



# TOWARDS A RESILIENT TRANSIT SYSTEM

Presentation at the 2019 APTA Bus & Paratransit Conference  
Louisville, KY  
May 21, 2019

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# THE PROBLEM



Changing environmental conditions • More and/or worsening extremes



Aging infrastructure • Deferred maintenance • Changing technology • Population growth



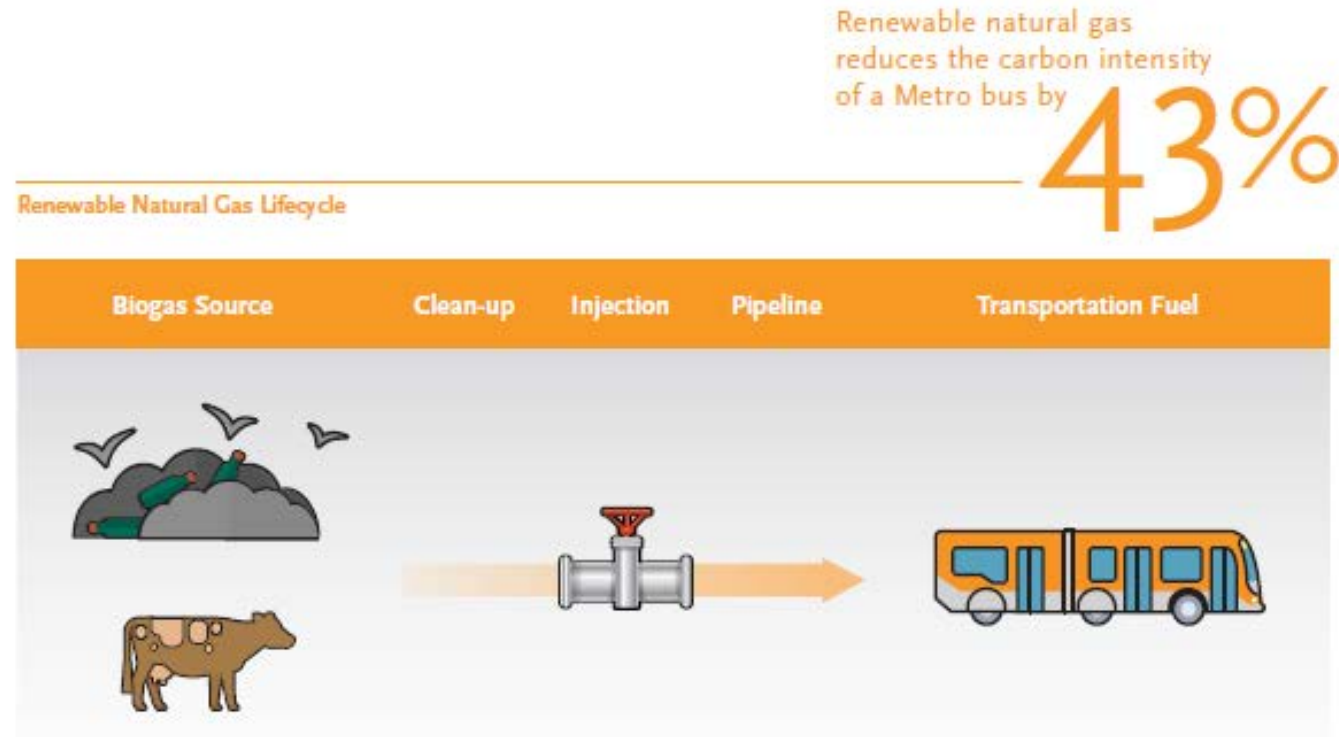
# LAMETRO CHALLENGES

- Subject to the most stringent regulatory requirements
- Technology is rapidly evolving
- We are in the midst of the largest build-out in LA history
- Need optimize environmental benefits
- Resources are scarce
- Our projects go through the most vulnerable areas
- Infrastructural *and* Operational Issues



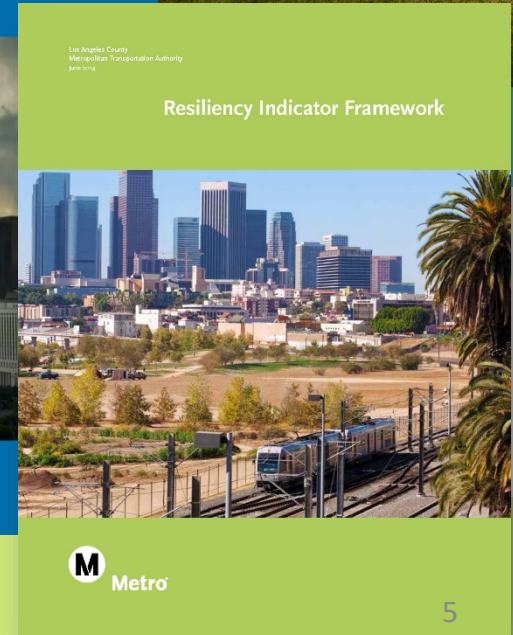
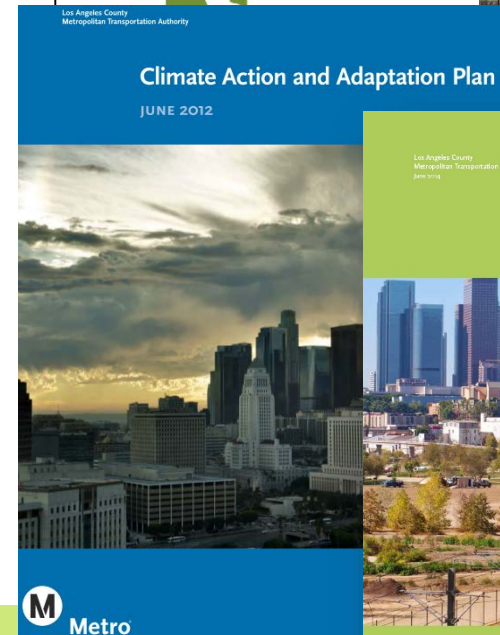
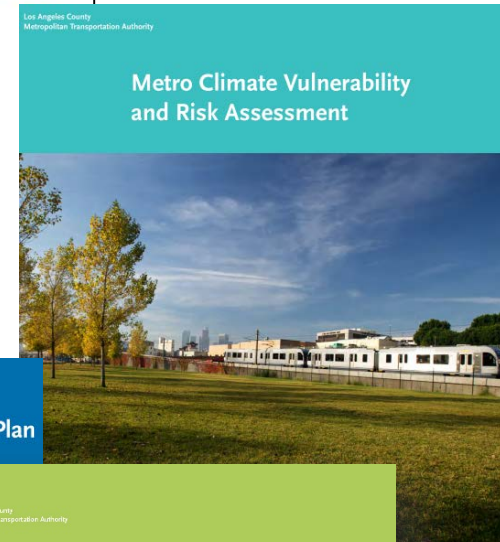
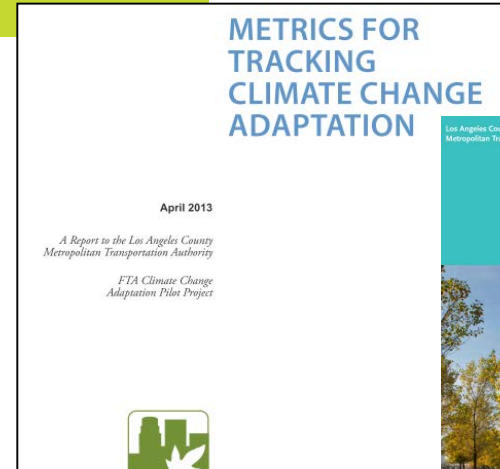
# LAMETRO'S TRANSPORTATION EMISSIONS SOURCES

- Near Zero/Zero Emissions Buses
- Battery Electric/Hybrid Vehicles
- Purchased Transportation
- Carpool and Vanpool Vehicles
- Green Construction Equipment
- Renewable Natural Gas/  
Ultra-Low NOx Engines



# LAMETRO: ON A RESILIENT FUTURE

- A robust set of climate-related activities since 2003
- Continual improvement and prioritize actions through indicators
- Using these principles to optimize strategy and tactics
- Incorporating resiliency into Metro processes (e.g., in State of Good Repair Asset Management Database)
- Familiarizing Metro team with concept of Resiliency
- Mapping of assets vs. vulnerable populations
- **UPDATE ON THE CAAP/Resiliency Framework and Policy**
- **Zero Emissions Bus Master Plan**





# RESILIENCY RESEARCH

- *TCRP 70, Improving the Resilience of Transit Systems Threatened by Natural Disasters, published in 2017*
- [resilienttransit.org](http://resilienttransit.org)

## RESILIENCE @the Academies

Individual, community, and national resilience is the ability to prepare and plan for, absorb, respond, recover from, and more successfully adapt to adverse events. No person or place is immune from disasters or disaster-related losses. Enhanced resilience allows better anticipation of disasters and better planning to reduce disaster losses — rather than waiting for an event to occur and paying for it afterward.

The National Academies of Sciences, Engineering, and Medicine have a number activities aimed at improving individual, community, and national resilience. This website is a portal to this work.

### News & Events

**Discussion:** On June 23, NOAA Administrator Kathryn Sullivan, Samuel Adams, the former mayor of Portland, Oregon, and current director of the U.S. Climate Initiative at the World Resources Institute, and NAS President Ralph Cicerone sat down to discuss building resilience through science. Joseph Witte, climate communicator at NASA Goddard, moderated the [conversation](#).



**Report:** Community-based flood insurance -- a single insurance policy that in theory would cover an entire community -- may create new opportunities to reduce flood losses and enhance the likelihood of communities paying more attention to flood risk mitigation. A new Academies [report](#) issued on July 24 discusses the pros and cons of offering collective flood insurance policies to communities, and identifies challenges that must be addressed if it were to be implemented.

**Game:** The Koshland Science Museum was awarded a [gold medal](#) in the museums category by the Serious Games Association for [Extreme Event](#), a role-playing game developed in collaboration with the Academies' Resilient America project. The game allows participants to simulate and build community resilience in the face of disaster.

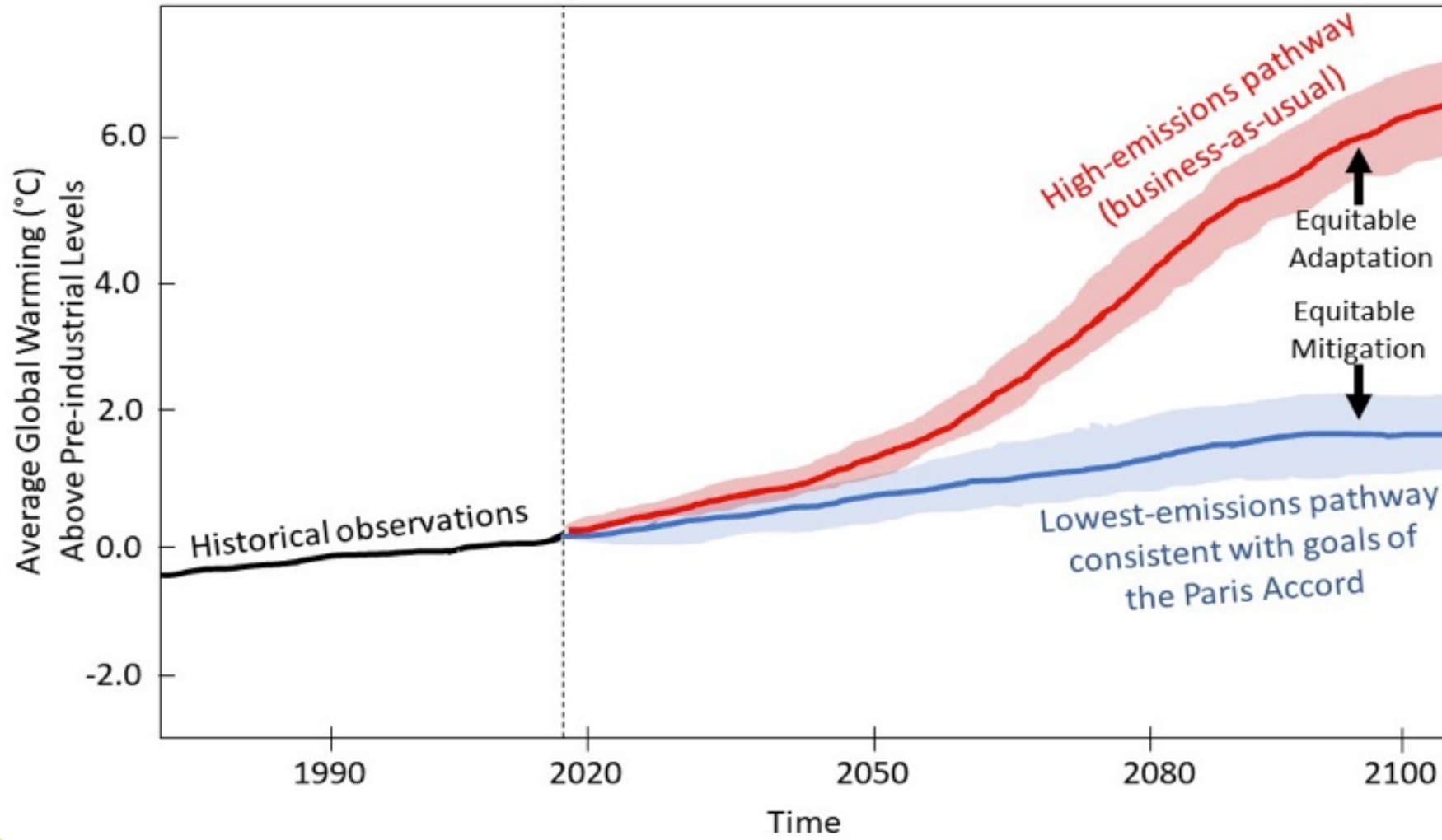


**Summary:** [Opportunities for the Gulf Research Program: Community Resilience and Health](#) summarizes a workshop held last September in New Orleans to examine opportunities to improve the health, well-being, and resilience of communities in the Gulf region.

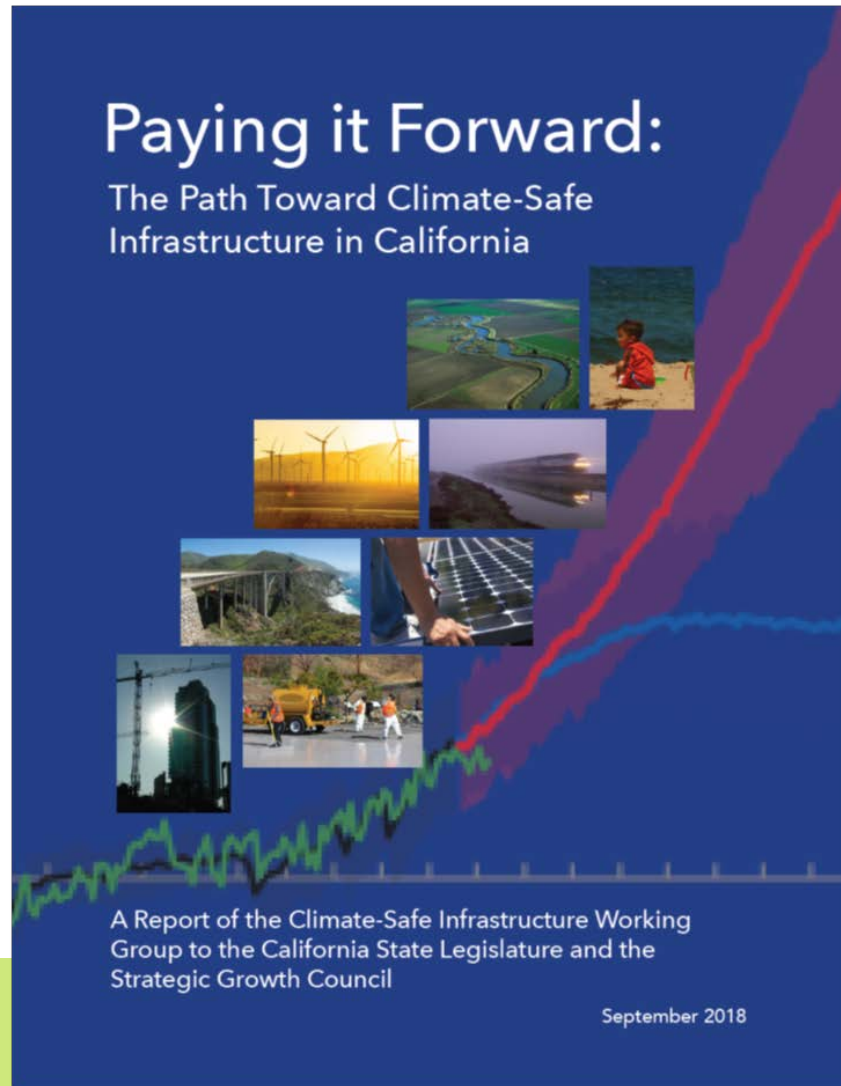
Groups at the Academies  
Engaged in Resilience Work



# CLIMATE SAFE PATH



# CLIMATE SAFE REPORT: KEY TAKE-AWAYS



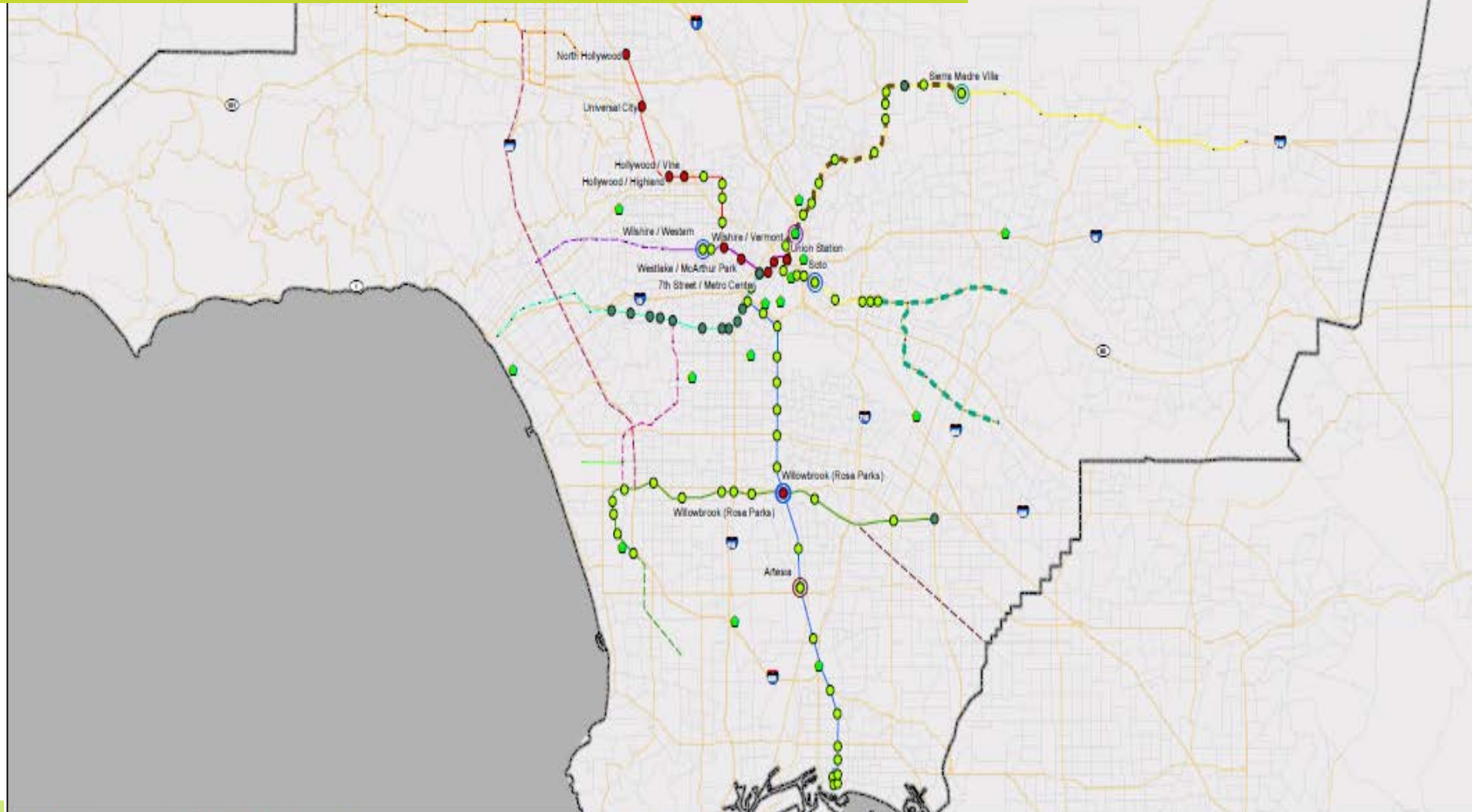
- Climate Safe Infrastructure as Policy
- Permanent Funding for Science and Infrastructure
- Reinvent Engineering Process
- Training: All Phases of Infrastructure
- Development of Standards/MOPs
- Changes in Procurement
- Climate Safe Commission



# MAPPING CRITICAL/AT RISK FACILITIES

- Stressors

- High heat days
- Precipitation
- Flooding
- Wind
- Wildfire
- Earthquake
- Sea Level Rise



|  |  |   |  |  |  |  |
|--|--|---|--|--|--|--|
| <b>Metro Rail and stations</b><br><ul style="list-style-type: none"> <li>Red Line</li> <li>Purple Line</li> <li>Blue Line</li> <li>Orange Line (BRT)</li> <li>Bus</li> </ul> | <ul style="list-style-type: none"> <li>Green Line</li> <li>Gold Line</li> <li>Expo Line</li> <li>Orange Line Extension</li> <li>Green Line Extension</li> <li>Green Line Extension to LAX</li> </ul> | <b>Under Construction/Future Lines and stations</b><br><ul style="list-style-type: none"> <li>Expo Line Phase 2</li> <li>Gold Line Foothill Extension</li> <li>Crenshaw Line</li> <li>Westside Extension</li> <li>Green Line Extension</li> <li>Green Line Extension to LAX</li> <li>West Santa Ana Transit Corridor</li> <li>Sepulveda Pass Transit Corridor</li> <li>Orange Line Extension</li> <li>Eastside Transit Corridor Phase 2</li> <li>Regional Connector Transit Corridor</li> </ul> | <ul style="list-style-type: none"> <li>Maintenance Facility</li> </ul> | <b>Stations</b><br><ul style="list-style-type: none"> <li>Critical</li> <li>Not Critical</li> <li>Unknown</li> </ul> | <b>Stations at Risk*</b><br><ul style="list-style-type: none"> <li>Temperature</li> <li>Winds</li> <li>Flooding</li> <li>Storms</li> </ul> | <b>Rail Lines at Risk*</b><br><ul style="list-style-type: none"> <li>Temperature</li> <li>Winds</li> </ul> |
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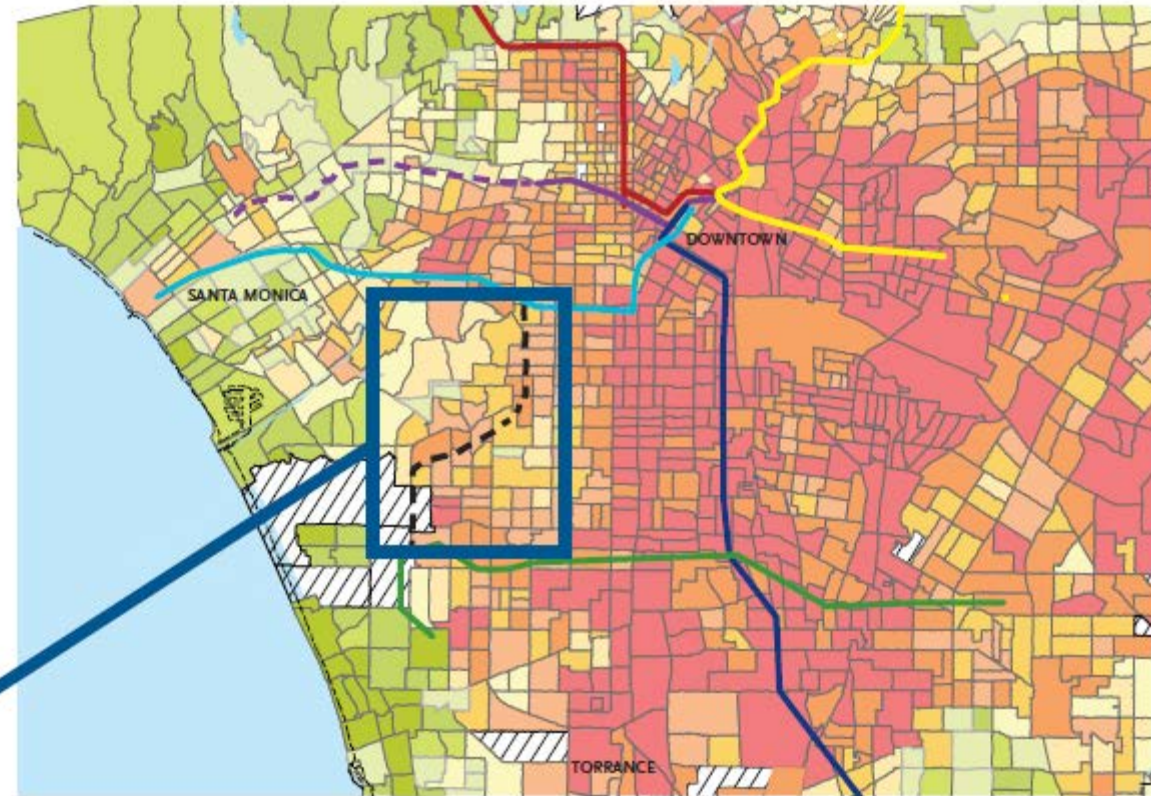
\*Assets identified as historically vulnerable by LA Metro staff



Source: Los Angeles County  
Los Angeles Metropolitan Transportation Authority

# vs. DISADVANTAGED COMMUNITIES

CalEnviroScreen Map of LA With Existing and Proposed Transit Alignments



Key

- Under Construction
- Metro Existing Rail Alignments
- 91-100% (Highest Scores)
- 81-90%
- 71-80%
- 61-70%
- 51-60%
- 41-50%
- 31-40%
- 21-30%
- 11-20%
- 1-10%

Higher scores are attributed to areas with higher environmental hazard exposures and vulnerable populations.

The reduction in emissions related to construction activity for CLAX was equivalent to removing over

**15,000** cars from the road 



Metro

# REDUCING IMPACTS

## ZERO EMISSIONS COMMITMENT

Towards a **2030 zero-emissions bus fleet** goal that will transform the operations and maintenance of our system. Ten years **ahead** of State mandate.



## ENERGY RESILIENCY

Metro **is designing an energy resilient future** to ensure continuation of cost-effective and equitable service.



## FUNDING SUSTAINABLE TRANSPORT/INFRASTRUCTURE

Constantly seeking to generate revenue to reduce our capital and operations costs. About **\$100M** has been raised from the sale of carbon credits for reinvestment in sustainable infrastructure.

Almost **\$1B** in Green Bonds.





# FUNDING LA METRO'S CLIMATE IMPACT REDUCTIONS

- The power of LEVERAGE at LA METRO
  - Annual \$2M allocation
  - Carbon Credit Sales
  - Green Bonds Sales



# FINANCING LA METRO'S SUSTAINABLE INFRASTRUCTURE

- Alternative forms of financing
  - P3s
  - Investment in lieu of fees
  - Monetized environmental benefits
  - Impact and Social Bonds
  - Incentives/Rebates
  - Value Capture and similar concepts





# REDUCING IMPACTS 2



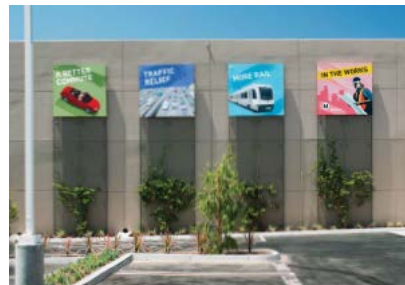
## ENGINEERING SUSTAINABILITY & RESILIENCY

Metro's is working with organizations like the American Society of Civil Engineers on Sustainable Infrastructure standards development, reinventing the engineering process, increasing capacity, and policy/advocacy.



## SUSTAINABLE ACQUISITION PROGRAM

Metro has begun the process to re-invent how we are procuring for goods and services.



## TRANSITIONING OUR WORKFORCE

Over 800 Metro employees and community members had been trained and certified as sustainability professionals. Many of them are trained on how to maintain sustainable infrastructure.



## REGIONAL AND NATIONAL PARTNERSHIPS

We are not the smartest people in the room. We leverage partnerships like the Metro Sustainability Council almost 70 sustainability sector representatives and stakeholder groups.





# IMPLEMENTATION CHALLENGES

- PUSHING THE AGENDA: Who is leading the charge?
- Sustainability and Resiliency Metrics?
- Workforce Development
- Profitability in the context of change
- Who are part of the conversation: Vulnerable Populations/Women and Girls



# QUESTIONS/DISCUSSION



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