Chapter 05

Vulnerability and Consequence Assessment

To develop the HCR Vulnerability and Consequences Assessment, City staff relied on the risk assessment process developed by the Association of Bay Area Government's (ABAG) Resilience Program and Adapting to Rising Tides (ART), which closely follows FEMA's Local Mitigation Planning Handbook. The assessment described in this chapter provides a comprehensive understanding of the vulnerabilities of San Francisco's assets to the natural hazards identified in Chapter 04, as well as the broader consequences that can occur as a result. Understanding how specific hazards affect assets and identifying potential consequences is key to developing and implementing resilience strategies and actions.

5.1 Assessment Overview

The assessment process has three primary components: multi-hazard exposure assessment, vulnerability and consequence profiles, and key planning issues.

Multi-Hazard Exposure Assessment

The assessment started with an exposure assessment for natural hazards that have spatial data available to better understand the geographic scope of hazards in San Francisco and the potential scale of impact. This assessment evaluated the exposure of San Francisco's population, households, critical response facilities, and commercial and industrial parcels. Exposure refers to the potential for an asset to experience a physical hazard, such as shaking from an earthquake or getting wet from a coastal flood event. Exposure is estimated in GIS by analyzing the overlap between hazard areas and asset location. The results of this assessment can be found in section 5.2.

Vulnerability & Consequence Profiles

Next, the project team developed a more in-depth risk assessment through the development of Vulnerability and Consequences Profiles for 29 asset classes across eight different sectors. The asset classes are described in Chapter 3 and the profiles can be found in Appendix A. In order to provide detailed risk assessment information on a large number of asset classes, the Vulnerability and Consequence profiles are focused on a limited set of hazards. The project team focused on groundshaking and liquefaction due to the high level of exposure across all assets and high level of risk ($3.08 Billion estimated economic impact to general fund facilities in San Francisco according to latest Hazus study). The team also decided to focus on weather and combustion-related hazards that are projected to become more severe due to climate change, namely flooding, extreme heat, and fire and air quality. The Vulnerability and Consequence Profiles include the results of an exposure analysis performed using GIS and characterize vulnerability by identifying how an asset class will be affected by a hazard and the ability to adjust based on the following four categories:

- **Physical**: the conditions or design aspects that make assets particularly vulnerable
- **Functional**: the functions, roles, or relationships that make assets particularly sensitive or limit their ability to adjust to a hazard event

- **Informational**: challenges in obtaining the data and information necessary to sufficiently understand and/or manage vulnerabilities
- **Governance**: challenges with management, regulatory authority, or funding options.

The consequences assessment identifies broader impacts if an asset is damaged or its function disrupted. Three categories of impacts have been identified:

- **Society and Equity**: impacts to health and safety, community networks, mobility, affordability, and workforce opportunities
- **Economy**: property and infrastructure damage, interruption of economic activity, and loss of revenue
- **Environment**: impacts to water, air, and/or soil, biodiversity, public access, ecosystem service benefits

Key Planning Issues

Key Planning Issues highlight the findings of the Vulnerability and Consequence Profiles and communicate vulnerabilities that cut across multiple sectors, hazards, or geographies. The Key Planning Issues highlight significant or near-term vulnerabilities that require coordination between numerous asset managers, issues that may cluster in a particular geography, and vulnerabilities that require regulatory changes to solve. They are used to support the development of cross-cutting strategies and are described in section 5.3.

5.2 Multi-Hazard Exposure Assessment

The City conducted an exposure assessment for any of the identified hazards that have a defined geographic spatial extent and high-quality spatial data available, often produced by a State agency. Table 5-1 describes the hazard scenarios and data sources used in the exposure assessment. This analysis was conducted in 2018 and 2019 using publicly-available data sources. In the table below, shaking intensity is represented for two Earthquake scenarios: San Andreas Fault M7.8 and Hayward Fault M7.0 events. Accounts of assets subjected to varying levels of shaking intensity are cumulative for each scenario.

TABLE 5-1
HAZARDS AND SCENARIOS USED IN EXPOSURE ASSESSMENT

Hazard	Scenarios / Zones	Data Source
Groundshaking	San Andreas 7.8	USGS, ABAG (2018)
	Hayward 7.0	USGS, ABAG (2018)
Liquefaction	Liquefaction Zone	USGS (2018)
Landslide	Earthquake Induced Landslide Zone	USGS, California Department of Conservation (2018)
Tsunami	Inundation Zone	California Department of Conservation (2018)
Coastal Flooding	100-Year Coastal Flood Zone	FEMA National Flood Hazard Layer (2018)
	100-Year Storm + Mid-Century Sea Level Rise (~24 inches)	BCDC: ART Sea Level Rise Maps (2018)
	100-Year Storm + End-of-Century Sea Level Rise (~66 inches)	BCDC: ART Sea Level Rise Maps (2018)
Stormwater Flooding	100-Year Stormwater Flood	SFPUC 100-Year Storm Flood Risk Map (2018)
Reservoir Failure	Inundation Area	DEM Data Library (2018)
Wildfire	High	Cal Fire FRAP (2018)
	Moderate	Cal Fire FRAP (2018)

Exposure Summary

The multi-hazards exposure assessment includes exposure of overall population, households, critical response facilities, commercial parcels, and industrial parcels. This set of assets provides a high-level view of the potential impacts to the population and building stock, including our critical emergency response facilities and takes into account changes in development since the 2014 HMP. Table 5-2 and the descriptions below summarize the results the exposure assessment.

Seismic

Nearly all of San Francisco's population, critical facilities, and commercial and industrial parcels would be exposed to violent or very strong ground shaking from a M7.8 earthquake on the San Andreas fault. In the event of a M7.0 earthquake on the Hayward fault, 4% of the population would be exposed to very strong shaking and 72% would be exposed to strong shaking. 12% and 17% of the total population may be exposed to liquefaction or landslide hazards respectively. Over half of all industrial parcels and almost a third of all commercial parcels are located within liquefaction hazard zones. 39% of critical facilities are also located in liquefaction hazards zones.

Flooding

Currently, approximately 1,400 people would be exposed to coastal flooding during a 100-year flood, based on preliminary mapping performed by FEMA. Currently, San Francisco is working with FEMA to update the preliminary maps but these have not been finalized at the time of this report. As discussed in Chapter 04, this mapping covers the Pacific coastal area, the Bay shoreline, the Port, and the Airport, leaving out inland waterways that are vulnerable to stormwater flooding in the city. The SFPUC has developed a Draft 100-Year Storm Flood Risk Map that shows areas of San Francisco where significant flooding from storm runoff is highly likely to occur during a 100-year storm. According to this mapping, almost 24,000 people could be exposed to stormwater flooding during a 100-year storm.

Projected sea level rise will worsen existing coastal flood hazards by increasing the elevation and frequency of flooding and extending the coastal flood hazard zone farther inland. Exposure to coastal flooding during a 100-year storm could increase to 29,000 by end-of-century due to sea level rise, not accounting for potential population growth.

Currently only three critical facilities would be exposed to coastal flooding in a 100-year flood. However, this figure could increase to 20 by end-of-century due to sea level rise. While exposure of commercial and industrial parcels to coastal flooding with mid-century sea level rise appears to be limited at 3% and 10% respectively, in raw numbers this represents hundreds of parcels that would be potentially inundated. By late-century, this could increase to at least 1,000 commercial and industrial parcels due to sea level rise.

National Flood Insurance Program (NFIP)-insured structures

San Francisco is a participant in the National Flood Insurance Program (NFIP), which is managed by FEMA and provides flood insurance for applicable properties based on a risk mapping process. The City has adopted a Floodplain Management Ordinance that is intended to reduce the risk of damage from flooding within the city and facilitate administration of this program at the local level. According to the National Flood Insurance Program Redacted Claims Dataset, San Francisco does not have any structures within the county that have been repetitively damaged. [1]

Wildland-Urban Interface Fire

The general population, households, critical response facilities, industrial parcels, or commercial parcels are not significantly exposed to wildland-urban interface fire risks.

Limitations

Several hazards analyzed in Chapter 04 do not have spatial data available by which to analyze different areas of exposure, including extreme heat, poor air quality, and high wind. This does not mean that these hazards do not have impacts on San Francisco's buildings, infrastructure, and communities. As such, exposure is only one component of vulnerability and risk. To that end, the hazards analysis in Chapter 04 provides one lens and the Vulnerability and Consequences Assessment provided in Appendix A provides a second lens.

[1] FIMA NFIP Redacted Claims Data Set: https://www.fema.gov/media-library/assets/documents/180374

TABLE 5-2: CITYWIDE HAZARD EXPOSURE

Hazard	Population (864,000 Total)		Households (384,000 Total)		Critical Response Facilities (95 Total)		Commercial Parcels (6,300 Total)		Industrial Parcels (2,100 Total)	
	#	%	#	%	#	%	#	%	#	%
Seismic										
San Andreas 7.8 - Violent	218,100	25%	78,200	20%	17	18%	900	14%	200	7%
San Andreas 7.8 - Very Strong	643,000	74%	305,800	80%	78	82%	5,400	86%	1,900	93%
Hayward 7.0 - Very Strong	32,500	4%	24,900	6%	13	14%	500	8%	300	15%
Hayward 7.0 - Strong	620,700	72%	288,200	75%	69	73%	5,000	81%	1,700	81%
Liquefaction Zone	108,000	12%	74,900	19%	37	39%	2,000	32%	1,200	58%
Flooding										
100-Year Coastal Flood Zone	1,400	0%	1,200	0%	3	3%	-	0%	100	3%
100-Year Storm + 24 inches SLR	15,300	2%	12,200	3%	12	13%	200	3%	200	10%
100-Year Storm + 66 inches SLR	29,000	3%	22,100	6%	20	21%	500	8%	500	22%
100-Year Stormwater Flood	23,700	3%	12,600	3%	9	9%	300	5%	300	14%
Wildland Urban Interface Fire										
Wildland Urban Interface Fire - High	900	0%	200	0%	0	0%	-	0%	-	0%
Wildland Urban Interface Fire - Moderate	10,300	1%	2,800	1%	1	1%	-	0%	-	0%
Other Hazards										
Tsunami	18,800	2%	10,200	3%	12	13%	100	1%	100	5%
Dam or Reservoir Failure	58,900	7%	19,000	5%	7	7%	400	6%	200	11%
Landslide	149,300	17%	62,000	16%	9	9%	200	3%	100	3%

5.3 Key Planning Issues

The Waterfront and Adjacent Neighborhoods: San Francisco's waterfront communities may be exposed to multiple hazards, including flooding, liquefaction, tsunami and extreme heat. These areas include a mix of densely populated neighborhoods (existing and planned), vulnerable populations, and critical infrastructure, including transit, shoreline protection, and stormwater/wastewater that could have citywide or regional consequences if impacted by a hazard event.

New Development: Major development projects are planned in areas that may be exposed to hazards, including coastal flooding and liquefaction. While new construction is built to modern building codes and is therefore more resilient than older buildings, codes do not take into account future climate hazards and seismic codes are designed for life safety rather than recovery. Even if new development projects are more resilient to hazards, surrounding public assets such as transportation, utilities, and parks may remain vulnerable, potentially impacting current and future residents and businesses.

Existing Buildings: San Francisco has an aging building stock with nearly half of housing units constructed before 1940 and barriers to improving its resilience. The City is working to address seismically vulnerable buildings through the Earthquake Safety Implementation Program (ESIP). In addition, many older buildings were not designed to be resilient to climate hazards, such as extreme heat, poor air quality, and flooding and the City does not have policies in place to address improvements.

Housing: Hazards and climate change will put additional stress on San Franciscans that are already under pressure from the housing crisis (affordability, crowding, displacement) and the overall high cost of living. This is particularly acute for people who are unsheltered, in unstable housing situations, and renters. Some residents also have limited resources for coping with disruptions in housing, employment, childcare, and transportation, many of which could occur following a hazard event.

Transportation: On a daily basis, and in response to and recovery from a hazard event, San Franciscans depend on reliable, affordable, and accessible transportation. In addition, the functionality of many City and community assets depends on transportation access. Critical transportation assets are vulnerable to current and future hazards and disruption could have citywide and regional consequences. These

considerations relate to city's climate goals of achieving 80% sustainable trips (walking, biking, public transit) in a world with more frequent climate hazard events.

Utilities: Utilities are critical for daily needs of households and businesses and disruption can have significant consequences for public health and the economy. In addition, utility restoration following a disaster is critical for recovery. The SFPUC has made significant improvements and more are planned/underway through Sewer System Improvement Program (SSIP), Water System Improvement Program (WSIP), and the Emergency Firefighting Water System (EFWS). Even with major improvements, elements of these utility systems may remain vulnerable to hazards. For some systems, there are limited alternatives and redundancies so reducing damage and disruption is critical.

Table 5-2 shows the legend for the hazard icons shown in each Key Planning Issue. The thirteen hazards addressed by the HCR Plan are displayed in a light gray tone in each Key Planning Issue. The icons displayed in a solid color indicate the hazard(s) that are applicable to a particular issue. The colors are associated with the primary hazard groups. The "All Hazards" group is indicated by displaying solid icons for all thirteen hazards.

TABLE 5-2 HAZARD ICON LEGEND

Earthquake	Tsunami	Landslide	Dam or Reservoir Failuure	Flooding	High Wind	Extreme Heat	Drought	Large Urban Fire	Wildfire	Poor Air Quality	Pandemic	Hazardous Materials
												
Geological				**Weather-related**				**Combustion-related**			**Biological / Toxic**	

The Waterfront and Adjacent Neighborhoods

San Francisco's waterfront communities may be exposed to multiple hazards, including flooding, liquefaction, tsunami and extreme heat. These areas include a mix of densely populated neighborhoods (existing and planned), vulnerable populations, and critical infrastructure, including transit, shoreline protection, and stormwater/wastewater that could have citywide or regional consequences if impacted by a hazard event.

Geographies

- Significant vulnerabilities and consequences have been identified in the Embarcadero/Financial District, Mission Bay, and Islais Creek.
- Ocean Beach is vulnerable to erosion.

Hazards

Sectors

Sector	Asset Class
Transportation	Public Transit, Roadways (including bridges), SFO, Water-Based Transportation
Utilities & Infrastructure	Stormwater/Wastewater, Shoreline Protection
Housing	Multi-family, Affordable
Business & Industry	Commercial, Industrial, Maritime

Vulnerabilities

- The legacy of building on fill makes the waterfront more susceptible to seismic and flooding hazards.
- Current and former industrial uses of waterfront areas can lead to issues around soil contamination and hazardous materials. Sea level rise may exacerbate these issues.
- Transportation and utilities especially face exposure to flooding near creeks, including Mission Creek and Islais Creek.

- The efficacy of several stormwater outfalls may be vulnerable to flooding due to SLR.
- Wastewater infrastructure is vulnerable to erosion events at Ocean Beach.
- Embarcadero Station, T-Third, and Caltrain may be vulnerable to future coastal flooding due to SLR.
- Embarcadero roadway is currently subject to flooding during King Tides and flooding will become more frequent and severe due to future SLR.
- Until the Seawall Safety Program undertakes improvements, the seawall remains seismically vulnerable, which has implications for nearby utilities, transportation assets, and buildings.
- Staging areas and transportation assets along the waterfront play a critical role in emergency response after a major hazard event.
- Emergency Firefighting Water System (EFWS) manifolds are vulnerable to SLR and critical for fire response in these neighborhoods.
- Integrating near-term seismic and long-term flooding strategies can be challenging.

New Development

To accommodate a growing population, major development projects are planned in areas that may be exposed to hazards, including coastal flooding and liquefaction. While new construction is built to modern building codes and is therefore more resilient than older buildings, codes do not take into account future climate hazards and seismic codes are designed for life safety rather than recovery. Even if new development projects are more resilient to hazards, surrounding public assets such as transportation, utilities, and parks may remain vulnerable, potentially impacting current and future residents and businesses.

Geographies

- Citywide
- Particularly: Downtown, Southeast, Waterfront

Hazards

Sectors

Sector	Asset Class
Housing	Multi-Family, Affordable
Population	Vulnerable Populations
Business and Industry	Commercial

Vulnerabilities

- The current seismic code focuses on life safety rather than recovery. As a result, buildings may be damaged and not be occupied during a long repair period.
- New developments along the Bay shoreline may be designed to accommodate SLR through elevation/construction methods, but the existing transportation and utility systems that service them are not necessarily resilient. This may create dysfunctional “Islands of Resilience.”
- New developments that make resilience improvements to the public realm will need to tie into existing portions of the public realm without similar investments (e.g. sidewalk and street elevations.)

- Need to consider the implications of additional code requirements on construction costs and the affordability of housing.
- Different property types have different challenges. Need to consider renters vs. owners, affordable vs. market rate.
- Building code does not adequately address future or current extreme heat and poor air quality.

Existing Buildings

San Francisco has an aging building stock, with nearly half of housing units constructed before 1940, and barriers to improving its resilience. The City is working to address seismically vulnerable buildings through the Earthquake Safety Implementation Program (ESIP). Many older buildings were not designed to be resilient to climate hazards, such as extreme heat, poor air quality, and flooding, and the City does not have policies in place to address improvements.

Geographies

- Citywide

Hazards

Sectors

Sector	Asset Class
Housing	Single-Family, Multi-Family, Subsidized Affordable
Business & Industry	Commercial, Industrial, Maritime
Public & Community Services	Municipal Buildings, Educational Facilities, Community Health Facilities
Emergency Response	Critical Response Facilities, Other Emergency Sites

Vulnerabilities

- Seismic codes are designed for life safety rather than recovery, so repairs and re-occupation following an earthquake may take an extended period of time.
- Private schools are not required to be upgraded to the same earthquake standard as public schools.
- Older concrete and steel buildings are vulnerable to damage in an earthquake.
- The City lacks comprehensive data on the seismic vulnerability of private buildings, including those that have performed seismic retrofits.

- Most buildings are not built to withstand any amount of flooding, as current construction materials, siting, and design standards do not consider potential exposure to either water or salt.
- Historic buildings/districts often have preservation-related design restrictions, so changes to improve resilience may be limited. Damage could lead to permanent loss of unique historic resources and impact tourism.
- Older, un-weatherized buildings (typically also without air conditioning) can lead to unhealthy conditions for occupants during extreme heat events.
- The City is working to improve the readiness of its buildings to serve as clean air and cooling centers for residents and City staff.
- The City lacks up-to-date data on privately-owned shelter facilities needed to inform resilience improvements.
- There is no comprehensive resilience design code, especially for climate hazards, which outline what municipal and private buildings need to do, and the associated costs/benefits.

Housing

Hazards and climate change will put additional stress on San Franciscans that are already under pressure from the housing crisis (affordability, crowding, displacement) and the overall high cost of living. This is particularly acute for people who are unsheltered, in unstable housing situations, and renters. Models predict significant damage to housing in a major earthquake, further exacerbating existing vulnerabilities. Some residents also have limited resources for coping with disruptions in housing, employment, childcare, and transportation, many of which could occur following a hazard event.

Geographies

- Citywide

Hazards

Sectors

Sector	Asset Class
Populations	Vulnerable Populations
Housing	Single Family, Multi-Family, Subsidized Affordable
Public and Community Services	Residential Care Facilities for the Elderly

Vulnerabilities

- Currently, the majority of low-income renters and homeowners (< 80% adjusted median income (AMI) are housing cost burdened (> 30% of income spent on housing).
- New models predict that in a magnitude 7.8 San Andreas earthquake, 18,300 residential buildings could be damaged in San Francisco, temporarily or permanently displacing 20% of all households.
- Nearly 12,000 multi-family units are exposed in both the 100-year stormwater flood zone and coastal flood zone with 24" SLR.

- Sixty percent of subsidized affordable housing units are located in 5 neighborhoods: Bayview Hunter's Point, Mission, South of Market, Tenderloin, and Western Addition.
- The share of subsidized affordable housing exposed to flooding hazards is higher than market rate housing. The SLR vulnerability zone (66 inches) contains over 4,000 subsidized affordable units.
- Unhoused populations (concentrated in SOMA, Rincon Hill, Civic Center, Potrero Hill, Bayview Hunters Point, Visitacion Valley) are among the most vulnerable San Franciscans. During hazard events, this population has limited resources to evacuate, communicate, and shelter. Unhoused populations often rely on informal networks rather than traditional support providers.
- As neighborhoods change, longstanding community relationships can break as people leave or neighborhood dynamics shift.
- The loss of affordable housing can also lead to the loss of services located in housing, such as residential care facilities for the elderly and childcare.

Public Awareness and Communications

The City needs better messaging on how it is addressing hazards and climate change impacts citywide and how different efforts relate to each other. Residents and other stakeholders may not understand how the City is working to increase resilience and how they can participate. Residents may also lack information on how to prepare for climate hazards events that are becoming more frequent.

Geographies

- Citywide

Hazards

Sectors

Sector	Asset Class
People	General Population, Vulnerable Populations
Emergency Response	Critical Response Facilities, Other Emergency Sites

Vulnerabilities

- Over the past 2 years, San Francisco has experienced extreme weather events, highlighting the importance of preparedness and public communications strategies.
- The lack of timely information may lead to avoidable health impacts.
- Emergency services may be strained if residents have not been empowered to help themselves during a hazard event.
- Need to avoid conflicting messaging for different hazards that are likely to occur at the same time.
- Residents receive information from a variety of sources, including TV, radio, print media, social media and word-of-mouth. Understanding these platforms and networks, particularly culturally-specific platforms, is essential to effectively communicate.

- There is also a nexus between populations that face greater vulnerabilities to hazards and climate change but are less likely to receive information about how to respond during hazard events.
- Communication strategies need to be tailored for specific populations.

Transportation

On a daily basis, and in response to and recovery from a hazard event, San Franciscans depend on reliable, affordable, and accessible transportation. In addition, the functionality of many City and community assets depends on transportation access. Critical transportation assets are vulnerable to current and future hazards and impairment could have citywide or regional consequences. These considerations relate to city's climate goals of achieving 80% sustainable trips (walking, biking, public transit) in a world with more frequent climate hazard events.

Geographies

- Citywide
- Particularly: Waterfront

Sectors

Sector	Asset Class
Transportation	Roadways, Public Transit, SFO, Water-Based Transportation
Emergency Response	Critical Response Facilities, Other Emergency Sites

Vulnerabilities

- Residents depend on public transit for access to critical facilities during and after a hazard event, including cooling, heating, air quality centers.
- Current roadway flooding impacts safety and access for bicyclists, pedestrians, and motorists. This issue may become more severe in the future with SLR and intense precipitation events.
- Embarcadero Station and parts of Muni T-Third and Caltrain may be exposed to future flooding due to SLR. MUNI Metro East light rail and Ocean Blvd see current impacts from King Tides and winter storm flooding.
- Air quality and extreme heat events impact biking, walking, and transit use due to health concerns.

- Roadways and transit equipment/facilities are vulnerable to damage from liquefaction, especially if underground utilities and fuel tanks are damaged; damage to SFMTA maintenance facilities can also impact transit operations.
- Debris and interruptions of overhead wires and power sub-stations from earthquakes and high winds may impact roadway accessibility and transit function.
- BART access to SFO may see disruption in a strong shaking event and some SFO terminals may be vulnerable to damage if they have not been recently seismically retrofitted. Runways may be vulnerable to liquefaction and strong shaking damage as well.
- Bridges have limited redundancy. Third Street, with two bascule bridges that may be exposed to future flooding due to SLR, is one of the primary north-south corridors in the southeast.
- Access to water-based transportation may be impacted by liquefaction damage in an earthquake. This may affect emergency response efforts.

Utilities

Utilities are critical for daily needs of households and businesses and disruption can have significant consequences for public health and the economy. In addition, utility restoration following a disaster is critical for recovery and there are many interdependencies. The SFPUC has made significant improvements and more are planned/underway through Sewer System Improvement Program (SSIP), Water System Improvement Program (WSIP), and Emergency Firefighting Water System (EFWS). Even with major improvements, elements of these utility systems may remain vulnerable to hazards. For some systems, there are limited alternatives and redundancies (e.g. potable water), so reducing damage and disruption is critical. The Lifelines Restoration Performance Project is taking a deeper dive of the issue of lifeline utilities and recommended actions to improve restoration timelines for earthquakes.

Geographies

- Citywide
- Particularly: Waterfront

Hazards

Sectors

Sector	Asset Class
Utilities and Infrastructure	Stormwater/Wastewater, Potable Water, Emergency Firefighting Water System (EFWS), Power, Natural Gas
Emergency Response	Critical Response Facilities, Other Emergency Sites

Vulnerabilities

- The stormwater/wastewater and potable water systems may be vulnerable to future coastal flooding due to sea level rise, particularly sensitive assets in low-lying areas.

- Stormwater/wastewater, potable water, EFWS and other utility systems (including reservoirs) may experience damage during a significant earthquake event.
- Damage to natural gas infrastructure can lead to an urban conflagration.
- Compared to other utilities, water and natural gas systems have relatively longer restoration timelines following an earthquake due to complex reconstruction needs.
- The electric power grid is currently strained during extreme heat events. These events are projected to increase in the future, potentially leading to brownouts or blackouts.
- Public transit is highly dependent on electric power.