2025 Risk Assessment Mitigation Phase

(Chapter RAMP-5)
Climate Change Adaptation

May 15, 2025

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CHAPTER V: CLIMATE CHANGE ADAPTATION

I. INTRODUCTION

As climate change and extreme weather events continue to increase, including its impacts on utility assets, operations, and services, risk frameworks will need to account for changing climate conditions in utility risk planning. The changing climate requires an energy ecosystem that is resilient to extreme weather, wildfires, and drought, while delivering safe, reliable, and affordable energy. Increased awareness of the importance of climate events amongst utilities has been growing, as these climate-driven events can have severe impacts on energy resource infrastructure. Some of the climate hazards that will have short- and long-term ramifications in the Southern California region include increased frequency in extreme temperatures, extreme weather conditions, and sea level rise. SoCalGas recognizes the need to adapt to these climate hazards to promote safety and reliability of services to its customers and mitigate the increasing risk through innovative and community-centric approaches.

Climate vulnerability refers to the susceptibility of SoCalGas's infrastructure, operations, and customer base to the change in climate hazards. This includes factors such as the exposure of utility infrastructure to these hazards and the utility's capacity to adapt to changing conditions. SoCalGas's Climate Adaptation Vulnerability Assessment (CAVA), which is being concurrently filed in Rulemaking (R.) 18-04-019, explores these factors. In contrast, climate risk refers to the consequences to human or ecological systems, that result from the vulnerability of infrastructure, operations, and customer base from climate change.[1] It is arrived at by combining the likelihood of climate events with their possible impacts to the utility and community served. Essentially, while vulnerability focuses on the inherent characteristics that render the utility and its customers susceptible to harm, risk considers both the likelihood of climate events and the potential consequences of such events. Understanding both concepts is crucial for developing and prioritizing effective strategies to promote reliable and resilient service in the face of climate change.

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[1] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2023 Synthesis Report* (March 19, 2023) at 128, *available at*: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf ("In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards.").

The California Public Utilities Commission (CPUC or Commission) has two open proceedings that consider how utilities should incorporate potential climate change impacts in their risk assessment processes: the Risk-Based Decision-Making Framework (RDF) proceeding (R.20-07-013) and the Order Instituting Rulemaking (OIR) to Consider Strategies and Guidance for Climate Change Adaptation (Climate Change Adaptation OIR) (R.18-04-019). In the Climate Change Adaptation OIR proceeding, SoCalGas is directed to file the Company's first CAVA on the same day it files its 2025 Risk Assessment and Mitigation Phase (RAMP) Report. Findings from the CAVA have been used to assist in identifying the types of impacts that future climate events may have across SoCalGas's infrastructure, operations, and services. The development of the CAVA has also supported SoCalGas's ongoing foundational work that seeks to improve SoCalGas's internal capabilities to understand and analyze climate data for climate informed decision making. This information will be integrated into future investment decision making.

The purpose of this chapter is to identify how climate change has the potential to affect SoCalGas's system and how the effects can potentially be addressed through adaptive actions. As described in this chapter, climate hazards and potential adaptation actions can have significant impacts on certain RAMP risks. Rather than acting as a RAMP risk itself, climate change hazards can drive, trigger, or exacerbate multiple RAMP risks while climate change adaptation can alleviate some of the likelihood or consequences of a particular negative outcome due to a climate hazard. SoCalGas provides in this chapter an overview of its climate change adaptation culture that examines, anticipates, and mitigates potential climate change effects on its assets and operations, key results from the CAVA, and RAMP controls and mitigations that are intended to increase resilience to climate hazards.

II. CLIMATE CHANGE ADAPTATION CULTURE AT SOCALGAS

SoCalGas's inter-disciplinary and cross-departmental climate advisory group was established in 2020 and meets quarterly to act as a forum in which leaders and decision-makers from across the Company can discuss the expected impacts of climate change hazards on operations and develop unique, innovative solutions to address them. Additionally, the Climate Advisory group uses these meetings to offer climate change expertise to leaders across SoCalGas to better incorporate climate change information to maintain safe and resilient operations. In addition to coordinating internal subject matter experts to determine if there are gaps in existing data for vulnerability assessment and adaptation planning, SoCalGas actively engages in partnerships with academic and research institutions to leverage cutting-edge expertise to further advance climate resilience initiatives.

III. CLIMATE ADAPTATION VULNERABILITY ASSESSMENT

In 2018, the Commission initiated the Climate Change Adaptation OIR,[2] which defined climate change adaptation for energy utilities and promoted efforts "to address climate change adaptation issues in Commission proceedings and activities to ensure safety and reliability of utility operations."[3] Building on this effort, the Commission issued Decision (D.) 20-08-046 in September 2020 to promote the use of "best available climate science" to make informed decisions towards building resilient infrastructure and services to tackle climate change.[4] Further, the Commission acknowledged the profound and unequal burden climate change places on Disadvantaged and Vulnerable Communities (DVCs) across the state, defined DVCs within the decision, and directed robust utility engagement to empower and support these communities in building resilience. The decision provides that California investor-owned utilities (IOUs) are required to conduct a CAVA every four years, at minimum, and their analyses must reflect best available science. Additionally, the decision required IOUs to submit a Community Engagement Plan (CEP).

On August 1, 2024, the Commission issued D.24-08-005 to update climate change adaptation modeling requirements and refine the climate adaptation and vulnerability assessments. It established the Shared Socioeconomic Pathway (SSP) greenhouse gas emissions scenario 3-7.0 as the reference scenario for energy utility use in the CAVA, adopted the Global Warming Level approach as the basis of CAVA planning in lieu of the targeted years approach, and updated the timing of CAVA submittals for the next cycle, requiring the assessment be filed one year prior to each utility's RAMP application.[5] SoCalGas submitted its CEP in 2024, is submitting its first CAVA concurrently with this RAMP filing, and will submit its General Rate

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2 R.18-04-019.

3 D.20-08-046 at 2.

4 *Id.*

5 The new timing of CAVA submittals established in D.24-08-005 will apply to SoCalGas's next CAVA.

Case (GRC) Application in 2026. SoCalGas's CAVA addresses the requirements of the Climate Change Adaptation OIR and industry best practices for assessing physical climate risks.

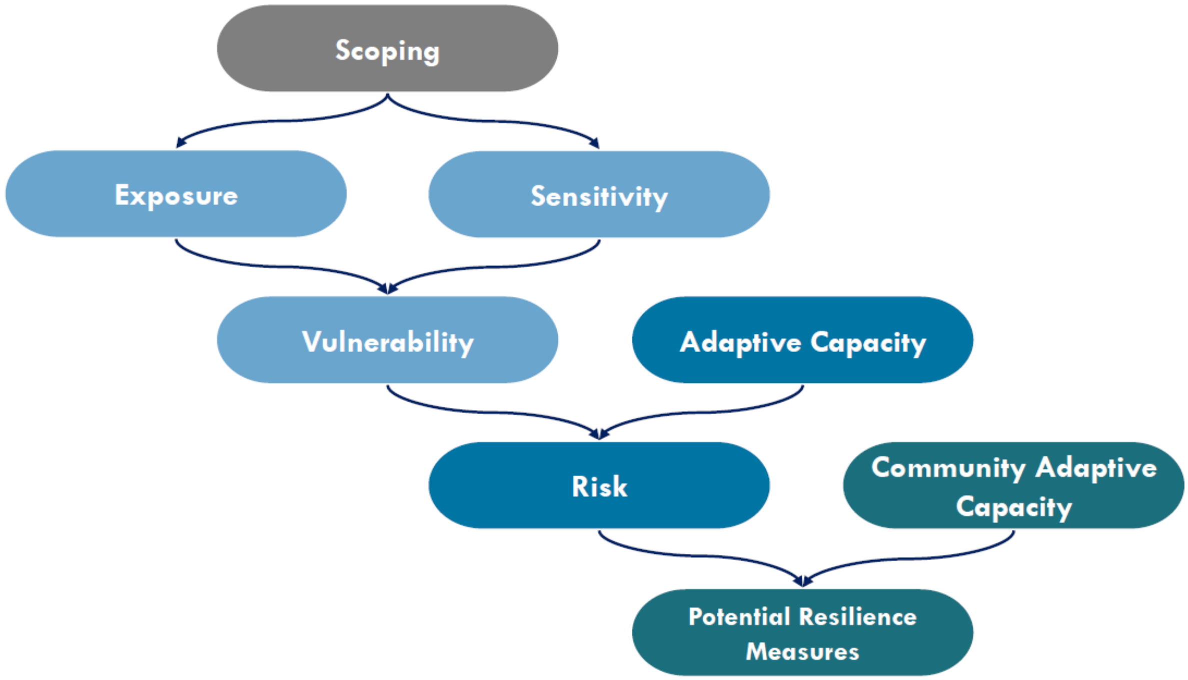
This section provides an overview of SoCalGas's concurrently filed CAVA, highlighting the methodology and key findings as they relate to the risks detailed in Volume 2. The results of CAVA serve primarily to identify assets at moderate- to high-risk due to climate hazards that could impact safe and reliable service and identify adaptation options that may be considered.

A. Methodology

The vulnerability assessment aims to identify asset and operational vulnerabilities across the SoCalGas service territory. Following the guidance of the CPUC, SoCalGas considers the 2030, 2050, and 2070 time periods in its assessment. The climate hazards of extreme heat, sea level rise, flooding/precipitation, landslide and wildfire are considered for each asset class. Subsidence has been determined to be of low consequence within the SoCalGas service territory.

In assessing vulnerabilities, the CAVA uses forward-looking climate science information applied to the gas system, and relies on a combination of climate exposure, infrastructure sensitivity, vulnerability, and adaptative capacity scores. In turn, and based on internal asset information, the assessment derives climate change risk scores that help identify the asset-hazard combinations that are considered priority vulnerabilities across SoCalGas's gas system. This approach is exemplified in the figure below.

Figure 1: CAVA Framework



The key components of the figure are defined as follows:

- Exposure: the degree to which assets or regions may experience climate hazards based on their physical locations.
- Sensitivity: the degree to which an asset's integrity or function could be adversely impacted in the event of hazard exposure.
- Vulnerability: the potential for negative outcomes on assets, operations, and services due to climate hazards.
- Adaptive Capacity: current capabilities to which an asset or operation can be adapted to mitigate climate hazards' negative outcomes based on organizational and operational maturity.
- Risk: the potential for negative outcomes for assets, operations, and services to climate hazards taking into consideration current adaptive capacity.
- Community Adaptive Capacity: current capabilities to which a community relies on to manage environmental hazards.

The Climate Change Adaptation OIR requires SoCalGas and the other California IOUs to conduct community outreach throughout the CAVA process, as well as to file a CEP one year prior to the filing of the CAVA. This stakeholder engagement includes interactions with local governments, community-based organizations, and customers, among others. This engagement is critical for ground-truthing the findings of the CAVA as well as spurring a regional approach to climate change adaptation, which is critical for the success of such endeavors. SoCalGas's outreach efforts include holding workshops, conducting interviews, convening information sessions, and performing surveys to provide opportunities for engagement and collaboration throughout the CAVA process.

B. Key Findings

Assets were categorized into the following five (5) simplified asset classes: (1) high-pressure pipelines, (2) medium-pressure pipelines, (3) facilities, (4) regulator stations, compressors, and valves, and (5) storage fields.[6] The risk classes are a combination of the 2050 asset vulnerability scores and asset adaptative capacity results. These results are intended to convey relative risk rather than absolute risk. Furthermore, the risk categories presented in the table are assigned at the asset class rather than the asset level. An asset class being designated as high risk does not imply that all assets within that asset class are high risk. The purpose is to prioritize what assets need a closer, site-specific analysis in the next CAVA phase.

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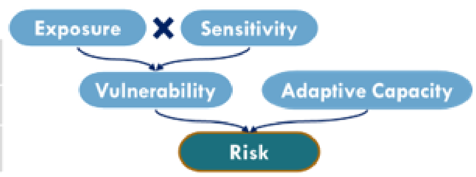
[6] In the analysis, each storage field was treated as a single asset. To be conservative, a storage field's exposure score for a particular hazard was assigned by taking the maximum exposure across the entire storage field area for that hazard, including aboveground and underground assets. This does not imply that all parts of the storage field had that level of exposure or the resulting level of vulnerability. This approach is helpful for screening purposes but likely overestimates the level of vulnerability for some assets (*i.e.*, Underground Storage Assets).

Table 1: Asset Risk Results by Asset Class and Hazard

	Coastal Erosion	Coastal Flood	Inland Flood	Landslide	Wildfire
High-Pressure Pipelines	Lower Risk	Lower Risk	Moderate Risk	Moderate Risk	Lower Risk
Medium-Pressure Pipelines	Lower Risk	Lower Risk	Lower Risk	Moderate Risk	Lower Risk
Facilities	Lower Risk	Lower Risk	Moderate Risk	Moderate Risk	Moderate Risk
Regulators, Compressors, Valves	Lower Risk	Lower Risk	Lower Risk	Moderate Risk	Moderate Risk
Storage Fields	Higher Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk

Color	Label
Red	Higher Risk
Orange	Moderate Risk
Green	Lower Risk



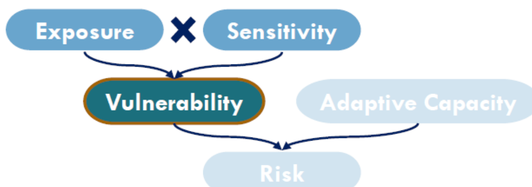
Per Asset Class:

- Storage fields were categorized as higher risk for coastal erosion (the only higher risk classification) and moderate risk for the other four hazards.
- High-pressure pipelines, including high-pressure service pipelines, were categorized as moderate risk for both inland flooding and landslides, and lower risk for the other three hazards.
- Medium-pressure pipelines, including high-pressure service pipelines, were categorized as moderate risk for landslide and lower for the other four hazards.
- Facilities were at moderate risk for inland flooding, landslide, and wildfire; and lower for the other two hazards.
- Regulator stations, compressor stations, and valves (including controllable and non-controllable) were grouped together and considered moderate risk for landslide and wildfire, and lower risk for the other three hazards.

The asset vulnerability score categories are summarized in Table 2. The categories are based on each 95th percentile asset vulnerability score for 2050 for each combination of asset class and hazard.

Table 2: Asset Vulnerability Summary for Year 2050

	Coastal Erosion	Coastal Flood	Inland Flood	Landslide	Wildfire
High-Pressure Pipelines	Very Low	Very Low	Moderate	High	Low
Medium-Pressure Pipelines	Very Low	Very Low	Low	Moderate	Low
Facilities	Very Low	Very Low	Moderate	Moderate	High
Regulators, Compressors, Valves	Very Low	Very Low	Moderate	Moderate	Moderate
Storage Fields	High	High	High	High	High



Color	Label
Red	High
Orange	Moderate
Light green	Low
Dark green	Very Low

Per Asset Class:

- Storage fields were classified as high vulnerability for all five hazard types.
- Facilities were at high vulnerability to wildfire and moderate vulnerability to both landslide and inland flooding.
- Regulator stations, compressor stations, and valves were at moderate vulnerability to inland flooding, landslide, and wildfire.
- High-pressure pipelines were at high vulnerability to landslide and moderate vulnerability to inland flooding.
- Medium-pressure pipelines were at moderate vulnerability to landslide.

Table 3 summarizes asset adaptive capacity, which was assessed qualitatively at the asset class level in a series of Subject Matter Expert (SME) workshops. The following definitions were used:

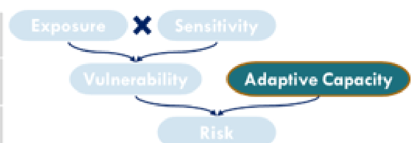
- High: “Sufficient or excellent capabilities to manage the climate hazard now and in the future” (or no exposure or very low sensitivity)
- Medium: “Some or many existing capabilities; however, there are opportunities to strengthen these”

- Low: "No or very few current capabilities"

Table 3: Asset adaptive Capacity Summary

	Coastal Erosion	Coastal Flood	Inland Flood	Landslide	Wildfire
High-Pressure Pipelines					
Medium-Pressure Pipelines					
Facilities					
Regulators, Compressors, Valves					
Storage Fields					

Color	Label
	Low Adaptive Capacity
	Moderate Adaptive Capacity
	High Adaptive Capacity



Most simplified asset classes and hazards were categorized as having moderate adaptive capacity. Exceptions included the following:

- Storage fields were considered low adaptive capacity for coastal erosion.
- Regulator stations, compressor stations, and valves were considered high adaptive capacity for coastal and inland flooding.
- Facilities were not exposed to either coastal erosion or coastal flooding, therefore, they were considered to have high adaptive capacity for those hazards.

While the CAVA is designed to inform medium to long-term planning, the focus in RAMP is on identifying asset classes with high vulnerability in the near-term within the Test Year 2028 GRC cycle. Vulnerability, however, does not equate to risk. Therefore, some of the assets identified as vulnerable in CAVA may not appear in risk chapters due to RAMP asset prioritization criteria set forth in the RDF, yet their identification remains critical for informing adaptation planning. For a detailed methodology of the framework used to determine risks included in RAMP through the CPUC's cost-benefit approach, please refer to Volume 1, Chapter RAMP-3: ERM Risk Quantification Framework. To explore further information on asset types more prone to specific climate hazards and examine how their vulnerability evolves through 2030, 2050, and 2070, please refer to Section 3 of the CAVA, titled "Vulnerability Assessment Methodology."

IV. CLIMATE CHANGE ADAPTATION IN THE RISK-BASED DECISION-MAKING FRAMEWORK

Effective climate adaptation requires the identification and evaluation of actions that can be taken to address vulnerabilities associated with climate change impacts. SoCalGas will continue to explore ways to integrate climate exposure data and vulnerability analysis into its quantitative risk models. Translating climate vulnerability into risk presents several challenges, as the translation of one concept into the other involves nonlinear relationships, interdependencies, and uncertainties. An example of climate hazard interdependencies is the risk of landslides or debris flows (flooding) following a wildfire. The decimation of ground cover leads to the potential for erosion and land movement (landslides/debris flows) during subsequent rain events.

Climate hazards do not necessarily impact every risk directly, and additional analyses are required to understand the specific pathways and interactions involved. Addressing these challenges will require ongoing research and collaboration across the industry to establish best practices for integrating climate data into risk considerations. SoCalGas is actively working to refine methodologies and conduct the critical analyses needed to create a robust approach to climate risk that captures the intricate dynamics linking hazards, system responses, and potential outcomes.

The table below summarizes the controls and mitigations listed in individual RAMP risk chapters that pertain to climate change adaptation options listed in CAVA or which increase climate resiliency. This list includes options to harden assets to climate hazards and modify SoCalGas's operational practices.

Table 4: Controls and Mitigations that Align with Increasing Resilience to Climate Hazards

Risk Chapter	Relevant ID	Relevant Control/Mitigation	Potential Climate Hazard(s)
High-Pressure Gas System	C010	Pipeline Monitoring Technologies	Inland Flooding and Landslides
	C013	Maximum Allowable Operating Pressure (MAOP) Reconfirmation	Inland Flooding and Landslides
	C014	Storage Field Maintenance Aboveground Facilities	Inland and Coastal Flooding, Coastal Erosion, Landslides, and Wildfires
	C016	Storage Field Maintenance Aboveground Piping	Inland and Coastal Flooding, Coastal Erosion, Landslides, and Wildfires
	C019	Storage Upgrade to Purification Equipment	Inland Flooding and Landslides
	C104	Cathodic Protection - Capital	Inland Flooding and Landslides
	C105	SCADA Operations	Inland Flooding and Landslides
	C109	Control Room Monitoring, Operation and Fatigue Management	Inland Flooding and Landslides
	C113	Leak Repair	Inland Flooding and Landslides
	C119	Engineering, Oversight and Compliance Review	Inland Flooding and Landslides
	C125	Pipeline Relocation/Replacement	Inland Flooding and Landslides
	C126	Shallow Exposure/Exposed Pipe Remediations	Inland Flooding and Landslides
	C134	Pipeline Monitoring	Inland Flooding and Landslides
	C135	Electronic Pressure Monitoring (EPM) Installations & Replacements	Inland Flooding, Landslides, and Extreme Temperatures
	C138	Right of Way	Inland Flooding, Landslides, and Wildfires
	C157	PSEP Phase 1A	Inland Flooding and Landslides
	C171	TIMP	Inland Flooding and Landslides

	C174	Service Replacements - Leakage Abnormal Operating Conditions CP Related	Inland Flooding and Landslides
	C177	Main Replacements - Leakage Abnormal Operating Conditions CP Related	Inland Flooding and Landslides
	C178	Distribution Leak Survey	Inland Flooding and Landslides
	C179	Distribution Main & Service Leak Repair	Inland Flooding and Landslides
	C185	PSEP Phase 1B	Inland Flooding and Landslides
	C186	PSEP Phase 2A	Inland Flooding and Landslides
Medium-Pressure Gas System	C120	DIMP - Distribution Riser Inspection Program (DRIP)	Inland Flooding and Landslides
	C124	Regulator Station Installation Replacement & Enhancement	Inland Flooding, Landslides, and Wildfires
	C134	Pipeline Monitoring	Inland Flooding and Landslides
	C135	EPM Installations & Replacements	Inland Flooding, Landslides, and Extreme Temperatures
	C174	Service Replacements - Leakage Abnormal Operating Conditions CP Related	Inland Flooding and Landslides
	C175	Residential Meter Protection	Inland Flooding and Landslides
	C177	Main Replacements - Leakage Abnormal Operating Conditions CP Related	Inland Flooding and Landslides
	C178	Distribution Leak Survey	Inland Flooding and Landslides
	C179	Distribution Main & Service Leak Repair	Inland Flooding and Landslides
	C182	DIMP - Distribution Risk Evaluation & Monitoring System (DREAMS)	Inland Flooding and Landslides
Underground Gas Storage	C401	Storage Integrity Management Program (SIMP)	Inland Flooding, Landslides, and Wildfires
	C402	Well Abandonment, Replacement Demo Verification, and Monitoring Practices	Inland and Coastal Flooding, Coastal Erosion, and Landslides
	C408	Storage Field Maintenance - Underground Components	Inland Flooding, Landslides, and Wildfires
Contractor Safety	C349	Contractor Safety Program	Extreme Temperatures

Employee Safety	C343	Employee Safety Strategy	Extreme Temperatures
	C345	Safety & Health - Operations	Extreme Temperatures
	C346	Safety & Health - Programs	Extreme Temperatures

SoCalGas will continue efforts to align regulatory proceedings, such as RAMP and the GRC, with efforts to address climate risks and mitigation activities. SoCalGas supports the Commission's decision in D.24-08-005 to move the timing of the CAVA filing to one year prior to the RAMP report.[7] This change will promote further integration of results and climate change adaptation options into mitigation and control programs.

[7] *See* D.24-08-005 at 83 (Ordering Paragraph 1).