



METROLINK®

Blueprint for Climate Adaptation and Event Response

APRIL 2021

This project is supported by a
Caltrans SB1 Adaptation Planning Grant

Note: This Blueprint document provides an overview of the Climate Vulnerability Assessment project for Metrolink staff and stakeholders. This is a living document which will be updated during the project.





Metrolink is the nation’s third-largest commuter rail system; its 538 total route miles serve six Southern California counties with a cumulative population of 21.5 million people—more than half of California’s total population. Approximately 15 million people live within five miles of Metrolink’s 62 stations throughout Southern California.

PROJECT PURPOSE

The unprecedented wildfires that raged through the state of California in the summer and fall of 2020 are clear evidence of the climate threats faced by jurisdictions, businesses, and residents. Metrolink has long been prepared to handle periodic flooding, wildfires, and go-slow heat orders. However, the increasing size, scale, and frequency of these extreme weather events requires a new level of attention.

The Southern California Regional Rail Authority (SCRRA/Metrolink) has initiated this study to better understand the vulnerability of the Metrolink rail system, its other assets, and its core ridership to existing and future changes in climate. Metrolink’s commuter rail service is a critical component of our region’s transportation system, forming an accessible connection between affordable housing and key economic centers.

The timing for this study is critical because SCRRA has initiated design for the first set of multiple projects, which are part of a 10-year major investment in a comprehensive, regional multi-agency program to restructure and revolutionize regional rail in the Southern California service area, known as the Southern California Optimized Rail Expansion (SCORE) Program. To safeguard these investments over their useful life, which ranges from 20 to 100+ years, it is essential that future climate conditions be considered in their planning, design, and delivery. This investment program is also a significant opportunity to increase the overall resilience of the Metrolink system and the populations it serves. Further, this study aligns with the following Metrolink initiatives: the Transit Asset Management Plan, the Strategic Business Plan, the Fleet Management Plan, and the Climate Action Plan.

WHAT DOES METROLINK AIM TO ACHIEVE?

The desired outcomes of the Metrolink Systemwide Climate Vulnerability Assessment are:

- Identification of the parts of the network most vulnerable to extreme weather events such as heatwaves, riverine flooding, sea level rise, drought, wildfire, and mudslides
- Development of climate-adaptation strategies and a roadmap for implementation, to enhance the resiliency of the passenger rail system in Southern California while ensuring the health and safety of passengers
- Development of new and deepened working relationships with partners to collaborate on emergency management and climate resilience
- Integration of SCRRA’s ongoing seismic preparations into climate adaptation efforts
- Protection of the mobility of Southern Californians, keeping equity in mind and focusing on the most vulnerable, disadvantaged, and transit-dependent populations
- Development of communication strategies regarding climate hazards and resilience efforts, for staff and the general public

PROJECT GUIDING PRINCIPLES

Assessing and prioritizing climate risks is essential to understand Metrolink’s overall vulnerability to a changing climate. The guiding principles for the project have been developed in alignment with the Board-adopted Strategic Business Plan. The project team will be guided by the following principles as we undertake each task:

- **Safety is Foundational:** We will improve the resiliency of our infrastructure and mitigate the impacts of climate change to ensure a safe, reliable regional rail system.
- **Connecting and Leveraging Partnerships:** We will collaborate with our partners on climate action and align with regional climate-related projects and plans to improve efficiency and the resilience of the region.
- **Modernizing Business Practices:** We will prioritize strategies that can mainstream climate adaptation measures throughout SCRRA’s planning, operations, and program delivery groups. We will maximize efficiency of resilience investments by identifying synergies between climate adaptation and seismic response, as well as evaluating projects based on economic, environmental, and social value.
- **Advancing Key Regional Goals:** We will produce an adaptive plan that can be updated as new information becomes available and prioritize nature-based adaptation strategies that can be more cost-effective than traditional infrastructure and provide additional co-benefits. We will prioritize disadvantaged communities who have fewer resources to cope with the impacts of climate change, and for whom improved transit accessibility can help improve social equity.

METROLINK’S RIDERSHIP AND SOCIAL VULNERABILITY

This assessment identifies the communities in Metrolink’s service area that are particularly sensitive to climate hazards due to socioeconomic factors such as age, income, vehicle access, or race/ethnicity. In Metrolink’s home catchment areas (the areas around Metrolink stations that include 90% of trip origins), 31.4% of people (5.4 million) live in census tracts designated as Disadvantaged Communities (DAC) by SB 535, and 46% of people (8.3 million) live in AB 1550 Low-Income census tracts. Metrolink’s ridership continues to become more ethnically diverse, with the percentage of non-Caucasian riders increasing from 45% in 2000 to 68% in 2018. Systemwide, approximately 15% of riders do not have a car available on weekdays (and 29% of Antelope Valley Line riders do not have a car to meet their mobility needs). The proportion of seniors, aged 65 and older, has risen to 7% and is expected to continue to rise.

Map of Metrolink Network and Examples of Current Climate-Related Challenges

Legend

Antelope Valley Line

Inland Empire - Orange County Line

Orange County Line

Riverside Line

San Bernardino Line

Ventura County Line

91/Perris Valley Line

Future Redlands Passenger Rail (Arrow)

Metro Rail

SB 535 Disadvantaged Communities

AB 1550 Low-income Communities

SB 535 Disadvantaged Communities and AB 1550 Low-income Communities

AB 1550 Low-income Communities within a 1/2-mile of a SB 535 Disadvantaged Community

Catchment Area

Source: CalEnviroScreen 3.0 (2018), California Department of Housing and Community Development (2018)

EXTREME HEAT EXAMPLE

Rail "Sun Kink" (Sept. 2020)

Extreme temperatures caused pressure in the rail (when metal expands due to heat) along the Metrolink Antelope Valley Line, creating a weak point in the track. Luckily, an engineer recognized the rail defect in time to stop the train and customers were safely off-loaded.

WILD FIRE EXAMPLE

Saddleridge Fire (Oct 2019)

A wildfire encroached along the Antelope Line in Sylmar, Porter Ranch, which caused service to stop in Santa Clarita. Through our established emergency management Quality Service Pledge, Metrolink was able to provide rideshare or alternative transit reimbursement for passengers to reach their final destination.

EXTREME PRECIPITATION EXAMPLE

Redlands Subdivision Flooding (Annual):

The Mission Zanja Channel is the primary source of flooding in the City of Redlands, which experiences flooding on an almost yearly basis. Morey Arroyo is an additional source of flooding to the area. Modeling has suggested that during a 100-year event, the track will be overtopped and inundated at various locations between the Santa Ana River and Bridge 9.4 (just before the easterly I-10 overpass).

SEA LEVEL RISE EXAMPLE

San Clemente Erosion (July 2018)

In 2014, track workers reported incidents of waves striking the revetment in San Clemente and sending spray over the top and onto tracks. Damage to the rail-line could stop all service (passenger and freight) between Los Angeles and San Diego. To prevent wave erosion, Metrolink worked closely with the U.S. Army Corps of Engineers to repair riprap, improving protection now and into the future.

4

PROJECT TIMELINE

This diagram highlights the key project tasks and key points in the process when stakeholders will be engaged.



STAKEHOLDER ENGAGEMENT

The stakeholder group includes representation from 20+ groups, representing public health, environmental justice, climate focused community-based/non-profit organizations, emergency management, and local/ state government. Note that a separate emergency management stakeholder focus group was created (highlighted on next page) to discuss a multi-agency response.

Stakeholder collaboration on this project is important to ensure that opportunities to leverage and build on existing climate-related work are maximized. Recent projects such as the San Bernardino County Climate Vulnerability Assessment and Resilience Strategy, the LA Metro Climate Action and Adaptation Plan, and SCAG resources on Adaptation and Resilience Planning for Providers of Public Transportation will be leveraged. In addition, current and ongoing regional climate adaptation efforts—such as the SCAG Regional Climate Adaptation Framework, OCTA Defense Against Climate Change Plan, and LA County Climate Vulnerability Assessment—will all benefit from coordinating on data and approaches and from sharing results and insights.

BNSF Railway
Caltrans
City of Los Angeles
Climate Resolve (Los Angeles, Riverside, and San Bernardino Counties)
Communities for a Better Environment, Southern California (Invited)
Los Angeles County Metropolitan Transportation Authority
Los Angeles County Sustainability Office
Los Angeles Department of Transportation
Los Angeles Regional Collaborative for Climate Action and Sustainability
Los Angeles - San Diego - San Luis Obispo Rail Corridor Agency
Mujeres de la Tierra, Los Angeles Region (Invited)
North County Transit District
Orange County Transportation Authority
Public Health Alliance of Southern California
Riverside County Transportation Commission
San Bernardino County Transportation Authority
Southern California Association of Governments
Union Pacific
Ventura County Transportation Commission

HOW DOES METROLINK RESPOND AND SUPPORT PARTNER AGENCIES DURING AN EMERGENCY EVENT?

Emergency response capabilities are important for Metrolink in two ways: having the ability to maintain its own resources and operations in the face of climate-change-related impacts and disruptions, and being able to contribute to an emergency response effort following a significant incident.

Metrolink’s current emergency management program has a solid foundation, but the more frequent and severe extreme weather events caused by climate change will add strain on existing elements of the program. To better prepare for these periods of unstable and severe climate conditions, Metrolink will examine and update protocols specific to its role as a regional mobility provider during an emergency; and will fortify institutional relationships and procedures with its partner agencies at the local, regional, and state level.

Metrolink’s established emergency-management framework comprises the following core elements:

- **Mitigation:** activities that eliminate the potential for a disaster, or reduce the impacts of a disaster or the organization’s vulnerability to a given disaster or emergency
- **Prevention:** actions to prevent a disaster or emergency and to safeguard employees, passengers, vehicles and facilities (i.e., Preventive Maintenance, SOPs)
- **Preparedness:** training, resourcing, and other activities conducted prior to an emergency or disaster with the goal of protecting lives and minimizing damage
- **Response:** actions taken after a disaster to provide emergency assistance
- **Recovery:** short- and long-term activities that return all operations to normal and/or improved standards

Metrolink’s emergency management roles and responsibilities include the following:

Internally identified roles	Externally identified roles
I-1 Protect the safety and security of personnel, riders, visitors, and others at risk from all hazards (including those related to climate change) while on the public transit system.	E-1 Conduct movement of people, goods, supplies, and equipment in support of the response.
I-2 Maintain customer service by minimizing interruptions or disruptions of transit operations.	E-2 Coordinate emergency response activities with local public safety agencies/first responders.
I-3 Protect SCRRRA facilities, physical assets, and electronic information.	E-3 Coordinate transportation emergency response activities with member agencies, local agencies, and partner transit agencies by providing or requesting, as appropriate, alerts/ notifications; situation status information; resources; and/or other information pertinent to the response activities.
I-4 Conduct a coordinated response among SCRRRA and its contractors.	

Metrolink maintains preparedness to support outward-facing, multi-agency response efforts through cooperation and planning with the following partner agencies:

- City of Covina Emergency Management
- City of Lancaster Emergency Management
- Los Angeles County Office of Emergency Management
- North County Transit District
- Orange County Sheriff’s Department
- Orange County Transportation Authority
- Riverside County Transportation Commission
- San Bernardino County Office of Emergency Services
- San Bernardino County Transportation Authority
- Ventura County Transportation Commission
- Los Angeles County Metropolitan Transportation Authority

During an emergency, Metrolink will also coordinate emergency response with the following entities:

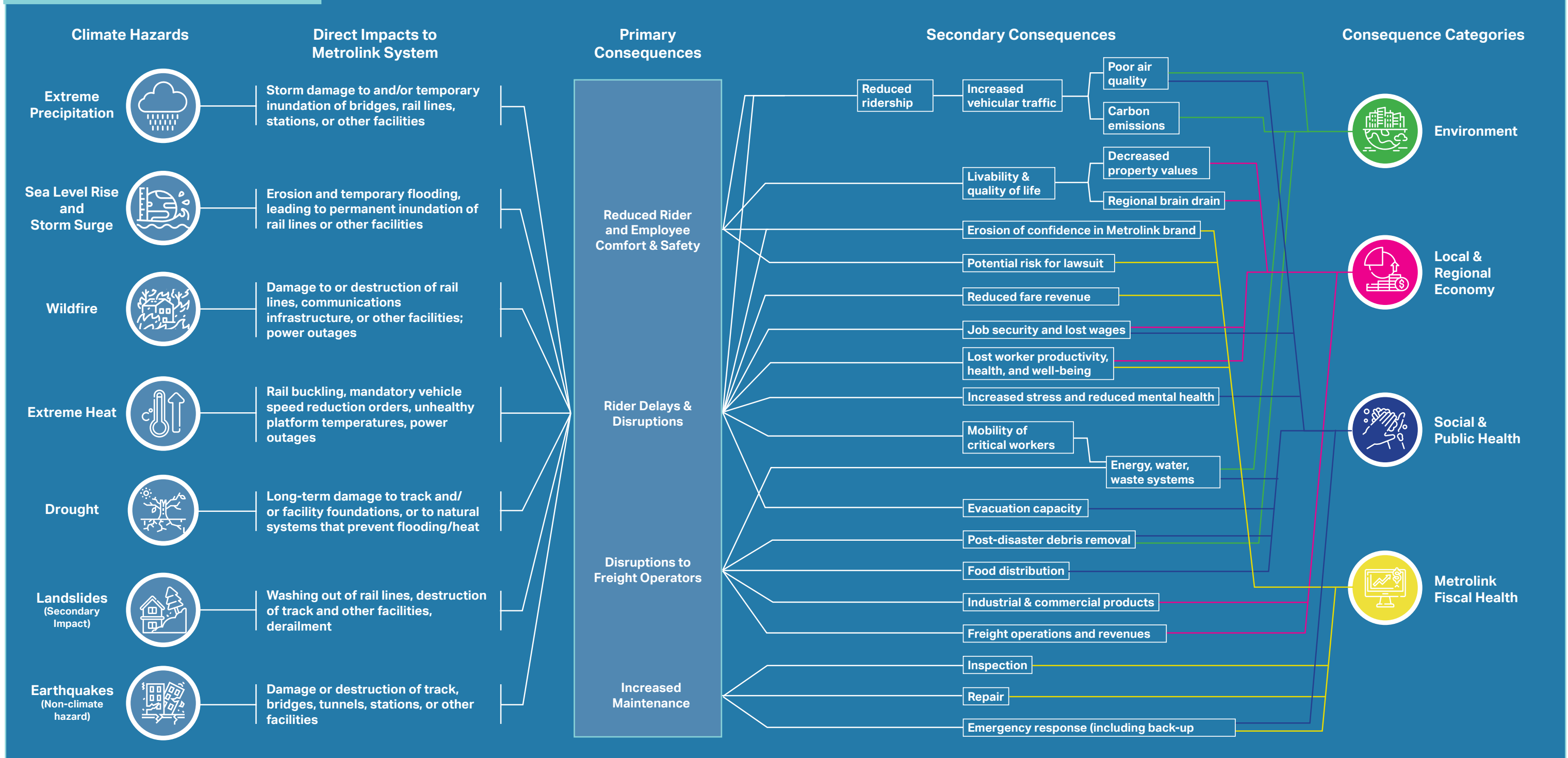
- First-response organizations in the affected jurisdiction(s)
- Regional and state organizations coordinating emergency transportation

WHY IS COLLABORATION SO IMPORTANT?

Metrolink's commuter service and rail infrastructure are key components of the Southern California region's transportation system. Any direct impacts to Metrolink assets caused by climate hazards will result in a series of cascading and interconnected consequences that will extend across jurisdictions and sectors. Therefore, many different stakeholders—from freight operators to transit agencies to riders—have a vested interest in the climate resilience of the Metrolink system.

The diagram below depicts examples of these cascading consequences. Climate hazards cause direct impacts to the Metrolink system; these result in primary consequences, which in turn cause secondary consequences. The secondary consequences are mapped to four consequences categories (environment, economy, social and public health, and Metrolink fiscal health) to demonstrate their cross-sectoral nature. It should be noted that, even though Metrolink does not move freight, disruptions to freight operators running on Metrolink-owned track could result in substantial secondary consequences.

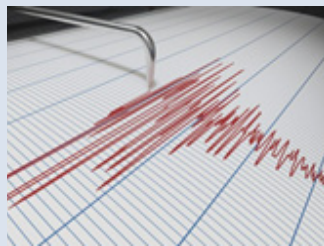
METROLINK CASCADING CONSEQUENCES



WHAT TYPES OF STRATEGIES WILL MAKE METROLINK MORE RESILIENT TO CLIMATE CHANGE?

Armed with an understanding of the network's climate vulnerabilities gained through the vulnerability assessment process, we will identify adaptation strategies that range from immediate implementation (such as updating design and planning guidelines) to long-term solutions (such as physical infrastructure protection). Some strategies will be implemented solely by Metrolink; others may require extensive regional collaboration. The strategies will be grouped into the following four categories:

Emergency Response Strategies



Address Metrolink's potential role in conducting emergency transportation efforts following a major incident, such as an earthquake or wildfire, and its internal capabilities to respond and recover quickly.

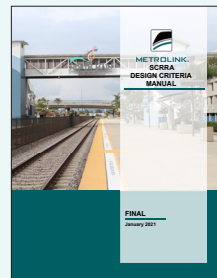
Example: Develop scenario-specific response plans to guide

Metrolink activities following a major incident, such as supporting the current effort to install earthquake detection and warning systems to automate the halting of trains).

Outcome

- Metrolink is better prepared to minimize the impacts of disruptions and can better support regional response efforts.

Governance Strategies



Address integrating climate resilience into policy, planning, design guidelines, regulatory compliance (permitting), and operations and maintenance.

Example: Update SCRR Design Criteria Manual to include climate change considerations, such as ensuring that stations provide adequate shade for passengers

Outcome

- Climate resilience is mainstreamed across Metrolink's decision-making and capital planning, ensuring that investments made now are climate-proofed.
- The efficiency of Metrolink's adaptation efforts and other regional adaptation efforts are maximized.
- Active engagement with stakeholders improves climate adaptation opportunities that span beyond jurisdictional boundaries.

Structural Strategies

Protect or adapt physical infrastructure such as raising assets out of reach of flood waters, shading commuters from the sun or heavy rain, or hardening bridge abutments against scour. Nature-based

solutions will be prioritized because they can provide co-benefits such as improved air quality, habitat creation, and improvement of the public realm. Some structural strategies may provide energy resilience by hardening distribution feeders or developing district-scale microgrids/resilience hubs that could be considered with utility and city partners.

Example: Installing a bioswale along a flood-prone station parking lot will reduce stormwater runoff and create habitat.

Outcome

- Metrolink's existing assets are resilient to a changing climate; disruptions in service are minimized.



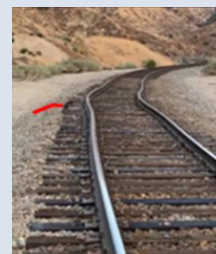
Informational Strategies

Address gaps in understanding the vulnerability of assets due to a lack of information (e.g., feasibility studies, ongoing monitoring, or data collection). Furthermore, awareness of climate hazards and adaptation will be built through education and outreach, and potential funding opportunities will be identified to support the implementation of strategies.

Example: Monitor rail temperatures and track alignment to identify patterns between extreme heat and sun kinks.

Outcome

- Metrolink has the information necessary to develop targeted adaptation strategies
- Metrolink is better positioned to make the business case for funding.



GLOSSARY OF TERMS

The following definitions have been adapted from those provided in the California Adaptation Planning Guide, 2020 (Governor's Office of Emergency Services).

Adaptation (Climate Change): Making changes in response to current or future conditions (such as the increased frequency and intensity of climate-related hazards), usually to reduce harm and to take advantage of new opportunities. Climate change adaptation describes actions that address the projected impacts on all aspects of community function that may result from climate change. This can include impacts related to hazard events (flood, wildfire, drought, or severe storms), as well as slow changes; ecosystem structure and function; and public health.

Climate change refers to a change in the climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer.

Climate Hazard (or climate threat): An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, damage to the environment, interruption of business, or other types of harm or loss.

Disadvantaged Communities (DAC) - SB535: Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure, or environmental degradation, or with concentrations of people that are of low income, high unemployment, low levels of homeownership, high rent burden, sensitive populations, or low levels of educational attainment. DACs are defined in accordance with SB535, based on CalEnviroScreen 3.0 statewide percentile scores.

Energy Resilience: Ensuring a reliable supply of energy and continued operations in the event of a power failure (during an extreme event) or during a public safety power shutoff (PSPS); for example using microgrids, distributed energy resources, or hardened distribution feeders.

Environmental Justice: The fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.

Extreme (Climate) Event: An event occurs when a weather or climate variable exceeds the upper or lower thresholds of its observed range.

Low-Income Communities: AB1550 defines low-income communities as census tracts with median household incomes at or below 80 percent of the statewide median income (California Air Resources Board).

Nature-based solutions: Adaptation strategies that harness natural systems to function, often providing ecological, aesthetic, or social benefits beyond their primary purpose.

Risk: Risk is the potential for damage or loss created by the interaction of hazards with assets such as buildings, infrastructure, or natural and cultural resources. For natural hazards, risk tends to be calculated based on evaluation of the probability (likelihood) of a hazard event occurring, vulnerability, and the event's potential consequences.

Resilience (Climate): The capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience. Adaptation actions contribute to increasing resilience.

Social Vulnerability: Social vulnerability is "the susceptibility of a given population to harm from exposure to a hazard, directly affecting its ability to prepare for, respond to, and recover."

Vulnerability is the exposure of human life and property to damage from natural and human-made hazards. Climate vulnerability describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerability can increase because of physical (built and environmental), social, political, and/or economic factor(s). Vulnerability comprises the following components:

- Exposure** is the presence of people and physical assets in areas that are subject to harm.
- Sensitivity** is the degree to which people and physical assets would be affected by changing climate conditions.
- Adaptive capacity** is the combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts [or] moderate harm or [to] exploit beneficial opportunities. Simply stated, it is the ability to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

CONTACT INFORMATION

Joseph McNeely P.E.
Project Engineer
E: McNeelyJ@scrra.net

Lisa Colicchio
Director, Special Projects Sustainability Initiatives
E: colicchiol@scrra.net

David Huang
Planning Manager
E: HuangD@scrra.net

