

April 2, 2018

SUBJECT: ICARP Adaptation Vision Framework – Defining Vulnerable Communities in the Context of Climate Adaptation

RECOMMENDED ACTION:

- Adopt the proposed definition of “vulnerable communities”
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BACKGROUND

In 2017, the Integrated Climate Adaptation and Resiliency Program's (ICARP) Technical Advisory Council developed a vision statement that expresses the characteristics of a resilient California, as well as principles that guide how adaptation actions should be implemented to achieve this vision. The Council adopted the Vision and Principles at the September 2017 meeting, with the condition that the Council further define “vulnerable communities”, a term that is referenced throughout the Vision and Principles. At the December 2017 quarterly meeting, the Council provided additional direction to staff that the final product should also include guidance on how to make the definition actionable within a California context. OPR staff presented a draft definition and supplemental guidance materials to the Council's Vision and Principles Workgroup at a meeting on February 23, 2018.

PROPOSED DEFINITION

The following definition is presented for the Technical Advisory Council's consideration:

Vulnerable Communities

Climate vulnerability describes the degree to which natural, built, and socio-economic systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change, and have less adaptive capacity to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by one or more physical (built and environmental), social, political, and economic factors, which are exacerbated by climate impacts.

In addition to the definition above, the attached document, “Defining Vulnerable Communities in the context of Climate Adaptation”, is presented for discussion and Council feedback. The document includes the *proposed* definition of vulnerable communities, as well as additional supplemental information and resources that can help make the definition actionable. These include a summary of publicly available, statewide assessment tools that can be used to evaluate climate vulnerability, additional indicators that could be used on a case-by-case basis depending on data availability and other project or plan considerations, and a list of process guides that can serve to aid agencies undertaking efforts to define vulnerable communities.

The intended audience for this document is practitioners working to define vulnerable communities within the context of adaptation planning or project implementation efforts.

Disclaimer: The attached resource guide includes information on publicly-available tools and resources that may be used to define vulnerable communities in an adaptation context. This information is provided to public agencies and the public in general as materials that may be helpful. This information

should not be construed as OPR providing any legal advice. Users of this information can access and use any of this information at their sole discretion. This resource guide was developed with input from the Integrated Climate Adaptation and Resiliency Program's Technical Advisory Council, which provides guidance to OPR and does not have any regulatory authority or mandate, as established through Senate Bill 246 (2015, Wieckowski).



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Defining Vulnerable Communities in the Context of Climate Adaptation

A resource guide developed through the Integrated Climate Adaptation and Resiliency Program (ICARP),
with guidance from the ICARP Technical Advisory Council

April, 2018

Background

The Integrated Climate Adaptation and Resiliency Program (ICARP) was established by Senate Bill 246. The Program is designed to develop a cohesive and coordinated response to the impacts of climate change across the state. Through its activities, the Program aims to develop holistic strategies to coordinate climate activities at the state, regional and local levels. One of the Program's main components is the Technical Advisory Council (TAC), which brings together state and local government, non-profit and private sector practitioners, scientists, and community leaders to help coordinate activities that better prepare California for the impacts of a changing climate.

In 2017, the ICARP Technical Advisory Council developed a vision statement that expresses the characteristics of a resilient California, as well as principles that guide how adaptation actions should be implemented to achieve this vision. The Council adopted the Vision and Principles at the September 2017 meeting with the condition that the Council define "vulnerable communities", a term that is referenced throughout the Vision and Principles (see bolded text in the "Vision and Principles" callout box on page 2). While the Council's definition of vulnerable communities provides clarity on the underlying factors of community vulnerability and how these are exacerbated by climate impacts, a definition alone may not provide the level of detail needed to take actionable steps within the context of climate adaptation plans and implementation actions.

The California Governor's Office of Planning and Research, with input from the ICARP Technical Advisory Council, developed this resource guide as a starting point for practitioners to use when first considering how to define vulnerable communities in an adaptation context.

The document includes:

- The ICARP Technical Advisory Council's [proposed] definition of climate-vulnerable communities
- A summary of existing statewide assessment tools that can be used to identify vulnerable communities in a climate adaptation context
- Additional indicators that could be used to assess underlying vulnerability on a case-by-case basis
- A list of process guides that can serve to aid agencies undertaking efforts to define vulnerable communities

This resource guide includes information on publicly-available tools and resources that may be used to define vulnerable communities in an adaptation context. This information is provided to public agencies and the public in general as materials that may be helpful. This information should not be construed as OPR providing any legal advice. Users of this information can access and use any of this information at their sole discretion. This resource guide was developed with input from the Integrated Climate Adaptation and Resiliency Program's Technical Advisory Council, which provides guidance to OPR and does not have any regulatory authority or mandate, as established through Senate Bill 246 (2015, Wieckowski).

**Adaptation Vision and Principles
Adopted by the ICARP Technical Advisory Council**

All Californians thrive in the face of a changing climate. Leading with innovation, California meets the challenge of climate change by taking bold actions to protect our economy, our quality of life, and all people. The state's most **vulnerable communities** are prioritized in these actions. Working across all levels of government, the state is prepared for both gradual changes and extreme events. Climate change adaptation and mitigation is standard practice in government and business throughout the state. California meets these goals with urgency, while achieving the following long-term outcomes:

- All people and communities respond to changing average conditions, shocks, and stresses in a manner that minimizes risks to public health, safety, and economic disruption and maximizes equity and **protection of the most vulnerable**.
- Natural systems adjust and maintain functioning ecosystems in the face of change.
- Infrastructure and built systems withstand changing conditions and shocks, including changes in climate, while continuing to provide essential services.

Principles

1. Prioritize **integrated** climate actions, those that both reduce greenhouse gas emissions and build resilience to climate impacts, as well as actions that provide **multiple benefits**.
2. **Prioritize actions that promote equity, foster community resilience, and protect the most vulnerable. Explicitly include communities that are disproportionately vulnerable to climate impacts.**
3. Prioritize **natural and green infrastructure** solutions to enhance and protect natural resources, as well as urban environments. Preserve and restore ecological systems (or engineered systems that use ecological processes) that enhance natural system functions, services, and quality and that reduce risk, including but not limited to actions that improve water and food security, habitat for fish and wildlife, coastal resources, human health, recreation and jobs.
4. **Avoid maladaptation** by making decisions that do not worsen the situation or transfer the challenge from one area, sector, or social group to another. Identify and take all opportunities to prepare for climate change in all planning and investment decisions.
5. Base all planning, policy, and investment decisions on the **best-available science**, including local and traditional knowledge, including consideration of future climate conditions out to 2050 and 2100, and beyond.
6. Employ **adaptive and flexible governance** approaches by utilizing **collaborative partnership** across scales and between sectors to accelerate effective problem solving. Promote mitigation and adaptation actions at the regional and landscape scales.
7. Take **immediate actions** to reduce present and near future (within 20 years) climate change risks for all Californians; do so while also **thinking in the long term** and responding to continual changes in climate, ecology, and economics using adaptive management that incorporates regular monitoring.

Vulnerable Communities

The following [*proposed*] definition was developed by the ICARP Technical Advisory Council (TAC) and is meant to provide a clear understanding of the multiple components that characterize vulnerable communities in an adaptation context and can be tailored to appropriately address the needs of different types of projects, scales, and communities. This definition draws upon the work of the International Panel on Climate Change¹ and the California Climate Justice Working Group².

Climate vulnerability describes the degree to which natural, built, and socio-economic systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change, and have less adaptive capacity to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by one or more physical (built and environmental), social, political, and economic factors, which are exacerbated by climate impacts.

Climate Vulnerability Assessment Tools

Understanding the components of vulnerability is a useful first step, however taking actionable steps to identify and assess vulnerable communities requires a diverse suite of indicators that address the complex factors defined above. The following narrative and tool descriptions are provided to help practitioners identify publicly accessible tools that can be used to assess vulnerable communities.

As outlined in the definition above, an individual or community may be vulnerable with respect to multiple factors at once, the cumulative effects of which may contribute to heightened vulnerability³. To fully understand the level of vulnerability a community may experience, it is important to first consider climate **risk**, which includes assessing both the degree of exposure and sensitivity to climate impacts, as well as an individual or community's level of **adaptive capacity**. It is recommended that climate risk be assessed by using the State's climate projections data tool, [Cal-Adapt](#), or other locally developed climate. Adaptive capacity can be assessed by considering the above-mentioned physical, social, and economic factors by using a number of different tools and indices (a number of publicly accessible tools are discussed below).

While not an exhaustive list, the following tools and data can be used to begin analyzing climate **risk**:

Cal-Adapt

California has invested significant resources in developing climate change information for the entire state at a resolution that is useful for planning at both a statewide and regional scale. These data are called downscaled climate data. Downscaling is an analytical tool that starts with data from global climate models and then makes adjustments using statistical techniques and/or numerical models to provide projections of climate impacts at a finer scale. California

¹ IPCC, 2014: Summary for policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32; p.5

² *Advancing Climate Justice in California: Guiding Principles and Recommendations for Policy and Funding Decisions*. Prepared by the Climate Justice Working Group. August 2017.

³ *Ibid*

has developed a set of downscaled climate data for the State using the Localized Constructed Analogs, or LOCA, statistical downscaling technique. All data are available through Cal-Adapt, an online tool that displays climate impacts in a spatial format. The platform also includes a web Application Programming Interface (API) to allow users to build their own applications. Accessible data includes annual averages, extreme heat, sea level rise, snowpack, wildfire, cooling degree days and heating degree days, downscaled climate projections, and more.

Urban Heat Island Index for California (UHII)

The Urban Heat Island Index, developed by the California Environmental Protection Agency, quantifies the extent and severity of urban heat islands for individual cities, including urban heat island interactive maps that show the urban heat island effect for each census tract in and around most urban areas throughout the state. This can also help identify and prioritize areas across the state for adaptation efforts such as urban greening and cool roofs and pavements.

While not an exhaustive list, the following tools can be used to begin analyzing **adaptive capacity**:

CalEnviroScreen (CES)

CalEnviroScreen 3.0 is a screening tool that identifies communities most affected by and vulnerable to the effects of many sources of pollution and population-based disparities. It aggregates state-wide environmental, health, and socioeconomic information to produce scores for every census tract in the state. A census tract with a high score is considered more disadvantaged than a community with a low score as a result of pollution burden and population characteristics. When overlaid with climate impact and exposure data, CalEnviroScreen can provide insight into built and environmental exposure factors that contribute to vulnerability.

Climate Change and Health Vulnerability Indicators for California (CCHVI)

The CalBRACE Project developed climate change and health indicator narratives and data to provide local health departments and partners with tools to better understand the people and places in their jurisdictions that are more susceptible to adverse health impacts associated with climate change, specifically extreme heat, wildfire, sea level rise, drought, and poor air quality. The assessment data can be used to screen and prioritize where to focus deeper analysis and plan for public health actions to increase resilience.

Healthy Places Index (HPI)

The California Healthy Places Index (HPI) is an interactive online data and GIS mapping tool that allows users to easily visualize the social and economic conditions that shape health in each neighborhood in California. HPI is validated with life expectancy and provides census tract rankings across the state. As of 2017, the Healthy Places Index platform also includes climate change indicators. This tool provides graphic overlays of climate risks, vulnerabilities and indicators of adaptive capacity, along with the healthy places index score, and other key decision support layers. HPI moves data into action by providing policy briefs outlining best practices to address risks associated with climate indicators.

Regional Opportunity Index (ROI)

Another mapping tool to identify census tracts lacking in opportunities and needing investment is the Regional Opportunity Index (ROI) from the UC Davis Center for Regional Change. The goal of the ROI is to help target resources and policies toward people and places with the greatest

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need. The tool incorporates both a “people” component and a “place” component, integrating economic, infrastructure, environmental, and social indicators into a comprehensive assessment of the factors driving opportunity.

Tool Indicator Comparison Table

The following table summarizes the indicators included in each of these assessment tools, organized by four categories, or *factors*, of vulnerability (blue highlighted cells identify which indicators are included in a given tool).⁴ While there are areas of overlap, each tool was designed to inform different decision-making processes and research questions, and as such, any single tool alone will not provide a comprehensive assessment of climate vulnerability. It should also be noted that while indicators may be included in multiple tools, each may use different data sources and timescales; when using multiple tools in an assessment process, users should review the metadata associated with each indicator to identify potential inconsistencies between tools.

Factor	Indicator	CES (weighted index + map)	CCHVI (not an index)	HPI (weighted index + map)	ROI (weighted index)
Existing inequities, institutionalized racism, or exclusion: People facing disadvantage or discrimination often have lower socioeconomic status, which result in fewer resources for preparing, coping and recovering from climate impacts.	Educational attainment				
	Employment				
	Housing burdened low income households				
	Income				
	Linguistic isolation				
	Poverty				
	Race and Ethnicity				
	Two parent household				
	U.S. Citizenship				
	Violent Crime Rate				
Physical states or conditions that increase vulnerability: Older adults, young children, pregnant women, and people with chronic health conditions or mental illness are more susceptible to harm from effects of climate change.	Asthma emergency department visits				
	Children				
	Cardiovascular disease				
	Elderly				
	Low birth-weight infants				
	Mental disability				
	Outdoor workers				
Poor environmental conditions, access to services, or living conditions: Populations at higher risk under a changing climate include those who are uninsured or underinsured or lack access to health	Alcohol outlets				
	Air conditioning				
	Active commuting				
	Diesel PM				
	Groundwater threats				
	Housing habitability				

⁴ These “factors” are taken from *Planning and Investing for a Resilient California: A Guidebook for State Agencies* developed by the Technical Advisory Group for Executive Order B-30-15. <http://www.opr.ca.gov/planning/icarp/resilient-ca.html>

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Factor	Indicator	CES (weighted index + map)	CCHVI (not an index)	HPI (weighted index + map)	ROI (weighted index)
care or child care, lack access to transportation, live in areas with poor air quality, live on upper floors of tall buildings, live in areas with lots of impervious surfaces and little tree cover, and lack life-supporting resources such as adequate housing, ways to cool living space, are food insecure or lack adequate medications, or are tenants or renters. Populations at higher risk also include those living in “land islands” that have limited access to resources and services due to conditions of geographic isolation.	Hazardous waste facilities and generators				
	Healthcare availability				
	Housing crowding				
	Impaired water bodies				
	Impervious surfaces				
	Ozone concentrations				
	PM 2.5 concentrations				
	Park Access				
	Solid waste sites/facilities				
	Public transit access				
	Toxic cleanup sites				
	Toxic releases from facilities				
	Traffic density				
	Tree canopy				
	Retail Density				
	Supermarket Access				
Lack of investment and opportunities: The disinvestment and resource deprivation historically experienced by communities facing inequities or isolation leads to degraded living conditions and lack of power over decisions that affect their lives.	Use of high-hazard, high-volatility pesticides				
	Water Contaminants				
	Homeownership				
	Health Insurance				
Vehicle Ownership/ Access					

Additional Indicators for Consideration

In addition to the assessment tools presented above, there are a larger number of other indicators developed by a wide range of research and guidance documents that could also be considered when analyzing and defining vulnerable communities in an adaptation context. The below list of indicators are not intended to be exhaustive, but provide examples of additional indicators that could complement existing tools and resources. Because these indicators are not incorporated into any of the tools presented in the section above, inclusion in an assessment process would require additional data collection and analysis on a case-by-case basis.⁵

⁵ The basis for this table of indicators can be attributed to the National Association for the Advancement of Colored People’s *Equity in Building Resilience in Adaptation Planning* [http://action.naacp.org/page/-/Climate/Equity in Resilience Building Climate Adaptation Indicators FINAL.pdf](http://action.naacp.org/page/-/Climate/Equity%20in%20Resilience%20Building%20Climate%20Adaptation%20Indicators%20FINAL.pdf)

* Additional indicator proposed by Technical Advisory Council member or State Agency partner

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Additional Vulnerability Indicators (examples)	
Demographics	Sexual Orientation
	Homelessness
	Occupation**
	Persons with criminal records
	Access and functional needs populations**
	H.S. Graduation Rates/College Degrees*
	Earning potential vs. job base provided*
	Population stability*
Housing Security	Homeowners or renters insurance
	Renter population**
	Homes in flood plains
	Flammable roof, vegetation within 10 meters of home***
	Homes with flood-proofing
	Number, location and population of prisons
	Domestic violence shelters
	Shelters for LGBTQ youth and adults
	Value, quality, and density of residential construction**
	Short-term rental market*
Mobility	Evacuation routes
	“Land island” communities*
Health Services	Individuals with health insurance coverages
	Persons with substance abuse
	Mental health services
	Substance abuse services
	Back up grid energy plans for hospitals*
	Domestic violence hotline
	Doctors or Nurses per capita
	Emergency response partnerships with pharmacies/clinics for medication reliant individuals*
	Distance to critical service providers(isolation factor) *
Environmental Hazards	Adequate/effective sewage/waste management systems
	Combined exacerbating effects of poor air quality (ozone and PM 2.5) and extreme heat*
Emergency Services	Household knowledge level of disaster resources
	Households with disaster kits
	Household distance to nearest fire station

** Additional indicator from: Cutter, S. L., B. J. Boruff, and W. L. Shirley. 2003. “Social vulnerability to environmental hazards.” *Social Science Quarterly* 84 (2): 242–261.

http://danida.vnu.edu.vn/cpis/files/Papers_on_CC/Vulnerability/Social%20Vulnerability%20to%20Environmental%20Hazards.pdf

*** Additional indicator from: Cooley, H., E. Moore, M. Heberger, and L. Allen (Pacific Institute). 2012. *Social Vulnerability to Climate Change in California*. California Energy Commission. Publication Number: CEC-500-2012-013 <http://www.energy.ca.gov/2012publications/CEC-500-2012-013/CEC-500-2012-013.pdf>

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	Availability of hazmat certification programs
	Hazmat certified individuals
	Potential loss of key infrastructure**
	Disaster plans in place at schools, businesses, churches, etc.
	Fire / EMS reliance on volunteers*
Business/Jobs	Minority owned businesses
	Businesses with flood proofing
	Businesses with insurance
	Union jobs
	High density/value commercial and industrial development**
	Amount of Full Time jobs available versus Part Time jobs year round*
	Recreation-based economies susceptible to climate impacts *
Public/Private Utilities	Telecommunications - availability and access (phone, cable, broadband, etc)
	Households with water/electricity shut offs in last 12 months
	Households reliant on well-water
	Reliance on wood based heat*
Social Services	Social services-availability
	Services for undocumented persons
	Access to childcare*
Governance	Inclusive governance
	Policy or ordinance requiring air conditioners in all single- or multi-family homes*
	Model ordinances addressing urban heat island (cool roofs, cool pavement, etc.)*
	Policy Landscape
Community Knowledge	Neighborhood cohesion
	Financial literacy
Fiscal Health	Completion of financial risk assessment*
	Potential loss of employment following a disaster**
Culture	Cultural/religious ties to land/water

Process Guides

Identifying quantifiable measures to assess and identify vulnerable communities is a critical component of any vulnerability assessment, however the process of prioritizing which indicators to include is equally important. Each of the toolkits and checklists presented below guides users through a series of questions that can help inform an assessment process. While these resources were not designed with the specific goal of informing climate vulnerability assessment processes they may be helpful resources depending on the type adaptation effort the assessment is intending to inform.

Bay Localize Community Resilience Toolkit

The Bay Localize Community Resilience Toolkit guides groups in leading workshops to plan for resilience in their communities while decreasing reliance on fossil fuels. It is designed for community groups that would like to get involved in making a difference in their neighborhood, city, or county. The Toolkit offers Bay Area-specific resources, but may be used in generating actions across many communities. (http://www.baylocalize.org/files/Community_Resilience_Toolkit_v1.0.pdf)

EO B-30-15 Equity Checklist

The Equity Checklist was created by the Equity and Vulnerable Communities subcommittee of the Technical Advisory Group, facilitated by the Climate Change and Health Equity Program of the California Department of Public Health and is intended to assist State agencies implement Executive Order B-301-5.⁶ The checklist it is intended to assist agencies to ensure that plans and investments identify and protect the State’s most vulnerable populations. This checklist can be used alongside any decision-making process to improve equitable outcomes. (http://www.opr.ca.gov/docs/20180312-Equity_Checklist.pdf)

Government Alliance on Race (GARE) Racial Equity Toolkit

The Government Alliance on Race and Equity (GARE) is a national network of government working to achieve racial equity and advance opportunities for all. The Racial Equity Toolkit is designed to integrate explicit consideration of racial equity in decisions, including policies, practices, programs, and budgets. Use of a racial equity tool can help to develop strategies and actions that reduce racial inequities and improve success for all groups. (https://www.racialequityalliance.org/wp-content/uploads/2015/10/GARE-Racial_Equity_Toolkit.pdf)

⁶ Executive Order B-30-15 directed State agencies to integrate climate change into all planning and investment, including accounting for current and future climate conditions in infrastructure investment. EO B-30-15 also mandates that because “climate change will disproportionately affect the state's most vulnerable people”, all “State agencies' planning and investments shall...protect the state's most vulnerable populations”. This was the first mandate in the United States requiring all state agencies to plan for climate change and to protect vulnerable people while doing so.