Update and amend CalOES' Prepare California Initiative to ensure equitable access for socially vulnerable and deep-seated landslide-exposed communities
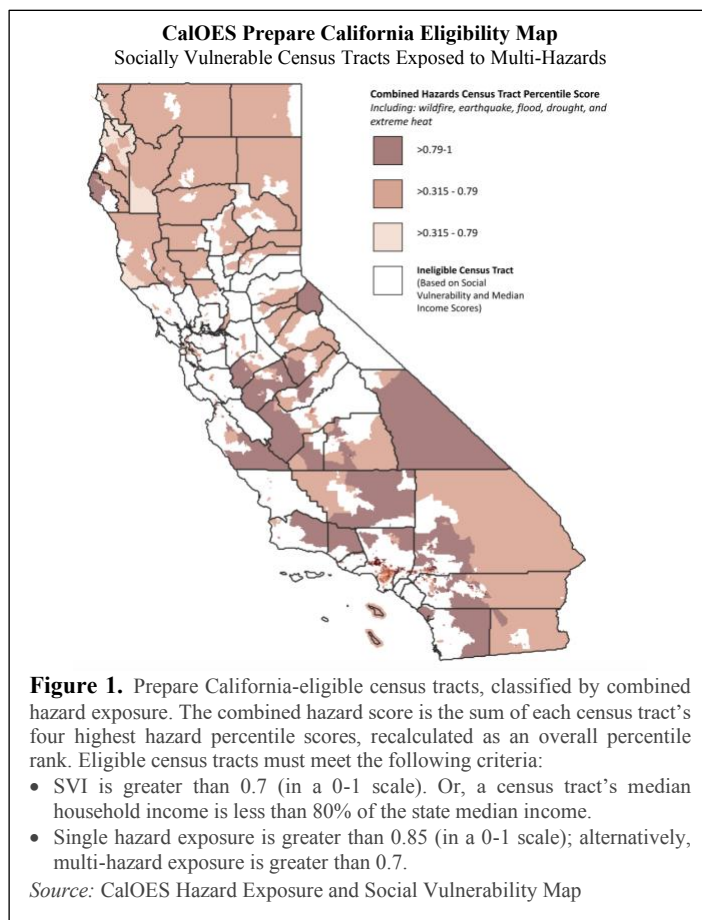
Executive Summary

The Governor's Office of Emergency Services (CalOES)'s Prepare California Initiative provides socially vulnerable and natural hazard-exposed communities the opportunity to invest in their own disaster resilience. Through two grant programs, Prepare California provides vulnerable communities the resources necessary to build local resilience, improve hazard mitigation infrastructure and disaster protocol, as well as increase public awareness of disaster risk in the face of escalating (and climate change-induced) natural disaster threat. To qualify for Prepare California, communities must classify as highly socially vulnerable according to the CDC/ATSDR's Social Vulnerability Index (SVI) (2018 model), and be exposed to significant or multiple natural hazards. However, SVI 2018 is outdated both in terms of its input census data and in its model design. While CalOES' multi-hazard criteria does address many of California's current and escalating disaster threats (fire, flood, earthquake, drought and extreme heat), it lacks consideration for deep-seated landslides. To maximize Prepare California's effectiveness in an upcoming round of funding (2023-2024), CalOES must swiftly revise its eligibility criteria by updating its Hazard Exposure and Social Vulnerability Map (Figure 1) to the CDC/ATSDR's most recent model (SVI 2020). Additionally, CalOES must include deep-seated landslide susceptibility in its multi-hazard criteria to ensure all vulnerable communities exposed to significant disaster threat are not overlooked.

Background

To better understand CalOES' Prepare California objective (and its eligibility criteria), the following terms must be defined:

Social vulnerability is understood as an individual's or population's socioeconomic or demographic characteristics which make them more susceptible to harm in a "natural" or human-induced disaster. Socially vulnerable communities may be more susceptible to physical or financial damages in a disaster scenario, or be less resilient (unable to recover as quickly) post-disaster (Drakes & Tate, 2022).

CalOES uses **the CDC/ATSDR's Social Vulnerability Index (SVI)** to quantify social vulnerability across the state, to pinpoint vulnerable communities' geographic location and to rank communities by (comparatively) *how* vulnerable they are. In SVI, social vulnerability is estimated based on a range of vulnerability indicators heuristically grouped into "themes": socioeconomic characteristics, household characteristics, race and ethnicity, and housing and transportation conditions (Figure 2). SVI is calculated per census tract as a normalized sum of vulnerability indicators' percentile ranks (Flanagan et al., 2011). A high SVI score

Figure 1. Prepare California-eligible census tracts, classified by combined hazard exposure. The combined hazard score is the sum of each census tract's four highest hazard percentile scores, recalculated as an overall percentile rank. Eligible census tracts must meet the following criteria:
- SVI is greater than 0.7 (in a 0-1 scale). Or, a census tract's median household income is less than 80% of the state median income.
- Single hazard exposure is greater than 0.85 (in a 0-1 scale); alternatively, multi-hazard exposure is greater than 0.7.

*Source:* CalOES Hazard Exposure and Social Vulnerability Map

indicates high social vulnerability, whereas a low score indicates low social vulnerability. Ranking census tracts by their estimated social vulnerability in this way can help guide CalOES to prioritize communities in need of greater government assistance before, during, and after a disaster.

A **hazard** is the probability of a danger or threat in a given time period, in a defined geographic area (Nadim, 2006). A **multi-hazard** refers to the likelihood of "compound" or "cascading" hazards—as climate change threatens more erratic weather conditions, the likelihood of multiple types of disasters occurring simultaneously or sequentially increases (Drakes & Tate, 2022). CalOES defines multi-hazard (in the context of Prepare California eligibility) as a census tract's exposure to wildfire, earthquake, flood, drought, or extreme heat (Figure 1). Deep-seated landslides are excluded from this multi-hazard assessment.

Issue Analysis

CalOES' Prepare California Initiative seeks to promote vulnerable and hazard-exposed populations' disaster resilience. However, its current methodology (Figure 1) to identify and prioritize such communities needs revision:

Prepare California eligibility relies on an outdated SVI model (2018)—as a result, socially vulnerable populations may be misrepresented. For context, the CDC/ATSDR have published several iterations of SVI to provide both current and historic assessments of social vulnerability at a state and national scale. When developing SVI 2020, the CDC/ATSDR significantly updated SVI's model design and amended input parameters based on a growing field of research into social vulnerability, indicating potential weak points in previous versions of SVI. The following variables are excluded from SVI 2018 but represented in SVI 2020: **Housing Cost Burden** (replacing Per Capita Income), and **No Health Insurance**. SVI's **Below 150% Poverty** variable is also modified (previously defined as "Below 100% Poverty" in SVI 2018) (Figure 2). SVI 2020 more adequately reflects the interconnectedness between socioeconomic
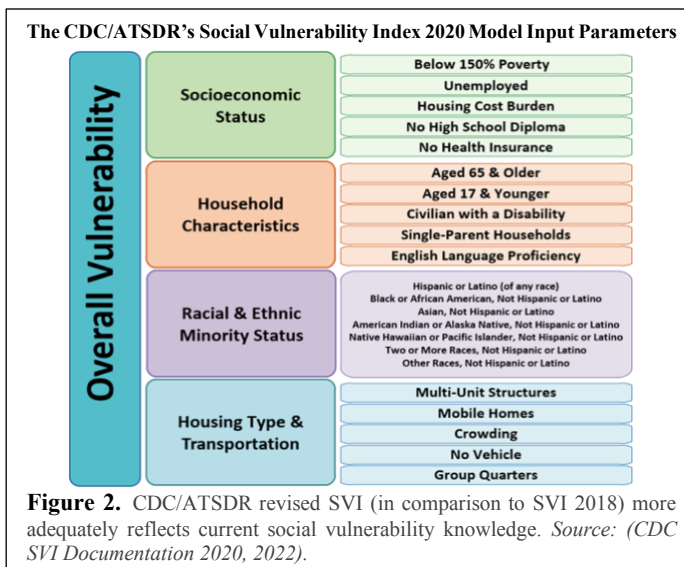
Figure 2. CDC/ATSDR revised SVI (in comparison to SVI 2018) more adequately reflects current social vulnerability knowledge. *Source: (CDC SVI Documentation 2020, 2022).*

vulnerability, financial insecurity, and healthcare access (federal poverty thresholds inform healthcare policies, and lack of insurance exposes already vulnerable communities to greater financial hardship should a disaster occur) (CDC SVI Documentation 2020). In previous SVI models, **English Language Proficiency** is considered a "Racial & Ethnic Minority Status" social vulnerability indicator. Grouping language proficiency with minority status potentially biases SVI 2018. English Language Proficiency is reclassified in SVI 2020 as a "Household Characteristics" parameter, making SVI 2020 a more appropriate tool (Figure 2). Additionally, because SVI 2020 is built on more recent census data, it provides a more accurate account of California social vulnerability in the present day.

CalOES does not include deep-seated landslide data in its multi-hazard criteria. This presents a potential gap in Prepare California, as socially vulnerable communities exposed to significant landslide threat (but not other types of hazards) are excluded from critical financial resources needed to build disaster resilience. Without the consideration of landslide exposure in CalOES' Prepare California Initiative, currently eligible populations may also be undervalued in their multi-hazard score (communities exposed to wildfire, flood, or earthquake hazards may also be highly landslide susceptible, but this heightened exposure is not represented in their current multi-hazard score) (Figure 3).

CalOES' Hazard Exposure and Social Vulnerability Map is based on 2018 TIGER/line census tract boundaries (provided in SVI 2018) (Figure 1). Census tract boundaries changed with the 2020 decennial Census (approximately 1,072 census tracts were amended, in addition to boundary line modifications for existing census tracts). This means CalOES' eligibility assessment is imprecise: singular and multi-hazard data is summarized and then ranked based on outdated census tract boundaries (meaning that census tracts' final multi-hazard scores may be overgeneralized, or inaccurate compared to their current jurisdictional boundaries); similarly, distinct communities may be inaccurately scored in SVI 2018 based on prior census tract boundary delineations. CalOES should solely base future Prepare California grants on current census tract data, to increase the accuracy of its social vulnerability analysis and to ensure multi-hazard exposure calculations are not misinformed.

Policy Recommendations

- CalOES must update its Prepare California Initiative social vulnerability metric by transitioning from SVI 2018 to SVI 2020. CalOES' Hazard Exposure and Social Vulnerability Map must also be updated to reflect this change in eligibility.
  - SVI 2018 does not adequately reflect current social vulnerability in California. Relying on this outdated model risks Prepare California's effectivity. Updating CalOES' eligibility criteria is integral to ensuring vulnerable communities are accurately scored (and appropriately visualized with current (2020) census tract boundaries).
- CalOES must amend its multi-hazard exposure criteria to also include deep-seated landslide susceptibility. Landslides expose vulnerable communities to significant financial damages, as well as potential for physical harm. Without the consideration of landslides, CalOES' multi-hazard analysis is incomplete.
  - Comprehensive landslide hazard data is not currently available at a California scale— projecting landslide likelihood depends on landslide type (shallow, deep-seated, etc.), landslide magnitude and frequency.

Despite this limitation, considerable data exists on landslide potential: the California Geological Survey (CGS)'s Deep-Seated Landslide Susceptibility Map estimates landslide likelihood based on known landslide occurrences, topography, rock strength (Wills et al., 2011). This data source merits consideration in CalOES' multi-hazard criteria, as a proxy for landslide exposure projections (see Figure 3 for proposed methodology).

- Should the aforementioned revisions be approved, CalOES should also consider conducting a gap analysis to identify highly socially vulnerable (SVI 2020) and highly landslide susceptible communities, not previously eligible for funding and in need of greater State support in future rounds of funding.

Further reading

- CalOES Hazard Exposure and Social Vulnerability Map: Data Source, Methods.
- Flanagan, B., Gregory, E., Hallisey, E., Heitgerd, J., & Lewis, B. (2011). A Social Vulnerability Index for Disaster Management. *Journal of Homeland Security and Emergency Management*, *8*(1). DOI.
- CDC/ATSDR Social Vulnerability Index (SVI 2020): Documentation.
- CGS Deep-Seated Landslide Susceptibility Map: Map Sheet 58 (Wills et al., 2011)
- Drakes, O., & Tate, E. (2022). Social vulnerability in a multi-hazard context: A systematic review. *Environmental Research Letters*, *17*(3), 033001. DOI.
- Nadim, F. (2006). *Administrative report: TC32 - Engineering practice of risk assessment and management* (Ser. 16th International Conference on Soil Mechanics and Geotechnical Engineering, pp. 3513–3516). DOI.

Authorship

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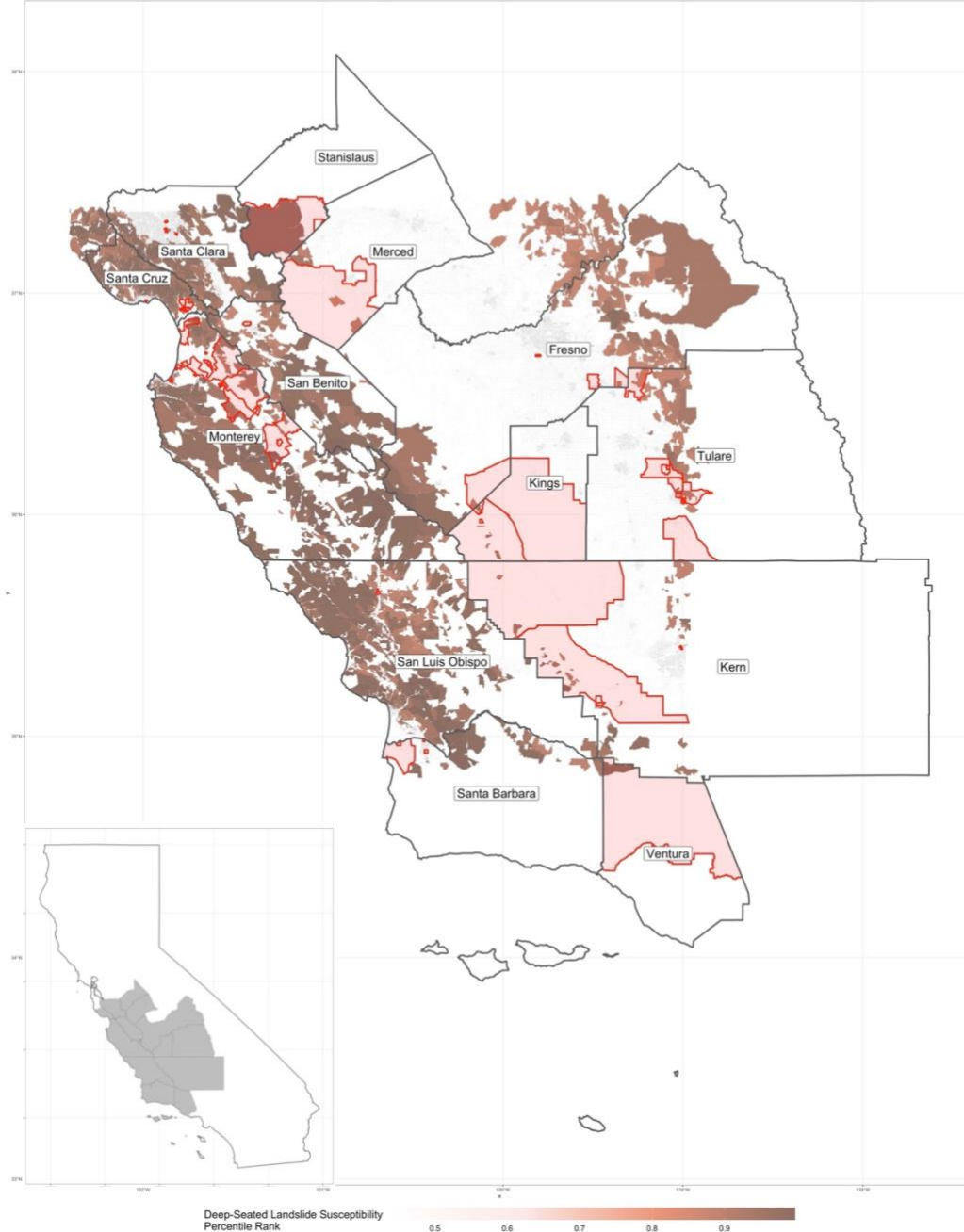
Figure 3. The California Geological Survey (CGS)'s Deep-Seated Landslide Susceptibility Map is summarized per census block and reclassified by percentile rank. Census blocks with a zero population estimate in 2020 are excluded in this process to ensure landslide susceptibility is only evaluated where there is known human exposure.

Highlighted census tracts (in pink) are those that should be considered in CalOES' Prepare California Initiative, should CalOES revise its eligibility criteria based on this policy brief's recommendations. Highlighted census tracts include at least one subpopulation (census block) that is highly socially vulnerable and highly landslide susceptible, based on the following criteria:
1. A census block must have a landslide susceptibility percentile score greater than 0.85.
2. And, the larger census tract encompassing this block must have an SVI 2020 score greater than 0.7.

While there are many populated blocks with high landslide susceptibility (particularly along the coastline), low social vulnerability scores mean they are not eligible for Prepare California funding. Comparing this figure to CalOES' current eligibility map (Fig.1), several landslide susceptible and socially vulnerable census tracts (Mountainous communities in Monterey County neighboring Salinas and San Benancio) are excluded from Prepare California due to CalOES' existing methodology (outdated SVI 2018, and lack of consideration for landslide disasters).
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