

2020

SUMMARY REPORT

HAZARDS

AND

CLIMATE

RESILIENCE

PLAN



THE CITY AND COUNTY
OF SAN FRANCISCO

ONESF
Building Our Future

**There is only ONE
San Francisco**

Let's take care of it.

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INTRODUCTION & PURPOSE



Purpose

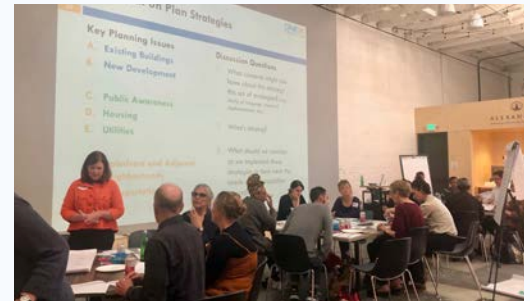
San Franciscans know how to respond to, recover from, and thrive after major disasters. From the Great San Francisco Earthquake of 1906 and subsequent fires that destroyed 80% of the city, to smaller earthquakes, such as the Loma Prieta Earthquake of 1989 are critical events that have shaped and changed San Francisco. As a result, San Francisco has invested billions of dollars to improve buildings and infrastructure to weather future earthquakes. In recent years, new and unprecedented hazards, such as extreme heat, unhealthy air quality from regional wildfires, and the ongoing COVID-19 pandemic have challenged San Francisco. Climate science tells us that these and other climate-related hazards, such as

coastal flooding and drought, will be on the rise as greenhouse gas emissions drive higher temperatures, higher sea levels, and unpredictable precipitation patterns.

The Hazards and Climate Resilience Plan (HCR) captures our latest understanding of how hazards are intensifying due to the climate crisis and what we can expect in the years to come. It presents a strategy for how San Francisco will become a safer and more resilient place by mitigating the impacts of seismic and climate hazards to our communities, buildings, and infrastructure, and adapting to what we cannot mitigate.

PLANNING PROCESS

This chapter describes the process used to develop the 2020 Hazards and Climate Resilience Plan, including engagement with agencies, stakeholders, and the public.



Leadership

The Office of Resilience and Capital Planning (ORCP) managed the HCR development process through a Steering Committee and a Technical Working Group involving several departments. The Technical Working Group also led engagement with City agencies through a Planning Team, comprised of staff from over 25 agencies with expertise in hazards, asset management, and mitigation and adaptation capabilities.

PLAN VISION

Make San Francisco resilient to immediate and long-term threats of climate change and natural hazards through actions to mitigate risks, adapt built and natural assets, and build a more equitable and sustainable city. Ensure systems are in place so that individuals, communities, institutions, and businesses survive, adapt, and thrive no matter the kinds of chronic stresses and acute shocks they experience.

Coordinate with and support the City's Climate Action Plan, which outlines urgent strategies needed to reduce greenhouse gas emissions and minimize the severity of climate change and its associated impacts.

ENGAGEMENT SNAPSHOT



MONTHLY
STEERING
COMMITTEE
MEETINGS



30
STRATEGY SESSIONS

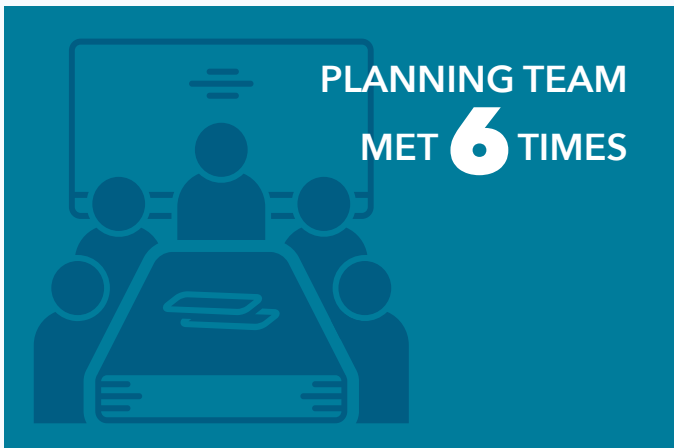
TECHNICAL WORKING
GROUP MET BI-WEEKLY



597
SURVEY RESPONSE



70
ORGANIZATIONS PARTICIPATED



PLANNING TEAM
MET **6** TIMES



9
PUBLIC PRESENTATIONS



Engagement

The HCR team organized five thematic workshops with leaders of community-based organizations, non-governmental organizations, and other groups that serve the San Francisco community, especially vulnerable populations.

A public survey was distributed during the stakeholder workshops and available online from July 2019 to September 2019. The survey had a total of 597 responses.

The following are some of the highlights from the stakeholder workshops and survey:

Solutions Need to be Diversified, Multi-Pronged, and Coordinated. There is no

“one-size-fits all” solution to addressing any of the hazards that may impact San Francisco.

Most Concerning Hazards. The vast majority of survey and workshop participants reported being the most concerned about earthquakes and poor/unhealthy air quality. Additionally, one in five survey respondents also identified disease outbreaks, urban fires, drought, extreme heat, and flooding as top concerns.

Resilience of Key City Assets. Survey and workshop participants agreed that it is important for the City and County of San Francisco to improve the resilience of infrastructure (e.g., utilities and transportation), buildings (e.g., housing, existing buildings, new development), and communities (e.g., community connections, neighborhood preparedness).

[I am] extremely concerned about an earthquake and the potentially devastating impact it would have on the housing stock.

- Survey Respondent

Only half of survey respondents said they know their neighbors well enough to help each other in an emergency.

Community Cohesion.

Workshop participants emphasized the importance of strengthening relationships and interactions within individual neighborhoods, at the

block level, within large multi-unit buildings, and through face-to-face social networks.

Preparedness. Workshop participants requested more concise information about how the organizations, businesses, and facilities in which they work should prepare for emergencies with specific recommendations based on location in the city and the people served.

Assessment

The Technical Working Group followed an assessment process with three components: exposure assessment, vulnerability and consequence profiles, and key planning issues.

Using mapping applications, the exposure assessment estimates how hazard zones intersect with infrastructure, buildings, and communities.

The Vulnerability and Consequence Profiles for 29 asset classes include the results of the exposure analysis and characterize vulnerability based on the following four categories:

- **Physical:** the conditions or design aspects
- **Functional:** the functions, roles, or relationships

- **Informational:** challenges in obtaining the data and information
- **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 ecosystems, biodiversity, and public access

Key Planning Issues highlight the findings of the Vulnerability and Consequence Profiles, including 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 were used to support the development of cross-cutting strategies.



SUMMARY OF STAKEHOLDER MEETINGS

THEME/ TOPIC	EXAMPLES OF UNIQUE PERSPECTIVE FOR EACH GROUP
Business/ Commercial Properties	<p>Provided feedback on effectiveness and impacts of incentivizing or mandating specific strategies on small businesses</p> <p>Identified challenges and opportunities to partner with businesses</p>
Housing Stakeholders and Residential Property Managers/ Owners	<p>Provided feedback on effectiveness and likely impacts of incentivizing or mandating specific strategies (e.g., installing or upgrading HVAC systems, communicating about hazards to residents/tenants)</p> <p>Identified challenges and opportunities for implementing strategies in supportive housing</p>
Disability and Functional Needs (DAFN)/Older Adults	<p>Identified unique needs when responding to hazards (e.g., charge motorized wheelchairs' batteries, maintain power for residents with assisted respiration)</p> <p>Emphasized the need to ensure that communication is accessible to people with a range of different disabilities</p>
Racial, Social, and Environmental Justice	<p>Emphasized the need to set up processes prior to a hazard to ensure that critical information about hazards reaches, and is easily understood by, low-income, immigrant, homeless, and other vulnerable communities</p> <p>Provided additional information on how hazards impact vulnerable, disenfranchised, and under-resourced communities, as well as critical needs for these communities</p>
Children, Youth, and Families	<p>Identified challenges in keeping young people of different ages groups safe during and immediately following a hazard</p> <p>Identified challenges and opportunities for implementing strategies in schools and out-of-school programming (e.g., summer camps, afterschool care)</p>

GUIDING PRINCIPLES

The following principles guided the development of the HCR, from scoping the assessment to evaluating and refining strategies.



EQUITY & HEALTH:

Proactively work to eliminate racial or social disparities in the impacts of all hazards and/or the distribution of resilience benefits.

COMMUNITY COHESION:

Empower people and partnerships to reduce vulnerability and promote resilience at the building, block, and neighborhood level.



AFFORDABILITY & ECONOMIC VIABILITY:

Help residents and business stay and thrive in San Francisco.



CLIMATE MITIGATION:

Help eliminate the greenhouse gas emissions, which drive climate change and worsen climate-related hazards.



BIODIVERSITY & CONNECTION TO NATURE:

Restore and leverage local ecosystems to help mitigate hazards and support climate adaptation, while ensuring all residents can access green spaces, parks, and natural habitats and experience nature every day.



SCIENCE-GROUNDED INNOVATION:

Closely monitor evolving climate and hazard-related science and modify approaches appropriately to maintain maximum effectiveness.



GOOD GOVERNANCE:

Provide dependable and actionable information to foster transparency and openness.

Strategy Development

The HCR strategies were developed over the course of several months with engagement from departments and stakeholders. They reflect existing departmental plans and priorities, forward-looking ways to address vulnerabilities, and stakeholder recommendations.

Resilience Capabilities

To ensure that strategies build upon the City's resilience capabilities, the strategies are categorized under five areas:

1. Funding and Finance:

San Francisco is one of the most expensive places in the world to live and build so the ability to have strong funding and financial mechanisms is critical to San Francisco's mitigation efforts. The City's 10-Year Capital Plan and its 5-Year Financial Plan lay the foundation for hazard mitigation and climate adaptation funding.

2. Public Asset Owner:

As an owner and builder of buildings and infrastructure, San Francisco has strong programs, mechanisms, and staff expertise to design, develop, construct, and maintain its assets.

3. Community Services Delivery:

The City and County of San Francisco offers many services that assist vulnerable populations, helping them access services that reduce their vulnerability before and after a natural disaster.

4. Research, Planning, and Guidance:

The City invests in innovative hazards and climate change research that directly inform policies, programs, and services.

5. Adopts & Enforces Regulations:

San Francisco adopts regulations that govern the construction of buildings, the form of urban development, and natural resource protection, among others.

Evaluation

Strategies were evaluated across six criteria types: environment, society and equity, economic, feasibility, governance, and disaster lifecycle. The purpose of the evaluation was to help develop multi-benefit strategies and ensure that all strategies consider the key lenses of equity and sustainability.

RISK LANDSCAPE

This section provides an overview of what's at risk in from natural hazards in San Francisco.

Assets

This section describes the asset sectors at risk that form the basis of the Vulnerability and Consequences Assessment described in the Planning Process. These assets span both public and private ownership and are essential to ensuring the delivery of services to the public.

Vulnerable Populations

Vulnerable populations refer to individuals within the city that are more susceptible to impacts from hazards due to demographic, socioeconomic, environmental, health, or other factors. It's important to assess and understand the ways that hazards can impact different particular groups in order to create programs that consider the unique needs of different populations.

Emergency Response Facilities

Emergency response facilities provide life safety, property, and environmental protection services during and after an emergency or disaster. These include Police and Fire Department buildings, the

In addition to buildings and infrastructure, San Francisco's communities are an asset. The HCR assessment focused on vulnerable populations, including people of color, children and youth, older adults, and people with disabilities.

Emergency Operations Center, hospitals, shelter sites, the animal care and control facility, and staging areas.

Public and Community Services

Public and community service assets include municipal buildings and maintenance yards, health-care facilities, food distribution, educational institutions, and community centers. These facilities are essential to community cohesion and often offer vital services to residents.

Housing

The housing stock of San Francisco ranges from simple older buildings built over a century and a half ago, to complex, modern high-rises. This variety in form supports the wide variety of people that rely on these buildings for their housing needs. There is also a range of quality and affordability of this housing stock, which impacts the ability of this housing to withstand hazards.

Business and Industry

Business and industry assets include commercial buildings, industrial buildings (including production, distribution, and repair), maritime uses at the Port of San Francisco, and hazardous material sites. These assets support economic activity and workforce opportunities. Some also play a critical role in disaster response and recovery.

Transportation

Transportation assets include roadways, bikelanes and sidewalks, the transit network, parking garages, water transportation, and the San Francisco International Airport. These assets facilitate the movement of goods, residents, workers, and visitors traveling within and through San Francisco, supporting economic activity and quality of life.

Utilities and Infrastructure

Utilities and infrastructure assets include electric power, natural gas, water, sewer and stormwater, shoreline protection, and communications assets. Often located underground and out-of-sight, utilities are essential to daily life, including the safe operation of homes, business, and transportation systems.

Open Space

Parks and open space contribute to the quality of life, providing space for recreation, activity, and respite and enjoyment. In addition, these spaces provide natural areas for native species to thrive, contribute to environmental health and biodiversity, and provide ecosystem services.

Future Development

Treasure Island, Mission Bay, parts of SoMa, and the Central and Southern waterfront have all seen and will continue to see tremendous growth and development over the next decades. These neighborhoods are all vulnerable shoreline communities located on landfill that could face serious challenges in the event of natural hazards, such as earthquakes and flooding. In addition, the San Francisco seawall is undergoing initial planning for restoration, providing another opportunity for structural and environmental changes along the shoreline in the coming years. Where and how to develop affordable housing and middle-class jobs remains a pressing issue, and is likely to be the guiding force for development in the foreseeable future.

DEMOGRAPHIC SNAPSHOT

POPULATION:

884,000

San Francisco is the 2nd densest large city in the U.S.

INCOME:



\$120,000+

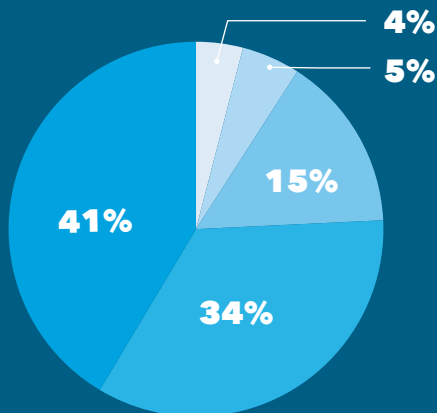
White non-Hispanic median income

\$30,000

Black households median income



RACIAL AND ETHNIC COMPOSITION:



- White
- Asian
- Hispanic
- Black
- Two+ races

PRE-EXISTING HEALTH CONDITIONS:

11%

of the San Francisco population has a disability

6.6% of adults have diabetes

5.3% have heart disease

15.2% have asthma

AGE:

27%

of the San Francisco population is projected to be age 60 and over by 2030

Climate Change and Implications for Hazards

Climate change is already happening. The National Ocean and Atmospheric Administration (NOAA) identifies 2015, 2016, 2017, and 2018 as the four hottest years in recorded history.¹ These extreme temperatures have a significant and cascading impact on global weather patterns. High temperatures melt polar ice caps and contribute to the thermal expansion of the oceans which cause global sea levels to rise. Warm ocean temperatures also increase evaporation, and this increased

concentration of water vapor in the atmosphere changes rainfall patterns as storms and droughts both become more extreme. While climate change may be global in scope, its impacts are local. The following table provides an overview of the implications that climate change has for hazards in San Francisco today and into the future.

CHANGES IN THE GLOBAL CLIMATE INCREASE THE SEVERITY OF LOCAL HAZARDS			
	INCREASING TEMPERATURES	RISING SEA LEVELS	CHANGING PRECIPITATION PATTERNS
Extreme Heat	●		
Drought	●		●
Wildfire & wildland-urban-interface fire	●		●
Poor Air Quality	●		
Coastal Flooding		●	
Stormwater Flooding		●	●
Soil Liquefaction in an Earthquake		●	

HAZARDS

The HCR characterizes 13 natural hazards that impact San Francisco. The hazards are grouped into four different types: geological, weather-related, fire-related, and biological & toxic. This chapter also includes an overview of climate change science and how climate change influences hazards in San Francisco.

GEOLOGICAL



EARTHQUAKE



TSUNAMI



LANDSLIDE



DAM OR RESERVOIR
FAILURE

WEATHER-RELATED



FLOODING



HIGH WIND



EXTREME HEAT



DROUGHT

FIRE-RELATED



LARGE URBAN FIRE



WILDFIRE



POOR AIR QUALITY

BIOLOGICAL & TOXIC



PANDEMIC



HAZARDOUS
MATERIALS



GEOLOGICAL

Earthquakes

Earthquakes present one of the greatest risks to San Francisco's buildings, infrastructure and people. San Francisco has experienced several devastating earthquakes in its history, and there is a high likelihood of a large earthquake in the near future. The energy released in earthquakes can produce different types of hazards, including groundshaking, liquefaction, tsunami, landslide, fire following earthquake (large urban fire), and dam failure.

Ground Shaking

All of San Francisco is susceptible to very strong to extreme ground shaking during a major earthquake. There is a 72 percent chance that an earthquake of magnitude (Mw) 6.7 or greater will strike the San

Francisco Bay Region between now and before 2043, which would result in in widespread casualties and infrastructure damage.

Liquefaction

Liquefiable soils in San Francisco are generally found in water saturated sandy or silty soils or landfill along the Pacific coast and San Francisco Bay and in inland areas of fill in the Financial District, South of Market Area, the Mission District, Civic Center areas, Treasure Island and San Francisco International Airport (SFO). Given past instances of severe liquefaction during the Great 1906 and 1989 Loma Prieta Earthquakes, it is reasonable to assume that severe liquefaction will again occur in future earthquakes with strong shaking.



Landslide

Landslides are most likely to occur on steep slopes on hills and cliffs. In addition, weak saturated soils that are bordered by steep or unsupported embankments or slopes are prone to landslide. Given the dense urban nature of San Francisco, landslides can result in many casualties and in serious damage to homes and other infrastructure. An increase in heavy rainfall events due to climate change may increase the risk of landslides in the future.

Tsunami

A tsunami is a series of ocean waves caused by sudden movement of the sea floor, typically as a result of major earthquakes. In San Francisco, tsunamis are most likely from large, distant Pacific rim earthquakes, and may also result from offshore earthquakes within the Bay Area. Distant earthquakes provide several hours of warning before tsunami

waves arrive in California. Nearby earthquakes are not likely to produce significant tsunamis because of the sideways, rather than vertical, movement of local faults needed to produce large tsunamis. Tsunamis not only affect beaches open to the ocean, but may also affect bays, ports, harbors, tidal flats, and coastal inlets. Areas within San Francisco susceptible to tsunami inundation include Pacific Coast areas of Lake Merced, the Sunset and Richmond Districts, Sea Cliff, the Presidio, and areas adjacent to San Francisco Bay.

Dam or Reservoir Failure

Dam or reservoir failure may impact the Sunset, Midtown Terrace, Twin Peaks, Clarendon Heights, and University Mound areas of San Francisco, where state-regulated reservoirs are located. Factors that increase the risk of dam or reservoir failure include the age of the structures and the likelihood of an earthquake.



WEATHER-RELATED

Flooding

Coastal Flooding

The shoreline of San Francisco Bay and the open Pacific Coast include areas that currently experience temporary flooding during extreme high tides and coastal storm events. As sea level rises, temporary coastal flooding will be more frequent and will inundate larger areas. Areas that are particularly susceptible to increasing risk of coastal flooding due to sea level rise include Mission Bay, Islais Creek, Hunters Point, Candlestick Point, the Financial District, the Marina District, Treasure Island, and SFO. Coastal flooding can pose threats to life and public safety, cause physical damage to buildings and infrastructure, disrupt economic activity, and impair public health.

Stormwater Flooding

Stormwater flooding occurs during storm events as rainfall runoff collects in areas that at one time were naturally-formed waterways but are now contained within the City's combined sewer and stormwater collection system. The Islais Creek area (Cayuga/Alemanya), South of Market, Inner Mission, and Civic/Center Western Addition include significant areas that are at risk of stormwater flooding during a 100-year storm, as well as during rainfall events that occur more frequently. As climate change causes sea level rise and precipitation events to become more intense, the frequency and extent of stormwater flooding may increase. Stormwater flooding can cause physical damage to buildings and infrastructure, disrupt economic activity, and impair public health.

Extreme Heat

Historically, San Francisco has experienced extreme heat events six to seven days per year, generally between May and October. The elderly, the very young, and those with chronic health problems are most at risk when extreme heat occurs. Neighborhoods with the greatest risk, based on sociodemographic characteristics, include Chinatown, SOMA, Tenderloin Center, Bayview/ Hunters Point, and the Mission District. Climate change is expected to increase the frequency and severity of extreme heat events. By 2100, the number of extreme heat days is projected to increase to 90 days per year.

Drought

California's Mediterranean climate is typified by dry summers followed by long, wet winters, thus making the state particularly susceptible to drought and flooding. The majority of San Francisco's water is brought to the city from the Hetch Hetchy watershed located in the Sierra Nevada Mountains through a complex series of reservoirs, tunnels, pipelines, and treatment systems.² As a result, changes in precipitation in the Sierra Nevada impacts the water supply in the Bay Area. Climate models project that a warming planet will lead to a reduced Sierra snowpack.³

High Wind

The most disruptive "high winds" occur either with strong storms in the winter or spring, or in late fall as part of the warm "Diablo winds". The "Diablo winds" can stoke fires in nearby counties and transport smoke to San Francisco. Storm-related wind can down trees or power lines and contribute to electrical outages.



FIRE-RELATED

Wildfire

Within San Francisco, a small portion of the Crocker Amazon neighborhood has been designated as a high fire hazard area. Significant portions of the Hetch Hetchy Regional Water System in San Mateo, Santa Clara, and Tuolumne Counties are also located in state-designated very high fire hazard areas. Though the probability of wildfires or wildland-urban interface fires within San Francisco is low, it remains high for areas outside the county where City-owned infrastructure is located. Climate change is increasing the risk of wildfires in Northern California.

Large Urban Fire

Most of San Francisco is believed to have a moderate risk of large urban fires, but areas believed to be at greatest risk include the North Waterfront, South Beach, Mission Bay, Potrero Hill, Hunters Point, Civic Center, Downtown, Tenderloin, and Hayes Valley neighborhoods. The most likely cause of large urban fire in San Francisco is a severe earthquake (fire following earthquake), which has the potential to cause severe damage to buildings and infrastructure. When making decisions about capital projects, maintenance, operations, and investments in the City's fire fighting systems, the San Francisco Fire Department (SFFD), San Francisco Public Utilities Commission (SFPUC), and San Francisco Public Works (SFPW) utilize a model that reflects the fires that could arise after a 7.8 earthquake on the San Andres fault.

Poor Air Quality

San Francisco is vulnerable to air quality impacts of wildfires. Although it is unlikely a wildfire occurs within San Francisco's city limits, smoke from wildfires elsewhere are transported into the city and significantly impact San Francisco's air quality. Air quality is closely associated with public health.



BIOLOGICAL AND TOXIC

Pandemic

As of this writing, the COVID-19 pandemic is underway. This pandemic started late December 2019 in Wuhan, China and has since spread to nearly every country in the world. The fact that we are experiencing a pandemic this year does not decrease the likelihood of experiencing another pandemic (of a different strain) next year. Pandemics severely strain the healthcare system by causing prolonged patient surge. Because of their frequency, duration, and scale, pandemics are one of the greater public health threats to the City and County of San Francisco; this threat has only increased with the rise in population density and international travel.

Hazardous Materials Release

According to state & local databases there are approximately 2,700⁴ Hazardous Materials facilities throughout San Francisco. An accidental hazardous materials release can occur wherever hazardous materials are manufactured, stored, transported, or used. The majority of these facilities are located along the east/south east portion of the city; therefore, the risk is greatest in that part of the city.

KEY ISSUES & STRATEGIES

Goals:

The HCR strategies are intended to achieve the following goals, that place an emphasis on equity, partnerships, and public engagement in addition to San Francisco's ongoing commitment to reducing damage and disruption from hazards.



Strategy Overview

The HCR includes over 95 near-term strategies that contribute to a more resilient city. The strategies are organized into 4 domains and 14 key issue areas.

COMMUNITIES

Housing: Build more and safer affordable housing

Vulnerable populations: Help our most vulnerable communities prepare to stay strong in San Francisco

Capacity building: Empower individuals, households, and organizations

Business and workforce: Get businesses and workers ready to bounce back after disaster

Communications: Reach out and share information with our communities

BUILDINGS

Municipal buildings: Invest in buildings that support community needs

Private buildings: Promote and incentivize building retrofits

New development: Design new buildings to better withstand hazards

INFRASTRUCTURE

Transportation: Invest in multimodal transportation

Water and Wastewater: Modernize water utilities to support businesses and households

Power and Communications: Enhance the reliability of communications and power in a disaster

CROSS-CUTTING

Open space & biodiversity: Activate and invest in natural habitats to combat climate change

Waterfront: Strengthen the waterfront to withstand seismic and flood risks

Assessment: Chart a path for the future

GLOSSARY

ADM	Office of the City Administrator
BOS	San Francisco Board of Supervisors
CBOs	Community Based Organizations
DAAS	Department of Disability and Aging Services
DBI	Department of Building Inspection
DEM	Department of Emergency Management
DPH	Department of Public Health
HSA	Human Services Agency of San Francisco
MOD	Mayor's Office on Disability
MOHCD	Mayor's Office of Housing and Community Development
NEN	Neighborhood Empowerment Network
OEWD	Office of Economic and Workforce Development
ORCP	Office of Resilience and Capital Planning
Planning	San Francisco Planning Department
Port	Port of San Francisco
Public Works	San Francisco Public Works
RPD	San Francisco Recreation & Parks Department
SF CARD	San Francisco Community Agencies Responding to Disaster
SFDT	San Francisco Department of Technology
SFE	San Francisco Department of Environment
SFFD	San Francisco Fire Department
SFMTA	San Francisco Municipal Transportation Agency
SFPL	San Francisco Public Library
SFO	San Francisco International Airport
SFPUC	San Francisco Public Utilities Commission



Communities



Housing:

Build more and safer affordable housing



Vulnerable Populations:

Help our most vulnerable communities prepare and stay strong in San Francisco



Capacity Building:

Empower individuals, households, and organizations



Business & Workforce:

Get businesses and workers ready to bounce back after disaster



Communications:

Reach out and share information with our communities

Continue to meet housing production goals

Address seismic retrofit needs within San Francisco's affordable housing stock

Study the overlap between vulnerable populations and vulnerable buildings

Develop a homelessness disaster response plan

Coordinate existing in-home and resident-facing risk mitigation programs

Perform gap analysis of vulnerable populations and available City services

Establish an evacuation strategy for people with access and functional needs

Improve and prepare behavioral health services for hazard events

Replace mercury-containing lighting in preschools and daycare centers

Develop a preparedness equipment purchase program

Develop a community-based organization capacity building initiative

Support volunteer emergency preparedness, response, and recovery programs

Expand the Neighborhood Empowerment Network Empowered Communities Program

Continue to build trust between the San Francisco Police Department and the communities they serve

Expand household hazardous waste collection efforts

Develop a Downtown earthquake resilience and recovery strategy

Continue small business continuity of operations planning assistance

Support the Small Business Development Center

Establish disaster relief funding and small business resilience fund

Expand layoff outplacement services

Expand the Women's Entrepreneurship Fund

Develop a post-hazard "open for business" campaign

Explore toxins abatement workforce development programs

Extend and improve the Building Occupancy Resumption Program

Develop and implement an air quality and extreme heat preparedness outreach campaign

Develop and manage a system for hazard and climate resilience data

Develop a communications strategy for citywide climate resilience efforts

Develop a Climate Resilience Framework

Develop public outreach and wayfinding plan for tsunami awareness and evacuation

HOUSING:

Build more and safer affordable housing

Key Planning Issue:

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.

Strategies:

Continue to meet housing production goals

Address seismic retrofit needs within San Francisco's affordable housing stock

Study the overlap between vulnerable populations and vulnerable buildings





Example Strategy

Address seismic retrofit needs within San Francisco's affordable housing stock

VULNERABILITY ADDRESSED:

Much of San Francisco's housing stock is in need of structural retrofits and life safety improvements. Loss of affordable housing due to damage from an earthquake would have a severe impact on vulnerable populations.

STRATEGY SUMMARY:

The San Francisco Mayor's Office of Housing and Community Development (MOHCD) manages acquisition and rehabilitation programs that provide funding to non-profit organizations to acquire older, rent-controlled properties, rehabilitate them, and preserve them as

permanent affordable housing. This strategy will use FEMA hazard mitigation funding to subsidize these developers to perform necessary retrofits, thereby reducing potential displacement of renters of damaged housing following earthquake events and reducing the necessity of landlords raising rents for building improvements.

LEAD:

MOHCD

PARTNERS:

DBI, Community development organizations

VULNERABLE POPULATIONS:

Help our most vulnerable communities prepare and stay strong in San Francisco

Key Planning Issue:

More sophisticated programs and policies that proactively address the disproportionate impacts of hazard events and advance equity are needed. Populations that are among the most vulnerable in San Francisco include the elderly, people of color, neighborhoods with high concentrations of poverty, and unhoused populations.

Strategies:

Develop a homelessness disaster response plan

Coordinate existing in-home and resident-facing risk mitigation programs

Perform gap analysis of vulnerable populations and available City services

Establish an evacuation strategy for people with access and functional needs

Improve and prepare behavioral health services for hazard events

Replace mercury-containing lighting in preschools and daycare centers

Example Strategies



Coordinate existing in-home and resident-facing risk mitigation programs

VULNERABILITY ADDRESSED:

This strategy seeks to improve the City's capacity and streamline its efforts to improve the resiliency of San Francisco homes and residents, especially vulnerable populations, to many of the hazards included in this plan.

STRATEGY SUMMARY:

This strategy creates an interdepartmental effort coordinating existing City programs providing in-home and resident-facing services. Opportunities in City services would be identified for existing programs, including climate resilience and emergency preparedness opportunities. This strategy will include a training program to engage multi-unit landlords, particularly those serving vulnerable populations. By working with existing programs, age-related emergency preparedness education can be included for City staff on home assessments.

LEAD:

DEM, DPH

PARTNERS:

HSA, ORCP, MOHCD, SFE, DBI



Establish an evacuation strategy for people with Access and Functional Needs

VULNERABILITY ADDRESSED:

In the event of an evacuation, the length of time necessary to evacuate large volumes of people, coupled with the potentially short period of time available to safely evacuate, leads to populations with limited mobility or medical conditions being particularly at risk.

STRATEGY SUMMARY:

Vulnerable populations are acutely impacted by disasters and can often face unique challenges. By developing a coordinated evacuation strategy, with consideration for the needs of populations with access and functional needs, support for this population can be effectively communicated to the public in case evacuation procedures need to be pursued.

LEAD:

DAAS, MOD

PARTNERS:

Age and Disability Friendly SF, DEM, MOD, SFFD, DBI, DPH

CAPACITY BUILDING:

Empower individuals, households, and organizations

Key Planning Issue:

Strong relationships within neighborhoods, at the block level, and within large multi-unit buildings can help ensure that vulnerable residents stay safe during and following a hazard event. At the same time, the resources connections, and skills of local businesses, community-based organizations, and regional partners should be leveraged to support efficient, effective, and equitable hazard mitigation efforts.

Strategies:

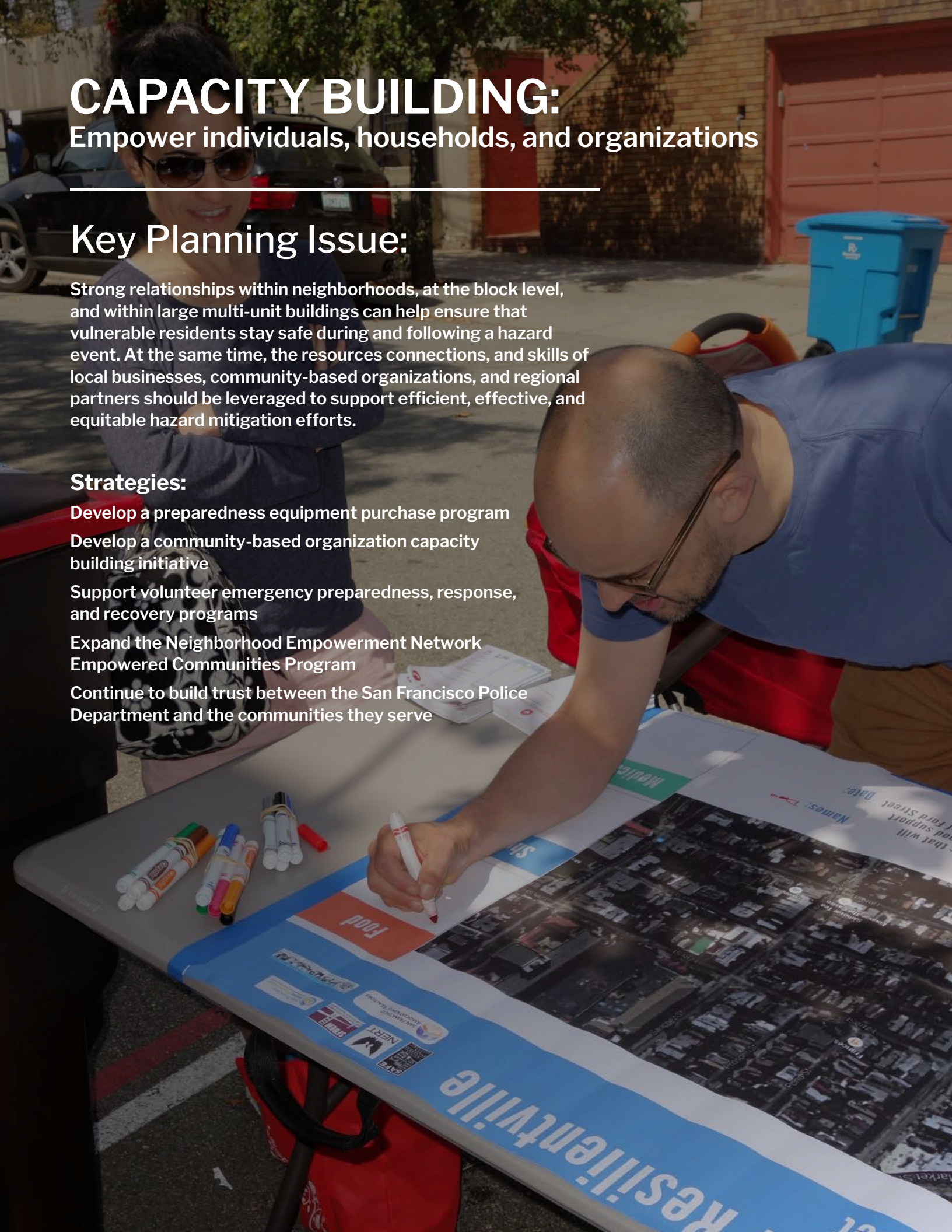
Develop a preparedness equipment purchase program

Develop a community-based organization capacity building initiative

Support volunteer emergency preparedness, response, and recovery programs

Expand the Neighborhood Empowerment Network Empowered Communities Program

Continue to build trust between the San Francisco Police Department and the communities they serve



Example Strategies



Develop a community-based organization capacity building initiative

VULNERABILITY ADDRESSED:

Community Based Organizations (CBOs) provide critical services to vulnerable populations, but often lack the resources to preemptively invest in hazard mitigation and emergency preparedness.

STRATEGY SUMMARY:

Building the capacity of community-based partners to develop their own emergency preparedness plans for the individuals, households, and/or neighborhoods that they serve, is an important means for the City to prepare its small business community to endure hazard events. This strategy is a key component of promoting neighborhood level resiliency.

LEAD:

MOD

PARTNERS:

DAAS, DPH, SF CARD, DEM, NEN, Rebuilding Together SF, Housing for Health, Age & Disability Friendly SF



Develop a preparedness equipment purchase program

VULNERABILITY ADDRESSED:

Climate change will increase the prevalence and intensity of hazards such as extreme heat and poor air quality events. This strategy aims to build citywide resiliency by improving the City's ability to respond to these emergency events.

STRATEGY SUMMARY:

A Preparedness Equipment Purchase Program would help fund the purchase of climate preparedness equipment to ensure City departments have equipment on-hand for deployment. This equipment can be used to augment and bolster the flexibility of the City's response to current and future extreme weather and hazard events.

LEAD:

DEM, DPH

PARTNERS:

Public Works, ORCP, SFE, SFFD

BUSINESS AND WORKFORCE:

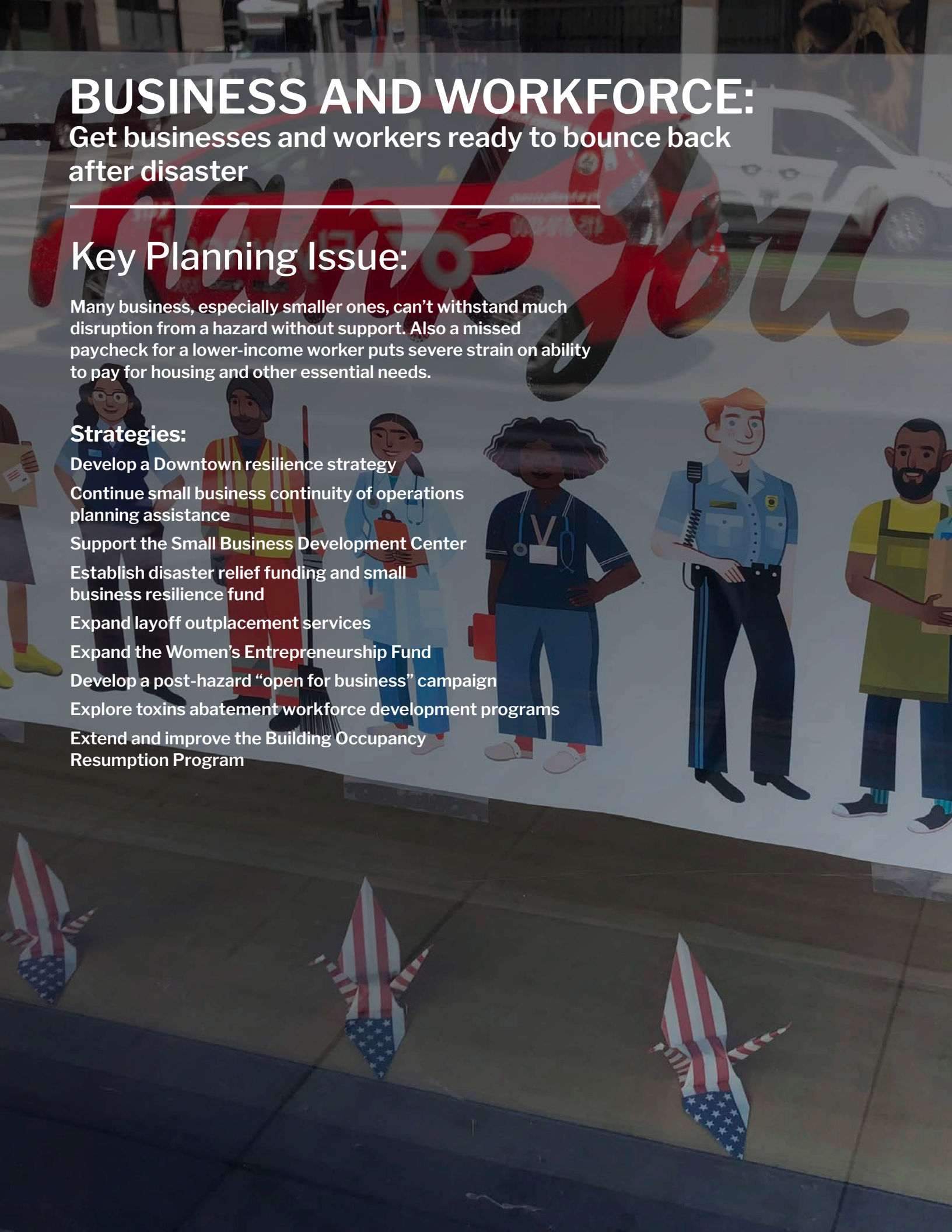
Get businesses and workers ready to bounce back after disaster

Key Planning Issue:

Many business, especially smaller ones, can't withstand much disruption from a hazard without support. Also a missed paycheck for a lower-income worker puts severe strain on ability to pay for housing and other essential needs.

Strategies:

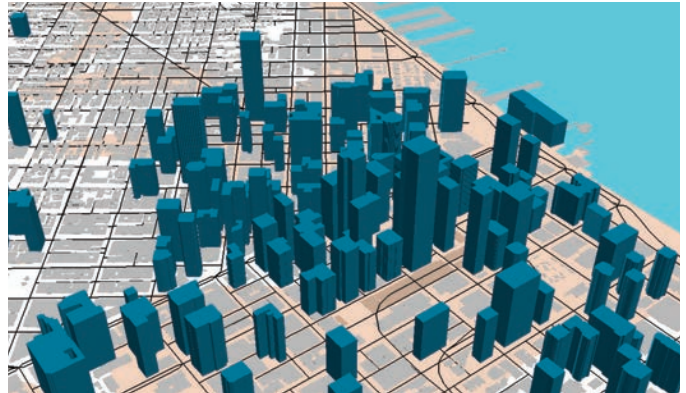
- Develop a Downtown resilience strategy
- Continue small business continuity of operations planning assistance
- Support the Small Business Development Center
- Establish disaster relief funding and small business resilience fund
- Expand layoff outplacement services
- Expand the Women's Entrepreneurship Fund
- Develop a post-hazard "open for business" campaign
- Explore toxins abatement workforce development programs
- Extend and improve the Building Occupancy Resumption Program



Example Strategies



Photo Credit: David Yu, Flickr



Develop a Downtown resilience strategy

VULNERABILITY ADDRESSED:

Damage to tall buildings in Downtown can lead to long-term disruption of whole neighborhoods, impacting housing, employment, and economic opportunity for thousands of residents.

STRATEGY SUMMARY:

The work that the City has done around tall buildings focuses on the buildings themselves, with little consideration for how the building fits into the surrounding neighborhood. This work does not consider how tall buildings interact with other structures around them and the relationships between businesses, residents, workers, and the critical infrastructure that allow the Financial District and adjacent neighborhoods to thrive. To this end, this strategy calls for the creation of a downtown recovery strategy for these areas to address the interconnection between tall buildings and their surrounding neighborhoods.

LEAD:

ORCP

PARTNERS:

Public Works, DBI, DEM, Port, Planning, SFE, SFPUC

Extend and improve the Building Occupancy Resumption Program (BORP)

VULNERABILITY ADDRESSED:

Damage and disruption to San Francisco's commercial buildings can disrupt residents' work and workplace social networks and can prompt widespread short-term unemployment.

STRATEGY SUMMARY:

BORP allows for building owners to arrange in advance for post-earthquake safety inspections using their own contracted inspectors. Participation is currently voluntary. The Department of Building Inspection (DBI) approves each participating building's application and pre-certifies the owner's inspection team. Most BORP participants are downtown office buildings. BORP addresses many of the problems associated with applying the general Safety Assessment Program to tall or otherwise complex or recovery-critical buildings.

LEAD:

DBI

PARTNERS:

ORCP, Public Works, Building owners & tenants

COMMUNICATIONS:

Reach out and share information with our communities

Key Planning Issue:

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.

Strategies:

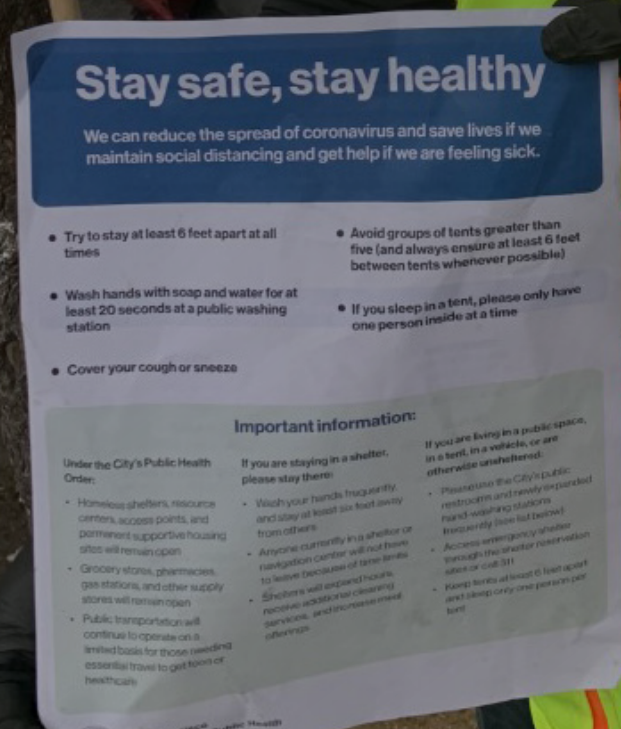
Develop and implement an air quality and extreme heat preparedness outreach campaign

Develop and manage a system for hazard and climate resilience data

Develop a communications strategy for citywide climate resilience efforts

Develop a Climate Resilience Framework

Develop public outreach and wayfinding plan for tsunami awareness and evacuation



Stay safe, stay healthy

We can reduce the spread of coronavirus and save lives if we maintain social distancing and get help if we are feeling sick.

- Try to stay at least 6 feet apart at all times
- Wash hands with soap and water for at least 20 seconds at a public washing station
- Cover your cough or sneeze
- Avoid groups of tents greater than five (and always ensure at least 6 feet between tents whenever possible)
- If you sleep in a tent, please only have one person inside at a time

Important information:

Under the City's Public Health Order:

- Homeless shelters, resource centers, access points, and permanent supportive housing sites will remain open
- Grocery stores, pharmacies, gas stations, and other supply stores will remain open
- Public transportation will continue to operate on a limited basis for those needing essential travel to get home or healthcare

If you are staying in a shelter, please stay there:

- Wash your hands frequently and stay at least six feet away from others
- Anyone currently in a shelter or navigation center will not have to leave because of their tent
- Shelters will expand hours, receive additional cleaning services, and increase meal offerings

If you are living in a public space, in a tent, in a vehicle, or are otherwise unsheltered:

- Use the City's public restroom and newly expanded hand washing stations frequently (see list below)
- Access emergency shelter sites or call 311
- Keep tents at least 6 feet apart and sleep only one person per tent



Example Strategy

Develop and implement an air quality and extreme heat preparedness outreach campaign

VULNERABILITY ADDRESSED:

This strategy would improve overall outreach and education coordination in the City and with media and community group partners. This will improve the effectiveness of City messaging, reduce public confusion in emergencies and ignorance of hazards, and build capacity citywide for preparedness efforts.

STRATEGY SUMMARY:

This strategy seeks to improve community engagement and education efforts. A centralized Air Quality and Extreme Heat Preparedness campaign, would partner with community-based,

City, and regional partners to unify messaging around health impacts, vulnerable populations, preparedness best practices, and available emergency and information services. .

LEAD:

DPH

PARTNERS:

DEM, ORCP, CBOS, SFE, Public Works, Public Information Officers, Government Affairs Staff

Buildings



Municipal Buildings:

Invest in buildings to support community needs in times of stress

Private Buildings:

Support and incentivize building retrofits

New development:

Design buildings to better withstand earthquakes and climate hazards

Assess and seismically retrofit municipal buildings

Seismically improve critical Port buildings

Develop a non-structural earthquake risk improvement program for municipal buildings

Install solar + storage at critical facilities

Increase resilience and operation efficiency of maintenance yards

Identify and create extreme weather public respite facilities

Complete the Mandatory Soft-Story Retrofit Program

Develop a voluntary program of seismic retrofits for smaller woodframe soft-story buildings

Implement the Tall Buildings Strategy for buildings taller than 250 feet

Develop standards and guidance to screen, evaluate, and retrofit non-ductile concrete and older steel buildings.

Improve implementation of California's Safety Assessment Program

Study and deploy emergency clean air and cooling capacity at key community facilities

Assess vertical evacuation options in high-hazard areas and guidance for large-building refugees

Analyze, identify, and evaluate properties at risk of stormwater flooding

Implement floodproofing and elevation projects for properties at risk of stormwater flooding

Increase privately owned building weatherization rates

Support increased building electrification

Review Sea Level Rise Capital Planning Guidance

Develop multi-hazard resilience design guidelines for municipal buildings

Develop coordinated code amendments for multi-hazard resilience of private development

MUNICIPAL BUILDINGS:

Invest in buildings to support community needs in times of stress

Key Planning Issue:

City services need to function during and after a hazard event to provide critical response and recovery services. The City owns many older buildings and facilities that need to be seismically retrofitted and were not designed to be resilient to climate hazards, such as extreme heat, poor air quality, and flooding.

Strategies:

- Assess and seismically retrofit municipal buildings
- Seismically improve critical Port buildings
- Develop a non-structural earthquake risk improvement program for municipal buildings
- Install solar + storage at critical facilities
- Increase resilience and operation efficiency of maintenance yards
- Identify and create extreme weather public respite facilities
- Secure a resilient public safety training facility for the San Francisco Fire Department
- Develop a strategy to conserve and monitor water use by capital projects



Example Strategies



Assess and seismically retrofit municipal buildings

VULNERABILITY ADDRESSED:

Community members rely on services provided by the City. The consequences of municipal building disruption are more severe for residents who are resource-constrained.

STRATEGY SUMMARY:

ORCP uses seismic hazard ratings, HAZUS, and other analytical tools to assess risk and prioritize seismic-strengthening projects within the public facilities portfolio. This strategy allows for effective prioritization that ensures retrofits first work to reduce life safety risk and then to minimize potential interruptions to essential services for San Francisco's most vulnerable populations. Known priority buildings at the time of the HCR's publication include 170 Otis, Kezar Pavilion, the Hall of Justice, the City's homeless shelters, as well as the City's temporary shelters.

LEAD:

ORCP

PARTNERS:

BOS, ADM, Mayor's Office, Public Works, all impacted departments



Photo Credit: J. Maughn, Flickr

Identify and create extreme weather public respite facilities

VULNERABILITY ADDRESSED:

Climate change is expected to increase the frequency and severity of extreme heat events. By 2100, the number of extreme heat days is projected to increase by 1.5 orders of magnitude to 90 days per year, up from around six currently.

STRATEGY SUMMARY:

As part of the Mayoral Directive on Air Quality Emergencies, this strategy relates to performing a feasibility assessment and subsequent implementation plan for improvements to publicly- and privately-owned buildings, in order for their operation as public respite facilities during future poor air quality or extreme heat events. Measures identified in the SF Fellows preliminary report will be the main focus of the feasibility assessment and the implementation plan.

LEAD:

ORCP

PARTNERS:

SFPL, DEM, RPD, ADM, Public Works, DPH

PRIVATE BUILDINGS:

Support and incentivize building retrofits

Key Planning Issue:

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.

Strategies:

Complete the Mandatory Soft-Story Retrofit Program

Develop a voluntary program of seismic retrofits for smaller woodframe soft-story buildings

Implement the Tall Buildings Strategy for buildings taller than 250 feet

Develop standards and guidance to screen, evaluate, and retrofit non-ductile concrete and older steel buildings

Improve implementation of California's Safety Assessment Program

Study and deploy emergency clean air and cooling capacity at key community facilities

Assess vertical evacuation options in high-hazard areas and guidance for large-building refugees

Analyze, identify, and evaluate properties at risk of stormwater flooding

Implement floodproofing and elevation projects for properties at risk of stormwater flooding

Increase privately owned building weatherization rates

Support increased building electrification

Example Strategies



Develop standards and guidance to screen, evaluate, and retrofit non-ductile concrete buildings

VULNERABILITY ADDRESSED:

Some older concrete buildings have non-ductile detailing and other deficiencies that have resulted in building collapse in previous earthquakes around the world. These buildings tend to be mid-rise buildings. Approximately 3,400 such buildings exist in San Francisco (public and private), but only a small percentage of those are expected to be significant collapse risk.

STRATEGY SUMMARY:

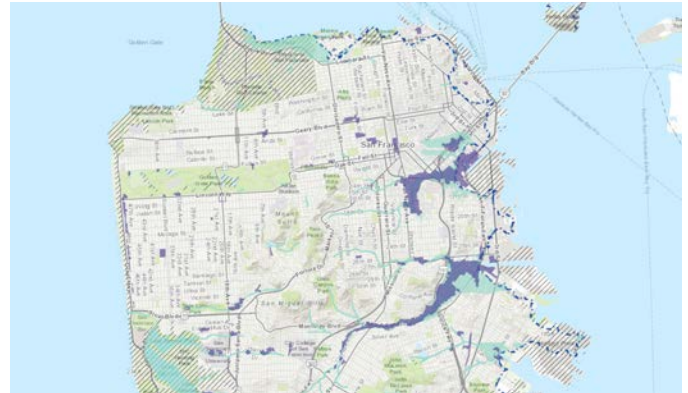
To address this issue, mandatory screening, evaluation, and retrofit of older concrete buildings should begin in 2020. Those buildings that pose significant collapse risk should be prioritized for retrofit. The program will be informed by broad stakeholder input.

LEAD:

ORCP, DBI

PARTNERS:

Building owners, Tenants, Engineering firms



Analyze, identify, and evaluate properties at risk of stormwater flooding

VULNERABILITY ADDRESSED:

Numerous residential and commercial buildings throughout San Francisco are at risk due to flooding that occurs when heavy precipitation generates runoff that exceeds the capacity of the City's stormwater system.

STRATEGY SUMMARY:

SFPUC is considering a program through which property owners affected by stormwater management would receive grants to reduce risk of flood damage. This proposed strategy will develop the framework for the grant program. The strategy will include analysis, identification, and evaluation of potential floodproofing and elevation projects. Preliminary cost-benefit analyses will also be performed. Specific projects will be separately implemented, based on interest from property owners.

LEAD:

SFPUC

PARTNERS:

Planning, DBI, Assessor

NEW DEVELOPMENT:

Design buildings to better withstand earthquakes and climate hazards

Key Planning Issue:

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.

Strategies:

Review Sea Level Rise Capital Planning Guidance

Develop multi-hazard resilience design guidelines for municipal buildings

Develop coordinated code amendments for multi-hazard resilience of private development



Example Strategy

Develop comprehensive and coordinated code amendments for multi-hazard resilience of private development

VULNERABILITY ADDRESSED:

Private buildings (residential, commercial, and industrial) are not necessarily designed to accommodate flooding, extreme heat impacts, poor air quality, and other natural and climate hazards.

STRATEGY SUMMARY:

In coordination with SFE and DBI, the Planning Department will develop multi-hazard Planning and Building Code amendments for new construction, additions, and substantial

renovations in identified hazard areas. This strategy will include opportunities for new development to include dedicated storage space for emergency equipment and supplies, include solar + storage, function as a temporary shelter or respite facility, enhance biodiversity, and/or include climate resilience initiatives within community benefit agreements. The feasibility study will include a cost-benefit analysis regarding housing costs and supply, as well as potential benefits or impacts to low-income owners and renters.

LEAD:

Planning

PARTNERS:

DBI, SFE, Port, SFO, Private property owners

Infrastructure



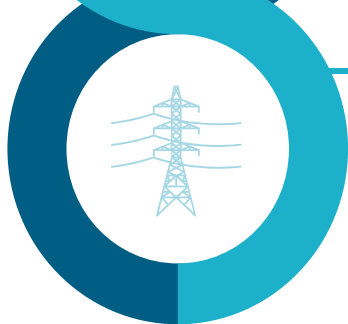
Transportation

Invest in multimodal transportation



Water and Wastewater:

Modernize water utilities to support businesses and households



Communications and Power:

Enhance the reliability of communications and power in a disaster

Implement a coastal multimodal resilience strategy for transit

Implement the SFMTA Communications & IT Strategy

Implement the SFMTA Asset Management & State of Good Repair Strategy

Implement the SFMTA Transit Fixed Guideway Strategy

Implement a security strategy for the SFMTA's infrastructure

Implement SFMTA's Traffic Signals Strategy

Conduct a multi-hazard vulnerability and operational assessment for Muni

Amend the SFMTA capital improvement program to consider hazard mitigation opportunities

Implement the SFMTA Parking Garage Strategy

Assess and develop an emergency response plan for the City's water infrastructure

Implement the Pipe Replacement Prioritization Program

Improve flood and earthquake resilience for regional dams and ancillary facilities

Diversify water supply options with new water sources and drought management

Assess and develop a long-term adaptation plan for the Hetch Hetchy Regional Water System

Mitigate wildfire hazards in SFPUC-owned watersheds

Study, improve, and expand the Emergency Firefighting Water System

Improve the capacity of the Portable Water Supply System

Advance Sewer System Improvement Program projects

Develop technologies, systems, and capacity to treat sanitary sewage at SFO

Increase the resilience of the municipal fiber optic network

Increase the resilience of the 911 radio system

Increase the resilience of the 911 radio system

Develop redundant and resilient electrical power capacity and distribution at SFO

TRANSPORTATION:

Invest in multimodal transportation

Key Planning Issue:

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.

Strategies:

Implement a coastal multimodal resilience strategy for transit

Implement the SFMTA Communications & IT Strategy

Implement the SFMTA Asset Management & State of Good Repair Strategy

Implement the SFMTA Transit Fixed Guideway Strategy

Implement a security strategy for the SFMTA's infrastructure

Implement SFMTA's Traffic Signals Strategy

Conduct a multi-hazard vulnerability and operational assessment for Muni

Amend the SFMTA capital improvement program to consider hazard mitigation opportunities

Implement the SFMTA Parking Garage Strategy

Example Strategies



Implement a coastal multimodal resilience strategy for transit

VULNERABILITY ADDRESSED:

This strategy seeks to increase the resilience of critical response facilities, municipal facilities, municipal yards, roadways, parking, and the public transit network.

STRATEGY SUMMARY:

This strategy is a capital facility improvement program area that assesses, studies, plans, and implements improvements to the multimodal transportation system that are vulnerable to flooding. This strategy includes technical studies and vulnerability and risks assessments that reduces flood risk to the multimodal transportation system. Examples of this work include implementing the Ocean Beach Master Plan and coastal planning efforts such as the Flood Study and Islais Creek Adaptation Study.

LEAD:

SFMTA

PARTNERS:

Port, Planning, ORCP, Public Works



Conduct a system-wide, multi-hazard vulnerability and operational assessment for Muni

VULNERABILITY ADDRESSED:

This strategy seeks to minimize the impact of a number of hazard and climate stressors to ensure resiliency of critical infrastructure and maintenance of SFMTA/Muni-delivered public transportation service.

STRATEGY SUMMARY:

This strategy proposes a system-wide, multi-hazard vulnerability and operational assessment for the Muni-operated public transportation system. This strategy would include technical studies and vulnerability and risks assessments to better understand the threat and impact of various hazards to critical infrastructure and services, identifying key actions, capital improvements, and service delivery strategies to mitigate these risks. Stakeholders engaged in HCR strategy review expressed that not all neighborhoods are well-served by public transit and/or do not have accessible or affordable transportation options; this isolation increases vulnerability.

LEAD:

SFMTA

PARTNERS:

Public Works, SFPUC, Planning, Regional agencies

WATER AND WASTEWATER:

Modernize water utilities to support businesses and households

Key Planning Issue:

Utilities are critical for daily needs of households and businesses and disruption can have significant consequences for public health and the economy. 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.

Strategies:

Implement the Pipe Replacement Prioritization Program

Assess and develop an emergency response plan for the City's water infrastructure

Diversify water supply options with new water sources and drought management

Improve flood and earthquake resilience for regional dams and ancillary facilities

Assess and develop a long-term adaptation plan for the Hetch Hetchy Regional Water System

Mitigate wildfire hazards in SFPUC-owned watersheds

Study, improve, and expand the Emergency Firefighting Water System

Improve the capacity of the Portable Water Supply System

Advance Sewer System Improvement Program projects

Develop technologies, systems, and capacity to treat sanitary sewage at SFO

Example Strategies



Develop a Long-term Vulnerability Assessment and Adaptation Plan for the Hetch Hetchy Regional Water System

VULNERABILITY ADDRESSED:

The water supply of the Hetch Hetchy Regional Water System (RWS) is vulnerable to drought, climate change, water demand, new regulations, and infrastructure failure.

STRATEGY SUMMARY:

The SFPUC Water Enterprise is conducting a long-term vulnerability assessment to its Levels of Service (LOS) for the Hetch Hetchy (RWS). A vulnerability-based planning approach will explore a range of future conditions to identify vulnerabilities, assess the risks, and later develop an adaptation plan that is flexible and robust to a wide range of future outcomes. The plan will guide water supply decisions of the RWS over the next 50 years or longer.

LEAD:

SFPUC

PARTNERS:

Bay Area Water Supply & Conservation Agency (BAWSCA)



Advance Sewer System Improvement Program projects

VULNERABILITY ADDRESSED:

The combined sewer system has a high exposure to seismic hazards. Coastal flooding will increasingly become an issue as sea level rises, particularly for sensitive assets in low-lying coastal areas.

STRATEGY SUMMARY:

The SFPUC is implementing the Sewer System Improvement Program (SSIP), a 20-year, citywide investment starting in 2012 to upgrade aging infrastructure to address challenges including seismic vulnerability, climate change, localized flooding, and water quality. These improvements achieve LOS objectives for a five-year, three-hour storm event and seismic resilience, ensuring treatment of flows within 72 hours of a major earthquake or a catastrophic event. New facilities will be built using a climate change design criterion and using green infrastructure. The first phase includes 70 projects around the City that represent a \$2.9-billion investment.

LEAD:

SFPUC

PARTNERS:

Public Works, Port, SFMTA

COMMUNICATIONS AND POWER:

Enhance the reliability of communications and power in a disaster

Key Planning Issue:

Functioning power and communications systems are critical for response and recovery following a disaster. Many other systems are dependent upon power and communications.

Strategies:

Increase the resilience of the municipal fiber optic network

Increase the resilience of the 911 radio system

Continue to improve power distribution infrastructure

Develop redundant and resilient electrical power capacity and distribution at SFO



Example Strategy

Increase the resilience of the Municipal Fiber Optic Network

VULNERABILITY ADDRESSED:

Damage and disruption to San Francisco's commercial buildings can disrupt residents' work and workplace social networks, and can prompt widespread short-term unemployment.

STRATEGY SUMMARY:

The City has a fiber network connecting almost all critical facilities and systems. A breakdown of this system due to a hazard event could result in a breakdown of communication between City departments, buildings, and the public for several days; severely affecting disaster response. Presently, there are no staff authorized to

maintain or repair the fiber network. Authorizing two fiber crews consisting of ten employees to install redundant fiber paths and a well-designed backup microwave link will ensure enhanced reliability and resilience for fiber infrastructure in case of a major disaster.

LEAD:

SFDT

PARTNERS:

SFMTA, SFPUC, SFFD, Joint Pole Association, other utilities

Cross-Cutting



Waterfront:

Strengthen the waterfront to withstand seismic and flood risks



Open Space & Biodiversity:

Use ecosystems services to support climate adaptation



Assessment:

Chart a path for the future through research and planning

Reduce seismic and flood risk along the Embarcadero Seawall

Conduct a seismic assessment of critical City assets along the Southern waterfront

Participate in US Army Corps of Engineers / Port Flood Study

Develop a process to move utilities from under pier structures

Address flooding around Islais Creek

Continue to implement the Ocean Beach Master Plan

Implement multi-hazard mitigation improvements for harbor dock infrastructure

Develop a hazard mitigation plan and emergency response evacuation plan for the SF Zoo

Adapt shoreline parks to sea level rise and salt water intrusion using marshes and plant diversity

Assess the stormwater catchment potential of public open space

Expand the Street Tree SF climate resilient tree planting initiative

Explore increasing the tree canopy in parks to provide shade

Assess current plant palettes to consider future climate conditions in plant selection

Strengthen efforts to conserve, restore, and steward biodiversity

Improve fire prevention in recreation areas

Complete the Lifelines Restoration Performance Project and implement recommendations

Complete the Extreme Precipitation Study

Comprehensively assess combined flood risks for San Francisco

Research earthquake risk mitigation of marine structure piles

Conduct groundwater data collection and modeling efforts

Improve San Francisco's climate health research capacity

WATERFRONT:

Strengthen the waterfront to withstand seismic and flood risks

Key Planning Issue:

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.

Strategies:

Reduce seismic and flood risk along the Embarcadero Seawall

Conduct a seismic assessment of critical City assets along the Southern waterfront

Participate in US Army Corps of Engineers / Port Flood Study

Develop a process to move utilities from under pier structures

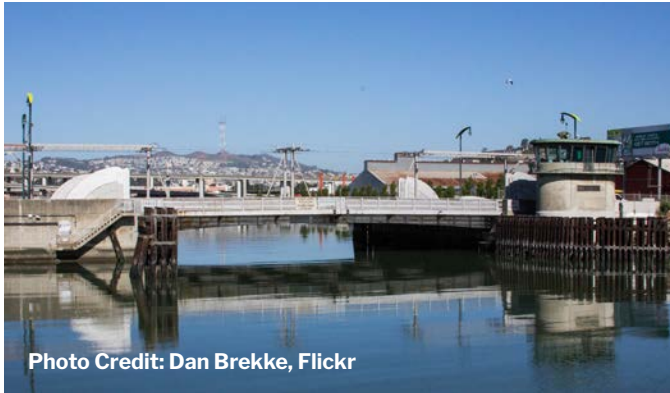
Address flooding around Islais Creek

Continue to implement the Ocean Beach Master Plan

Implement multi-hazard mitigation improvements for harbor dock infrastructure

Develop a hazard mitigation plan and emergency response evacuation plan for the SF Zoo

Example Strategies



Address flooding around Islais Creek

VULNERABILITY ADDRESSED:

Numerous transportation assets in the vicinity of Islais Creek would be subjected to flooding from urban precipitation and sea level rise in the future.

STRATEGY SUMMARY:

In coordination with the Port, SFMTA, and other partners, the Planning Department will create designs for priority projects that address current and future flooding concerns while addressing other neighborhood and citywide goals, as identified through the ISMAS process. These designs will come from extensive public process and benefit an underserved neighborhood, as well as citywide infrastructure and biodiversity by incorporating ecosystem services.

LEAD:

Planning

PARTNERS:

Port, SFMTA



Continue to implement the Ocean Beach Master Plan

VULNERABILITY ADDRESSED:

Climate-induced sea level rise and severe erosion are threatening the southern portion of Ocean Beach, with implications for recreation amenities and major infrastructure that reduces risk to water quality and the environmental and public health for the City and County of San Francisco.

STRATEGY SUMMARY:

The Ocean Beach Climate Change Adaptation Project addresses sea level rise, erosion, and shoreline protection at the southern end of Ocean Beach. The main strategies include managed retreat, asset protection through grey infrastructure, and natural adaptation measures that improve public access and habitat quality. The project is divided into short- and long-term improvements. The short-term improvements are meant to improve interim conditions while the long-term project is under development.

LEAD:

SFPUC

PARTNERS:

Public Works, SFMTA, RPD, Golden Gate National Recreation Area, SF Zoo

OPEN SPACE & BIODIVERSITY:

Activate and invest in natural habitats to combat climate change

Key Planning Issue:

95% of San Francisco's land area has been developed and its remaining natural heritage is in a precarious state due to the ongoing challenges of invasive species, urban growth, pollutants, the effects of climate change, and other human impact. Greening is integral to local climate mitigation and adaptation, such as providing relief from extreme heat.

Strategies:

Adapt shoreline parks to sea level rise and salt water intrusion using marshes and plant diversity

Assess the stormwater catchment potential of public open space

Expand the Street Tree SF climate resilient tree planting initiative

Explore increasing the tree canopy in parks to provide shade

Assess current plant palettes to consider future climate conditions in plant selection

Strengthen efforts to conserve, restore, and steward biodiversity

Improve fire prevention in recreation areas



Example Strategies



Adapt shoreline parks to sea level rise and salt water intrusion using marshes and plant diversity

VULNERABILITY ADDRESSED:

Coastal flooding due to sea level rise could eventually drown shoreline habitats resulting in the loss of critical ecosystem services and biodiversity. Flooding can negatively impact planted areas and trees and saltwater flooding is especially damaging to planted areas.

STRATEGY SUMMARY:

Develop a framework for making vegetation throughout the park system, including shoreline parks with marshes, better able to cope with future climate and sea level rise conditions, including repetitive salt water exposure. Some elements are already in place as the Recreation and Parks Department (RPD) plants wind- and salt-tolerant plants near the coast; however, this approach needs to be formalized. Additionally, co-benefits to biodiversity should be considered.

LEAD:

RPD

PARTNERS:

Port, USACE



Expand the StreetTreeSF Climate Resilient Tree Planting Initiative

VULNERABILITY ADDRESSED:

Environmental factors, such as air quality and tree density, affect vulnerability to extreme heat. In addition, the elderly, the very young, and those with chronic health problems are most vulnerable to extreme heat.

STRATEGY SUMMARY:

SFPW's Bureau of Urban Forestry (BUF) maintains the City's 125,000 street trees. The StreetTreeSF Climate Resilient Tree Planting Initiative will reduce neighborhood vulnerability to climate threats while meeting the San Francisco Urban Forest Plan's goal of growing the street tree population by half. Tree planting will prioritize neighborhoods with low tree canopy rates, those most vulnerable to extreme heat, and public health/air quality disparities. Species will be selected with a climate adaptation and mitigation focus to promote carbon sequestration, pest and disease resilience, drought tolerance, urban heat island reduction, and stormwater filtration.

LEAD:

Public Works

PARTNERS:

OEWD, City agencies with streetscape projects, Non-profit partners

ASSESSMENT:

Chart a path for the future

Key Planning Issue:

The science around hazards and climate change is constantly progressing. We will strive to understand future impacts to inform effective decision-making.

7

Strategies:

Complete the Lifelines Restoration Performance Project and implement recommendations

Complete the Extreme Precipitation Study

Comprehensively assess combined flood risks for San Francisco

Research earthquake risk mitigation of marine structure piles

Conduct groundwater data collection and modeling efforts

Improve San Francisco's climate health research capacity

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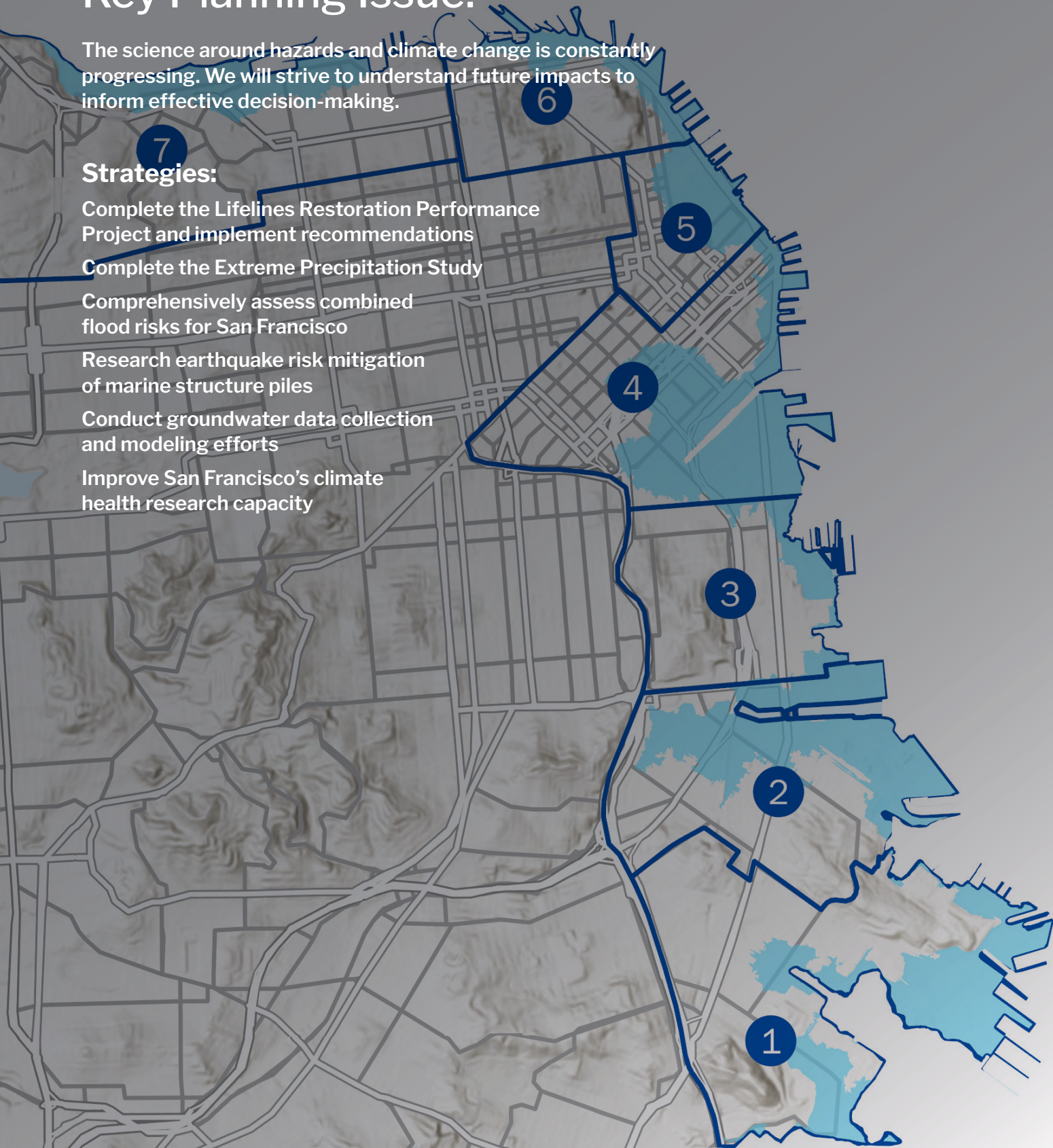
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Example Strategies



Sector	Organization	Emergency Response		Short-term Restoration		Long-term Recovery		
		0 hours	72 hours	2 weeks	2 months	6 months	1 year	3 years
Electric Power	PG&E	█	█	█	█	█	█	█
	SFPUC	█	█	█	█	█	█	█
Fuel	Kindler Morgan ¹	█	█	█	█	█	█	█
	SFPUC	█	█	█	█	█	█	█
Communications	AT&T Wireless	█	█	█	█	█	█	█
	Comcast	█	█	█	█	█	█	█
	Verizon Wireless	█	█	█	█	█	█	█
	SF Dept of Technology	█	█	█	█	█	█	█
Highways & Local Roads	Caltrans ²	█	█	█	█	█	█	█
	Golden Gate Bridge	█	█	█	█	█	█	█
Public Works	Public Works	█	█	█	█	█	█	█
	SFPUC	█	█	█	█	█	█	█
Transport	MUNI	█	█	█	█	█	█	█
	BART ³	█	█	█	█	█	█	█
Natural Gas	PG&E	█	█	█	█	█	█	█
Wastewater	SFPUC	█	█	█	█	█	█	█
Solid Waste	Recology	█	█	█	█	█	█	█
Port	Port of San Francisco	█	█	█	█	█	█	█
Airport	SFO	█	█	█	█	█	█	█
Firefighting Water (EFWS) ⁴	SFPUC	█	█	█	█	█	█	█

¹Kindler Morgan has not provided expected restoration performance. Kindler Morgan has many unknowns and vulnerabilities that make estimating restoration of fuel delivery challenging.
²Most case scenario is Hayward Fault.
³Speed of BART to full operations immediately after an earthquake. After post-earthquake fire fighting needs are met, SFPUC will focus efforts on restoring potable water first and then return to complete needed repairs to the EFWS system.

Comprehensively assess combined flood risks for San Francisco

VULNERABILITY ADDRESSED:

Flood risk in San Francisco takes several forms, including coastal flooding from extreme tides/storms and sea level rise, extreme precipitation, stormwater, and groundwater.

STRATEGY SUMMARY:

A combined flood risk analysis and assessment could result in a more comprehensive understanding of current and future flood risks and consequences, and the best strategies to reduce risk. It would be beneficial to conduct combined flood risk analysis within the next three years, in advance of strategies being developed in coastal flood risk projects. There is no current effort to assess combined flood risk. Stakeholders engaged in HCR strategy review stated the importance of including groundwater in this analysis process as well.

LEAD:

SFPUC

PARTNERS:

ORCP, Public Works, SF Planning (Pending scope)

Complete the Lifelines Restoration Performance Project and implement recommendations

VULNERABILITY ADDRESSED:

Depending on severity and building type, damages can lead from short- to long-term closure. The shutdown of financial institutions and other global companies might have economic impacts that are felt worldwide.

STRATEGY SUMMARY:

Following a disaster, the timely restoration and recovery of hospitals, homes, businesses, non-profit organizations and government of San Francisco depend on lifeline systems such as transportation, communication, water and wastewater, electricity, natural gas, and fuel. The Lifelines Restoration Performance Project will develop a simple infrastructure resilience assessment framework to establish performance goals—that is, desired targets for system recovery timelines following a scenario earthquake event, evaluate the current state of performance for specific systems in that earthquake, and recommendation actions to achieve desired restoration times.

LEAD:

ORCP

PARTNERS:

DEM, SFPUC, Public Works, Private Utilities

NEXT STEPS

On an annual basis, the Office of Resilience and Capital Planning will evaluate progress on strategy implementation and help identify ways to help overcome barriers to implementation. The goals and strategies of the 2020 Hazard and Climate Resilience Plan will be integrated and implemented through several City and County of San Francisco planning activities including:

Climate Action Plan

The 2020 Climate Action Plan will not only provide a blueprint for achieving net zero carbon emissions by 2050, but also how the City will adapt to the unavoidable impacts of climate change. The climate adaptation strategies from the HCR will be integrated into a combined strategy for eliminating carbon emissions and adapting to climate change impacts.

Community Safety Element

The Community Safety Element of the General Plan will be updated to better support key strategies from the HCR and Climate Action Plan, equity, and environmental justice.

Capital Planning

The 10-Year Capital Plan includes funding principles to make trade-offs between competing needs. “Protects Life Safety and Enhances Resilience” will continue to be Funding Principle #2 and the projects identified in the HCR will be considered in the planning process.

Emergency Management

Information from the HCR will be integrated into future updates of emergency management planning documents, such as the Emergency Response Plan, Disaster Debris Management Plan, and Earthquake Annex.

Acknowledgements

Steering Committee

Office of Resilience and Capital Planning (ORCP)
Planning Department (Planning)
Department of Public Health (DPH)
Department of the Environment (SFE)
Department of Emergency Management (DEM)
City Administrator – Steering Committee
Public Works (Public Works) – Steering Committee
Mayor’s Office (MYR) – Steering Committee

Technical Working Group (met bi-weekly)

Office of Resilience and Capital Planning (ORCP)
Planning Department (Planning)
Department of Public Health (DPH)
Department of the Environment (SFE)
Department of Emergency Management (DEM)

Planning Team

Controller’s Office (CON)
Department of Building Inspection (DBI)
Department of Emergency Management (DEM)
Department of Public Health (DPH)
Department of Public Works (DPW)
Department of Technology (DT)
Department of the Environment (SFE)
Fire Department (SFFD)
General Services Agency, Risk Management Div. (GSA)
Mayor’s Office of Housing and Community Development (MOHCD)
Mayor’s Office on Disability (MYR)
Municipal Transportation Agency (MTA)
Office of the City Administrator (ADM)
Office of Community Investment and Infrastructure (OCII)
Office of Homeless of Supportive Housing (HAS)
Office of Resilience and Capital Planning (ORCP)
Police Department (SFPD)
Port of San Francisco (Port)
Public Utilities Commission (SFPUC)
Real Estate (RED)
Recreation and Parks Department (REC)
San Francisco International AirPort (SFO)
SF Department of City Planning (Planning)
Sherriff’s Department (SHF)
Treasure Island Development Agency (TIDA)

Strategy Sessions:

Mayor’s Office
San Francisco Board of Supervisors (BOS)
Supervisor Sandra Fewer
Supervisor Catherine Stefani
Supervisor Aaron Peskin
Supervisor Gordon Mar
Supervisor Vallie Brown
Supervisor Norman Yee
Supervisor Matt Haney
Supervisor Rafael Mandelman
Supervisor Hillary Ronen
Supervisor Shamann Walton
Supervisor Ahsha Safai
Mayor’s Office of Housing and Community Development (MOHCD)
Neighborhood Empowerment Network (NEN)

Office of the City Administrator
Office of Workforce and Economic Development (OEWD)
Port of San Francisco (Port) and Port Commission
San Francisco Department of Public Health (DPH)
San Francisco Department of the Environment (SFE)
San Francisco Planning Department (Planning)
San Francisco Department of Emergency Management (DEM)
San Francisco Fire Department (SFFD)
San Francisco Department of Technology (DT)
San Francisco Public Utilities Commission (SFPUC)
and PUC Commission
San Francisco Department of Aging and Adult Services (DAAS)
San Francisco Public Works (DPW)
San Francisco Municipal Transportation Agency (SFMTA)
San Francisco International Airport (SFO)
San Francisco Police Department (SFPD)

Stakeholder Workshops:

Businesses + Commercial Properties

Able Services
ACCO Engineered Systems
Arup
Business Council on Climate Change
East Cut CBD
Fisherman’s Wharf CBD
Mercy Housing
Mid Market CBD
Ocean Avenue Association
Office of Small Business / Small Business Commission
Pacific Gas & Electric (PGE)
Presidio Work Spaces
Public Utilities Commission
Recology
Shorenstein Real Estate
terrafuse.ai
Whole Foods
Yerba Buena Community Benefit District

Housing and Residential Property Managers/Owners

Alton Management Corporation
CA Housing Partnership - SF
Enterprise Community Partners
FPI Management, Inc./EPMI Management Group
McCormack Baron Salazar
Mercy Housing
Mission Plaza Apartments
Pacific Union Development Company (PUDCo)
RMS
San Francisco Housing Authority
Tenderloin Neighborhood Development Corporation (TNDC)

People with Disabilities/

Access or Functional Needs and Older Adults

American Red Cross SF Disaster Cycle Services
The ARC of San Francisco
Department of Aging & Adult Services
Department of Emergency Management
Department of Family & Children’s Services
Department of Public Health – Community Behavioral Health Services
Golden Gate Village

Homebridge, Inc
Hospice by the Bay
Human Services Agency - Administration
Independent Living Resource Center of San Francisco
IntelliRide (Paratransit Service)
Interfaith Council of San Francisco
Mayor's Office on Disability
Meals on Wheels
Neighborhood Empowerment Network
On Lok
Richmond Senior Center
San Francisco In Home Support Services (SFIHSS)
Public Authority

Racial, Social, and Environmental Justice

Enterprise Community Partners
Gao Designs
GreenAction for Health and Environmental Justice
Hassell Studio
Interfaith Power & Light
Office of Civic Engagement and Immigrant Affairs
Neighborhood Empowerment Network
Planning Department
RDJ Enterprises
Resilient Bayview
Walter & Elise Haas Fund

Children, Youth, and Families

Community Youth Center
CARECEN SF / Central American Resource Center
Homeless Prenatal Program
Hunters Point Family
MEDA / Mission Economic Development Agency
Oasis for Girls
SF LGBT Center
Third Street Youth Center & Clinic
YMCA

Endnotes

¹ <https://www.noaa.gov/news/2018-was-4th-hottest-year-on-record-for-globe>

² San Francisco Public Utilities Commission, "About Us: Overview", accessed September 28, 2018, <https://sfwater.org/index.aspx?page=355>

³ Reich, KD, N Berg, DB Walton, M Schwartz, F Sun, X Huang, and A Hall, 2018: "Climate Change in the Sierra Nevada: California's Water Future." UCLA Center for Climate Science.

⁴ Josuwa Bernardo (SFDPH), SF Hazardous Materials Sites, 2018, Distributed by California State Water Resource Board (SWRCB). Email Correspondence regarding compiled data.

ONESF

Building Our Future

There's only one San Francisco.
Let's take care of it.

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