input process be for getting information on current adaptation practices back to the CAS Working Groups?
    a. How would success be measured?
        i. in distributing info?
        ii. in providing input?

Political representatives:

12. What are your priorities for climate adaptation for your constituents?

a. How are you addressing water distribution issues in your area?

Specialists on environmental threat outreach:

13. What are some examples of successful outreach campaigns?
    a. What made them successful?
    b. How did you measure your success?

Appendix E: Department of Water Resources: Ten Draft Adaptation Strategies (Outline of Water Working Group Section of the CAS)

1. Provide Sustainable Funding for Statewide and Integrated Regional Water Management

- The State Legislature should initiate a formal assessment of state and local financing mechanisms to provide a continuous and stable source of revenue to sustain the programs described herein. Activities in particular need of certainty and continuity in funding include regional water planning, inspection, maintenance, repair, and rehabilitation of flood management facilities, observational networks and water-related climate change adaptation research.

2. Fully Develop the Potential of Integrated Regional Water Management

- By 2011, all IRWM plans should identify strategies that can improve the coordination of local groundwater storage and banking with local surface storage and other water supplies such as recycled municipal water, surface runoff and flood flows, urban runoff and storm water, imported water, water transfers, and desalinated groundwater and seawater.

- By 2011, all IRWM plans should include specific elements to adapt to a changing climate, including:

- An assessment of the region's vulnerability to the long-term increased risk and uncertainty associated with climate change.

- An integrated flood management component.

- A drought component that assumes, until more accurate information is available, a 20 percent increase in the frequency and duration of future dry conditions.

- Aggressive conservation and efficiency strategies.

- Integration with land use policies that:

- Help restore natural processes in watersheds to increase infiltration, slow runoff, improve water quality and augment the natural storage of water.

- Encourage low-impact development that reduces water demand, captures and reuses storm water and urban runoff, and increases water supply reliability.

- A plan for entities within a region to share water supplies and infrastructure during emergencies such as droughts.

- Large water and wastewater utilities should conduct an assessment of their carbon footprint and consider implementation of strategies described in the draft AB 32 Scoping Plan to reduce greenhouse gas emissions. To take advantage of an existing framework and process for calculating their carbon footprint, these utilities should join the Climate Action Registry.

3. Aggressively Increase Water Use Efficiency

- As directed by Governor Schwarzenegger, DWR in collaboration with the Water Boards, the California Energy Commission (CEC), the California Public Utilities Commission, the California Department of Public Health, and other agencies, are developing and will implement strategies to achieve a statewide 20 percent reduction in per capita water use by 2020.

  - By 2010, all Urban Water Management Plans must include provisions to fund and implement all economic, feasible, and legal urban best management practices established by the California Urban Water Conservation Council (CUWCC) (see sidebar).

  - All local governments are required by statute to adopt the State Model Water Efficient Landscape Ordinance (MWELO) or equivalent (see sidebar). Because the model ordinance only addresses new development, local governments must pursue conservation programs to reduce water use on existing landscapes.

  - Notwithstanding other water management objectives, local and regional water use efficiency programs—agricultural, residential, commercial, industrial and institutional—should emphasize those measures that reduce both water and energy consumption.

  - Agricultural entities should apply all feasible Efficient Water Management Practices (EWMPs) to reduce water demand and improve the quality of drainage and return flows, and report on implementation in their water management plans. Recycled water is a drought-proof water management strategy that may also be an energy efficient option in some regions.

  - In those regions, wastewater and water agencies should collaboratively adopt policies and develop facility plans that promote the use of recycled water for all appropriate, cost-effective uses while protecting public health.

  - In consultation with DWR and the Department of Public Health, the Water Boards should identify opportunities to optimize water recycling consistent with existing permitting authority.

4. Practice and Promote Integrated Flood Management

- Flood management systems must better utilize natural floodplain processes. Thus, flood management should be integrated with watershed management on open space, agricultural, wildlife areas, and other low density lands to lessen flood peaks, reduce sedimentation, temporarily store floodwaters and recharge aquifers, and restore environmental flows.

- The state will establish a System Reoperation Task Force comprised of state personnel, federal agency representatives and appropriate stakeholders that will:

  - Quantify the potential costs and benefits and impacts of system reoperation for water supply reliability, flood control, hydropower, water quality, fish passage, cold water management for fisheries and other ecosystem needs;

- Support the update of U.S. Army Corps of Engineers' operations guidelines for Central Valley reservoirs;

  - Support the update of flood frequency analyses on major rivers and streams;

  - Evaluate the need to amend flow objectives;

  - Expand the study of forecast-based operations for incorporation into reservoir operations;

  - Include watershed level analyses that detail localized costs and benefits; and

  - Identify key institutional obstacles that limit benefits.

- To coordinate California's water supply and flood management operations, state and federal agencies collaboratively established the Joint Operations Center (JOC). To successfully meet the challenges posed by climate change, the JOC capacity must be expanded to improve tools and observations to better support decision-making for individual events and seasonal and interannual operations, including water transfers. The JOC should be enhanced to further improve communications and coordination during emergencies, such as floods and droughts.

- By January 1, 2012, DWR will collaboratively develop a Central Valley Flood Protection Plan that includes actions to improve integrated flood management and considers the expected impacts of climate change. The plan will provide strategies for greater flood protection and environmental resilience, including:

  - Emergency preparedness, response, evacuation and recovery actions;

  - Opportunities and incentives for expanding, or increasing the use of floodway corridors to reduce stress on critical urban levees and provide for habitat, open space, recreation and agricultural land preservation;

  - Options and recommendations to provide at least 200-year level protection for all urban areas within the Sacramento-San Joaquin Valley;

  - Increased use of setback levees, flood easements, zoning, and land acquisitions to provide greater public safety, floodplain storage, habitat and system flexibility;
  - Flood insurance requirements to address residual risk;
  - Extensive, grassroots public outreach and education; and
  - The integration of flood management with all aspects of water resources management and environmental stewardship.

- All at-risk communities should develop, adopt, practice and regularly evaluate formal flood emergency preparedness, response, evacuation and recovery plans.
- Local governments should implement land use policies that decrease flood risk.
- Local land use agencies should update their General Plans to address increased flood risks posed by climate change. General Plans should consider an appropriate risk tolerance and planning horizon for each locality.
  - Local governments should site new development outside of undeveloped floodplains unless the floodplain has at least a sustainable, 200-year level of flood protection.
  - Local governments should use low-impact development techniques to infiltrate and store runoff.
  - Local governments should include flood-resistant design requirements in local building codes.

5. Enhance and Sustain Ecosystems

- Water management systems should protect and reestablish contiguous habitat and migration and movement corridors for plant and animal species related to rivers and riparian or wetland ecosystems. IRWM and regional flood management plans should incorporate corridor connectivity and restoration of native aquatic and terrestrial habitats to support increased biodiversity and resilience for adapting to a changing climate.
- Flood management systems should seek to reestablish natural hydrologic connectivity between rivers and their historic floodplains. Setback levees and bypasses help to retain and slowly release floodwater, facilitate groundwater recharge, provide seasonal aquatic habitat, support corridors of native riparian forests and create shaded riverine and terrestrial habitats. Carbon sequestration within large, vegetated floodplain corridors may also assist the state in meeting greenhouse gas emissions reductions mandated by AB 32.
- The state should work with dam owners and operators, federal resource management agencies, and other stakeholders to evaluate opportunities to introduce or reintroduce anadromous fish to upper watersheds. Reestablishing anadromous fish, such as salmon, upstream of dams may provide flexibility in providing cold water conditions downstream, and thereby help inform system reoperation. Candidate watersheds

should have sufficient habitat to support spawning and rearing of self-sustaining populations.

- The state should identify and strategically prioritize for protection lands at the boundaries of the San Francisco Bay and Sacramento-San Joaquin Delta that will provide the habitat range for tidal wetlands to adapt to sea-level rise. Such lands help maintain estuarine ecosystem functions and create natural land features that act as storm buffers, protecting people and property from flood damages related to sea-level rise and storm surges.

- The state should prioritize and expand Delta island subsidence reversal and land accretion projects to create equilibrium between land and estuary elevations along select Delta fringes and islands. Sediment-soil accretion is a cost-effective, natural process that can help sustain the Delta ecosystem and protect Delta communities from inundation.

- The state should consider actions to protect, enhance and restore upper watershed forests and meadow systems that act as natural water and snow storage. This measure not only improves water supply reliability and protects water quality, but also safeguards significant high elevation habitats and migratory corridors.

- Reliable water supplies and resilient flood protection depend upon ecosystem sustainability. Building adaptive capacity for both public safety and ecosystems requires that water and flood management projects maintain and enhance biological diversity and natural ecosystem processes. Water supply and flood management systems are significantly more sustainable and economical over time when they preserve, enhance and restore ecosystem functions, thereby creating integrated systems that suffer less damage from, and recover more quickly after, severe natural disruptions. By reducing existing, non-climate stressors on the environment, ecosystems will have more capacity to adapt to new stressors and uncertainties brought by climate change.

- Water management systems should protect and reestablish contiguous habitat and migration and movement corridors for plant and animal species related to rivers and riparian or wetland ecosystems. IRWM and regional flood management plans should incorporate corridor connectivity and restoration of native aquatic and terrestrial habitats to support increased biodiversity and resilience for adapting to a changing climate. Habitat management should include increased emphasis on the implementation and enforcement of Best Management Practices to eliminate damaging nonpoint source discharges.

- Flood management systems should seek to reestablish natural hydrologic connectivity between rivers and their historic floodplains. Setback levees and bypasses help to retain and slowly release floodwater, facilitate groundwater recharge, provide seasonal aquatic habitat, support corridors of native riparian forests and create shaded riverine and terrestrial habitats. Carbon sequestration within large, vegetated floodplain corridors may also assist the state in meeting greenhouse gas emissions reductions mandated by AB 32.

- The state should work with communities to implement Low Impact Development (LID). LID increases infiltration in urban environments, protecting waterways and aquatic ecosystems from scouring and erosive damage, and reduces contaminant loads and consequent water quality degradation introduced by urban runoff. LID increases infiltration and groundwater recharge that can augment water supplies in some locations.

- The state should work with dam owners and operators, federal resource management agencies, and other stakeholders to evaluate opportunities to introduce or reintroduce anadromous fish to upper watersheds. Reestablishing anadromous fish, such as salmon, upstream of dams may provide flexibility in providing cold water conditions downstream, and thereby help inform system reoperation. Candidate watersheds should have sufficient habitat to support spawning and rearing of self-sustaining populations.

6. Expand Water Storage and Conjunctive Management of Surface and Groundwater Resources

- California must expand its available water storage including both surface and groundwater storage. DWR will incorporate climate change considerations as it works with the U.S. Bureau of Reclamation (Reclamation) and local agencies to complete surface storage feasibility studies and environmental documentation for the Sites Reservoir and Upper San Joaquin River Basin Storage Investigations.

- DWR will also make climate change recommendations as it works cooperatively with Contra Costa Water District on the Los Vaqueros Reservoir Expansion Investigation, and DWR will advise Reclamation on climate change matters on the Shasta Lake Water Resources Investigation.

- State, federal, and local agencies should develop conjunctive use management plans that integrate floodplain management, groundwater banking and surface storage. Such plans could help facilitate system reoperation and provide a framework for the development of local projects that are beneficial across regions.

- Local agencies should develop and implement AB 3030 Groundwater Management Plans as a fundamental component of IRWM plans.

- Local agencies must have such groundwater management plans to:

  - Effectively use aquifers as water banks;

  - Protect and improve water quality;

  - Prevent seawater intrusion of coastal aquifers caused by sea-level rise;

  - Monitor withdrawals and levels;

  - Coordinate with other regional planning efforts to identify and pursue opportunities for interregional conjunctive management;

- Avert otherwise inevitable conflicts in water supply; and
- Provide for sustainable groundwater use.

- Local land use agencies should adopt ordinances that protect the natural functioning of groundwater recharge areas.

7. Fix Delta Water Supply, Quality and Ecosystem Conditions

- State agencies and stakeholders should continue to support the work of the Delta Vision Task Force, BDCP, DRMS, and DRERIP, and encourage the incorporation of adaptive responses to climate change for the Delta in all four processes.

- By June 2009, affected state agencies, led by DWR, will initiate a coordinated effort to invest in the Delta ecosystem, water conveyance improvements, flood protection and community sustainability in order to achieve a sustainable Delta.

8. Preserve, Upgrade and Increase Monitoring, Data Analysis and Management

- For data to be useful in climate monitoring and climate change detection, there must be better and more consistent monitoring of critical variables such as temperature, precipitation, evapotranspiration, wind, snow level, vegetative cover, soil moisture and streamflow. Expanded monitoring is especially needed at high elevations and in wilderness areas to observe and track changes occurring in the rain/snow transition zone, which is critical for projecting future water supply.

- Similarly, improved observations of atmospheric conditions are needed to help define and better understand the mechanisms of the underlying atmospheric processes that lead to California's seasonal and geographic distribution of precipitation. This will help climate modelers to better project future rain and snow patterns on a regional scale. Information on water use is currently limited and often unreliable.

- Accurate measurement of water use can facilitate better water planning and management. By 2009, DWR, the state and regional Water Boards, the Department of Public Health, and the California Bay-Delta Authority will complete a feasibility study for a water use measurement database and reporting system.

9. Plan for and Adapt to Sea Level Rise

- The state will establish an interim range of sea level rise projections for short-term planning purposes for local, regional and statewide projects and activities.

- The Resources Agency, in coordination with DWR and other state agencies, should convene and support a scientific panel of the National Research Council (NRC) to provide expert guidance regarding long-range sea level rise estimates and their application to specific California planning issues.

- Based upon guidance from the NRC, DWR, in collaboration with other state agencies, will develop long-range sea level rise scenarios and response strategies to be included in the California Water Plan Update

10. Identify and Fund Focused Climate Change Impacts and Adaptation Research and Analysis

- In association with research institutions such as the Regional Integrated Sciences and Assessment centers, Lawrence Livermore and Berkeley National Laboratories, and the University of California, state agencies should identify focused research needs to provide guidance on activities to reduce California's vulnerability to climate change. The state should also explore partnerships with the federal government, other western states, and research institutions on climate change adaptation.

- Since some uncertainty will always exist, the state's water supply and flood management agencies need to perform sensitivity analyses of preliminary planning studies, and risk-based analyses for more advanced planning studies. As noted earlier, until better information becomes available, local agencies should plan for droughts 20 percent more severe than historic droughts. For flooding, sensitivity and risk-based analyses should consider an appropriate risk tolerance and planning horizon for each individual situation. Selection of climate change scenarios for these analyses can be guided by recommendations of the Governor's Climate Action Team.

- The state should sponsor science-based, watershed adaptation research pilot projects to address water management and ecosystem needs. Funding for pilot projects should only be granted in those regions that have adopted IRWM plans that meet DWR's plan standards and have broad stakeholder support.

- As part of the California Water Plan Update process, every five years DWR will provide revised estimates of changes to sea level, droughts, and flooding that can be expected over the following 25 years.

Appendix F: Draft Strategy for Addressing Environmental Justice in California's Climate Adaptation Strategy (CAS)

(To Be Proposed for Incorporation into the Draft CAS)

A. Introduction

The following constitutes a contribution by a consultant to the California Climate Adaptation Strategy, written outside the state employee drafting process for the eight sectors, i.e., without reference to the draft strategy, due to confidentiality factors regarding the draft plan. Therefore, the intent of this strategy is to give policymakers basic overall avenues by which to address the impacts of climate change on California's most vulnerable populations, and not to make sector-specific recommendations.

B. Key Goals of this Strategy

1. To ensure that the CAS planning and implementation process safeguards the rights of vulnerable populations (defined below).
2. To ensure that the CAS planning and implementation process augments the adaptive capacity (defined below) of vulnerable populations.

C. This Strategy's Definitions

1. **Responsible Parties:** For the purposes of this strategy, responsible parties are defined as both state actors, including all governmental agencies, and non-state actors, including all California stakeholders (community-based organizations, households and individuals). Non-state organizations are responsible for representing their constituencies' best interests in the adaptation planning and implementation process, towards the goals of safeguarding their rights and augmenting their adaptive capacity. Insofar as most adaptation decisions will be made at the household level, households and individuals are responsible for adaptation and the impacts of their decisions on others. State actors are responsible for state system-wide adaptation decisions, and for creating a policy climate that is conducive for state and non-state actors to make the best possible adaptation decisions with regards to impacts on vulnerable communities (including both direct climate impacts and the secondary impacts of policy).

   Environmental Justice: The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (U.S. EPA).

   Equity: A concept wherein benefits are distributed with sensitivity to preexisting imbalances in resource distribution, with a goal of fully compensating for those imbalances. This is applied in terms of both processes and outcomes: process equity regards access to decision-making processes, while outcome equity regards the distribution of net benefits.

2. **Vulnerable Populations:** For the purposes of this strategy, vulnerable populations are those exposed to impacts from climate change in disproportionate measure because of geographic location combined with lack of adaptive capacity.

   Adaptive Capacity: The ability of a system to adjust to climate change in order to moderate potential damages, take advantage of opportunities, and cope with consequences.

D. State Actions Are Needed to Safeguard the Rights and Augment the Adaptive Capacity of Vulnerable Populations:

The State of California faces costs (economic, social and political) if it does not take proactive steps to address the needs of vulnerable populations in the face of climate change. Attention must be paid both to process equity and outcome equity in the planning and implementation of the state's adaptation strategy.

Process equity can be addressed by ensuring that vulnerable populations are identified through participatory community-based research, and those populations' local, deep knowledge is taken into account in state adaptation decision-making processes. In adaptation planning, steps should be taken to improve vulnerable populations' **adaptive capacity**: improving access to climate and adaptation information and otherwise acting to decrease a population's sensitivity to the impacts of climate change.

Outcome equity can be addressed by the state's development of impact evaluation tools in parallel with adaptation measures, the establishment of baselines for adaptation outcomes, the projection of policy outcomes in terms of equity based on these data, the amendment of policy based on projected outcomes, and the eventual evaluation of distributional outcomes after a policy measure's implementation.

The following are some specific suggestions for how the state might address process and outcome equity in adaptation planning and implementation.

5. **Feedback Loops:**
   a. **Public Participation Through Regional Environmental Justice Advisory Committees** – Convening regional leaders (from EJ advocacy groups as well as other nongovernmental organizations) through a bottom-up process to assist in identifying vulnerable populations and sharing local, deep knowledge with state planners.
   b. **EJ Ombudsman** – Tasking a state employee with assisting the regional committees and ensuring their feedback reaches state planners.
   c. **Targeted Outreach** – Using focus groups and ethnographic experts to determine locally appropriate outreach mechanisms to get information about climate change and adaptation to the most vulnerable populations.

6. **Direct Assistance:**
   a. **Assistance to Vulnerable Communities for Adaptation Planning and Infrastructure Development** – Aiding these communities in finding funding sources for improving local adaptive capacity.
   b. **Innovation Incentives** – Funding local initiatives to improve adaptive capacity through a competitive process.

F. A Separate, Specific Initial Entry Point for EJ Concerns or Questions Regarding the CAS is Needed

A separate and specific avenue for processing environmental justice concerns or questions regarding the CAS should be defined and published on the CAS web page as early as possible in the public comment period for the CAS. While EJ concerns or questions may be processed in a similar manner to other concerns, the designation of a separate and specific entry point will help raise the visibility of EJ questions and concerns both for the public and for adaptation planners.

G. This Strategy Should be Revised Dynamically

It is assumed that this strategy will be revised as California's climate change impacts and factors affecting adaptive capacity (including political environment) evolve and interact over time. This strategy alone will not ensure equitable treatment of vulnerable populations throughout the adaptation strategy planning and implementation process. Public and private commitment to the mitigation of the worst impacts of climate change on the most vulnerable populations is needed for the achievement of this strategy's goals.

Appendix G: Sierra Nevada Alliance's Pledge to Seven Principles for Adaptation

Sierra Water & Climate Change Adaptation Pledge

SIERRA NEVADA ALLIANCE

Keeping light in the range.

Climate change is significantly impacting wildlife, water supply, water quality, ecosystem health, and rural communities. The Sierra snowpack is predicted to decrease by 25-40% by mid-century and changes in snowpack and ecosystems are already occurring. We must reduce greenhouse gas emissions and make water and energy conservation a priority to prevent catastrophic climate change. In addition to reducing emissions, we must adapt to the changes we can't prevent in ways that ensure the protection of our natural resources and vibrant Sierra communities.

I pledge to be a leader and encourage the following activities when given the opportunity:

1. **Educate myself and others regarding global, national, statewide, and regional impacts of climate change.**
2. **Identify possible future changes through modeling.**
3. **Use adaptive management strategies to maintain flexibility.**
4. **Monitor and track changes in weather, hydrology and ecosystems in my community, watershed and/or region.**
5. **Promote the resiliency of existing ecosystems and minimize stressors to these systems.**
6. **Prioritize projects that will succeed under multiple scenarios.**
7. **Integrate and coordinate local efforts.**

I will coordinate with the Sierra Nevada Alliance to fulfill my pledge. The Sierra Nevada Alliance will provide assistance, regular communications and resources with the latest information, tools, and experts that can help my efforts.

Signature: _____

Contact Information

Name _____

Organization _____

I am involved with the following resource planning efforts:

☐Water ☐Land-Use Planning ☐Hydropower Relicensing ☐Watershed
☐Forestry Management ☐Flood Protection ☐Fish & Wildlife Management
☐Other _____

Email _____

Phone _____☐ cell ☐ home ☐ work

Address/City/Zip _____

www.sierranevadaalliance.org / 530-542-4546 / joan@sierranevadaalliance.org / PO Box 7989 South LakeTahoe, CA 96158

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