

How Do Tax Ordinances Impact LA Transit Infrastructure? A Case Study of Los Angeles Metro's CAAP Policies and Strategies

Elizabeth Lai
Spring 2022

Occidental College
Department of Urban and Environmental Policy
Professor Mijin Cha

Table of Contents

Introduction..... 3

Background..... 4

Literature Review..... 11

Methodology..... 17

Findings..... 19

Analysis..... 27

Policy Recommendations..... 31

Conclusion..... 34

Bibliography..... 36

Appendix..... 40

I. Introduction

The transportation sector is one of the highest greenhouse gases emissions counting sector within the US.¹ With climate change, driven by GHG emissions and burning of fossil fuels, becoming an inevitable present and future, governments at the federal, state and local levels are adapting climate target and projects in order to mitigate its effects and to prepare infrastructure. Decarbonization in transit and public transportation is one of the main areas of focus for policy making. However, the implementation of policies regarding building out public transit and energy infrastructure projects typically involve large capital investments of tens of millions of dollars or more.² The city of Los Angeles has committed to these efforts in their creation of Metro's 2019 Climate Action and Adaptation Plan (CAAP) and tax ordinances 2008 Measure R and 2016 Measure M to help fund these transit projects.

The objective of this paper is to evaluate decarbonization in transportation efforts in Los Angeles, specifically examining Metro's utilization of strategies in order to implement CAAP policies. I aim to examine the question of: *What strategies are utilized by specific transport programs that are funded by Measure R and M to implement the decarbonization policies set by Metro's 2019 Climate Action and Adaptation Plan (CAAP) in Los Angeles?* In order to answer this question, I utilized a qualitative method approach. Interviews with Metro agency members and transit advocacy groups was conducted and examined, as well as analyzing projects' Environmental Impact Reports. Qualitative interviews highlighted key insight on the importance

¹ EPA, "Sources of Greenhouse Gas Emissions," EPA (Environmental Protection Agency), accessed April 1, 2022, [https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=Transportation%20\(29%20percent%20of%202019,ships%2C%20trains%2C%20and%20planes.](https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=Transportation%20(29%20percent%20of%202019,ships%2C%20trains%2C%20and%20planes.)

² Ku, Anthony Y, Andrew de Souza, Jordan McRobie, Jimmy X Li, and Jaimie Levin. "Zero-Emission Public Transit Could Be a Catalyst for Decarbonization of the Transportation and Power Sectors." OUP Academic. Oxford University Press, September 27, 2021. [https://academic.oup.com/ce/article/5/3/492/6375879?login=true.](https://academic.oup.com/ce/article/5/3/492/6375879?login=true)

of tax ordinance transit investment and current strategies Metro employs in order to implement CAAP policies.

II. Background

i. Metro as the Main Transit Agency

Metro, or Los Angeles County Metropolitan Transportation Authority, is a public transportation planner, coordinator, designers, builder, and operator for the Los Angeles County. Metro was formed in 1933 out of a merger of the Southern California Rapid Transit District and the Los Angeles County Transportation Commission. It consists of six lines and ninety-three stations and runs seven days a week.³ Metro runs the third largest public transit system in the country as well as its four light rails are the largest by ridership in the country.⁴ The buses are second in the country by ridership and size of fleet.⁵ While best known for its buses and trains, Metro runs and oversees many other critical transportation programs, including bike and freeway funding programs, open streets initiatives, and rail station area real estate development.⁶ It is also important to add that while Metro operates trains and buses, it does not have authority to manage streets. This authority remains with local cities. Funding for Metro and its programs and projects are both at a state and federal level. LA Metro also serves as the tax authority and implementation agency for voter approved sales tax measures.⁷ Additionally, money from four LA County sales taxes alone now accounts for about 50 percent of Metro's budget, such as Prop A in 1980, Prop C in 1990, Measure R in 2008, and Measure M in 2016.⁸ These four half-cent

³ Metro, "About Metro Archive." LA Metro (Metro, 2022), <https://www.metro.net/about/>.

⁴ The Housing Innovative Collaborative, "Los Angeles County Metropolitan Transportation Authority (Metro)," Housing Innovation Collaborative, April 28, 2020, <https://housinginnovation.co/collaborative/metro/>.

⁵ WayBack Machine, "Facts At a Glance," Wayback Machine: Internet Archive, November 18, 2016, <https://web.archive.org/web/20161225081954/https://www.metro.net/news/facts-glance/>.

⁶ Nathan S. Holmes, "La Regional Transportation, Explained," Medium (Medium, February 1, 2020), <https://nsholmes21.medium.com/la-regional-transportation-explained-a33253f3627b>.

⁷ CALCOG, "Los Angeles County Metropolitan Transportation Authority (Metro)." California Association of Councils of Governments. CALCOG, January 19, 2021. <https://calcog.org/losangeles-county-metropolitan-transportation-authority-metro/>.

⁸ Nathan S. Holmes, "La Regional Transportation, Explained,"

sales taxes allow Metro to get two cents for every dollar spent in LA County to be spent on a variety of transportation programs and projects. From the 2020 Metro Funding Source Guide, “...the primary sources of Countywide transportation funds are countrywide sales taxes Proposition A, Proposition C, Measure R and Measure M, which each impose a sales and use tax of ½ cent in the County.”⁹

ii. *Decarbonization in Public Transportation*

Since 2016, transportation has been the biggest direct source of U.S. greenhouse gas emissions.¹⁰ Most of the sector’s emissions come from road transport, which derives over 90 percent of its energy from petroleum. Emissions from the transportation sector continues to grow and represents 29 percent of total US emissions.¹¹ Total transportation sector emissions rose 29 percent from 1990 to 2005, driven by VMT increases in road transport. With continued improvements in vehicle efficiency, sector emissions fell 9.7 percent from their 2005 peak by 2015. In recent years, sector emissions have been increasing, due largely to increased passenger-vehicle VMT.¹² Moreover, emissions are projected to rise through 2050 as increases in vehicle miles traveled outweighs efficiency gains. Most transportation emissions are carbon dioxide (CO₂) produced by the combustion of fossil fuels. Methane and nitrous oxide are also emitted as by-products of combustion.

Shifting toward and building out public transportation infrastructure in order to give people more options on how to travel safely, affordably and sustainability is another strategy from LA Metro for working toward decarbonization in their plans to increase public transit

⁹ “Metro Funding Sources Guide 2020” (Los Angeles County Metropolitan Transportation Authority, May 2021), <http://media.metro.net/2020/Metro-Funding-Sources-Guide-2020.pdf>.

¹⁰ Lawson, Ashley, and Fatima Maria Ahmad. “Decarbonizing U.S. Transportation.” Center for Climate and Energy Solutions, February 4, 2020. <https://www.c2es.org/document/decarbonizing-u-s-transportation/>.

¹¹ EPA. “Fast Facts on Transportation Greenhouse Gas Emissions.” EPA. Environmental Protection Agency. Accessed December 1, 2021. <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>.

¹² Lawson, Ashley, and Fatima Maria Ahmad. “Decarbonizing U.S. Transportation.”

infrastructure. In the past, both federal and state transportation funding has been primarily utilized to build infrastructure, like highways, that promotes more convenient travel in private cars rather than in public infrastructure.¹³ However, in order to decrease GHG emissions in transport, Metro aims to instead increase funding for transit projects and building out public transit infrastructure in order to encourage shared mobility. These strategies highlight the increasing public support for investment for high volume fixed route transit like commuter rail, bus rapid transit, the light rail, and local bus services. Through efforts to build out more affordable and convenient transit infrastructure, Metro aims to support more transport methods of cars to public transit which in turn can reduce the total number of vehicle miles traveled (VMT) on roads, a key metric for transportation decarbonization.

The third strategy toward transportation decarbonization is the electrification of fleets. In 2010, fewer than 17,000 electric vehicles (EVs) existed around the world. Today, about 17,000 new EVs on the world's roads every day. However, battery electric vehicles make up less than 1% of all light-duty vehicles in the US and an even smaller fraction of heavier vehicles like trucks and buses¹⁴. To further electrify fleets, we need to ramp up investment in alternative vehicle technology research, development, and deployment. Also, just as important as the vehicles is the investment in the infrastructure needed to power the vehicles of the future. Policy support and funding for an expanded network of EV charging stations and the electric grid infrastructure are needed to supply power to those charging stations. It could also include other alternative fuel infrastructure such as green hydrogen distribution networks. Moreover, electrification of bus fleets is slowly transitioning. For example, Metro's bus fleet shifted went to

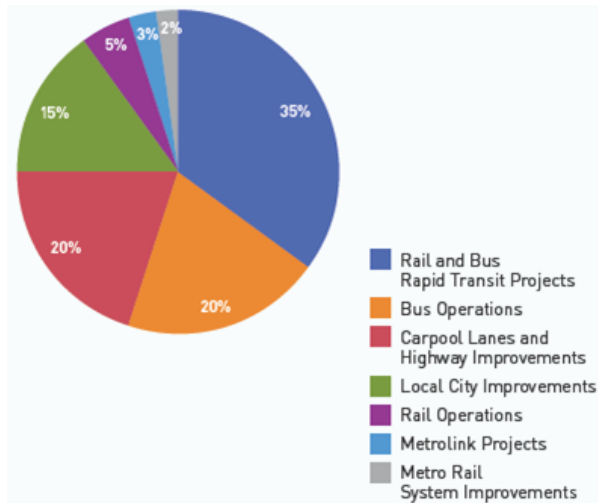
¹³ Lawson, Ashley, and Fatima Maria Ahmad. "Decarbonizing U.S. Transportation."

¹⁴ Goldman, Joshua. "A New Framework for Transportation Decarbonization ." Aspen Institute Energy and Environment . Aspen Institute, June 21, 2021. <https://www.aspeninstitute.org/blog-posts/a-new-framework-for-transportation-decarbonization/>

alternative fuel only policy in 1994 with no new diesel buses. Experiments were done with ethanol, methanol and CNG. CNG, or compressed natural gas, was the most reliable of the alternative fuels available. The last Metro diesel bus retired around 2009¹⁵.

iii. Measure R

In order to kick start transit construction to create sustainable, safe, efficient, and affordable transit, LA County and Metro proposed Measure R, a 30-year half-cent local sale tax increase. It was predicted to raise about \$36 billion. From these funds, 70% would be dedicated to expanding the bus and rail transit system in LA County. The Measure R Expenditure Plan devotes funds to specific projects and operational purposes as described in seven transportation



categories:

Figure 1: Jonathan, "PlanItMetro: LA Metro Thinking and Investing BIG," PlanItMetro: Metro's Planning Blog, 2014

This Measure would virtually double the size of LA County's transit system of 120 miles and 103 stations toward 236 miles and 200 stations.¹⁶

Measure R was described as to help relieve traffic

congestion, fund critical transit and highway projects, and create jobs¹⁷. Measure R was passed in November 2008. Two thirds majority of LA County voters approved the Measure R to help finance new and current transportation projects/programs. Collection of the tax began July 1,

¹⁵ Hymon, Steve "Metro Retires Last Diesel Bus, Becomes World's First Major Transit Agency to Operate Only Clean Fuel Buses," The Source, January 12, 2011, <https://thesource.metro.net/2011/01/12/metro-retires-last-diesel-bus-becomes-worlds-first-major-transit-agency-to-operate-only-clean-fuel-buses/>.

¹⁶ Move LA, "About Us: Move LA," Move LA, accessed March 29, 2022, https://www.moveLA.org/about_us#:~:text=Measure%20R%20was%20a%2030,236%20miles%20and%20200%20stations.

¹⁷ Metro, "Measure R and the Financing Plan," Measure R Overview - Munk School of Global Affairs (Los Angeles County Metropolitan Transportation Authority), accessed March 30, 2022, https://munkschool.utoronto.ca/imfg/uploads/191/measure_r_overview_presentation_march_2012_katz_2.pdf.

2009¹⁸. The passing of the 2008 tax ordinance, whose revenue sparked the drive for public funded construction to start to build out public transit, demonstrates the growing support for the continual development of the LA public transit system in a city that historically prioritized vehicles¹⁹.

These funds are distributed by the Los Angeles County Metropolitan Transportation Authority monthly to jurisdictions on a per capita basis. Measure R specifies that the funds are utilized for transportation purposes only. Measure R highlights which projects have eligibility for funding and “jurisdictions are encouraged to apply their Measure R LR funds towards multi-jurisdictional projects, specifically projects that support other Measure R rail, bus and highway corridor projects”²⁰

Moreover, the Measure R Local Return promotes sustainability when funding transit projects. Jurisdictions are encouraged to utilize Measure R funds for projects that foster sustainable countrywide transportation systems by increasing alternative transportation choices and improving the efficiency and operation of the streets and infrastructure. Included are specific coordination approach listings from Measure R Local Return Guidelines about decarbonization projects under *Promote Sustainability*:

1. More corridor-based projects, specifically those that support other Measure R rail, bus and highway corridors
2. Bus rapid service implementation
3. Bike and pedestrian access and connectivity to support transit and rail stations

Also, local agencies are encouraged to maximize the use of this funding resource to reduce greenhouse gas emissions and improve mobility and access to local communities. Examples of

¹⁸LA Metro, “Measure R,” LA Metro, March 21, 2022, <https://www.metro.net/about/measure-r/#:~:text=A%20two%2Dthirds%20majority%20of,those%20already%20in%20the%20pipeline.>

¹⁹ LA Metro, “Measure R,” LA Metro, March 21, 2022.

²⁰ Metro, “Measure R Local Return Guidelines” (Los Angeles County Metropolitan Transportation Authority, 2010), [https://www.dropbox.com/s/2632gijuj65fz6f/2009-Measure-R-Local-Return-Guidelines.pdf?dl=0.](https://www.dropbox.com/s/2632gijuj65fz6f/2009-Measure-R-Local-Return-Guidelines.pdf?dl=0)

projects include “livable streets, complete streets, car sharing programs, parking pricing strategies and other actions to reduce congestion and vehicles miles traveled. By attempting to fund more infrastructure and rail projects to build out and strengthen public transit, these listings from Measure R also promote the efforts toward decarbonization²¹.

iv. Measure M

Measure M’s goals are to mitigate environmental effects from GHG emissions, grow an efficient and safe public transit system, and enhance the County’s regional transportation system by investing in capital improvements in Metro’s bus system and rail systems. Measure M would double the size of the regions mass transit system and update Los Angeles County’s highway, streets, and roads, such as new carpool lanes and projects, that will ease freeway bottlenecks for both auto and truck traffic. Measure M extends Measure R, which was set to expire in 2039 and supports the finishing of the projects started by Measure R.

Measure M was approved in November 2016 with support of 70% of Los Angeles County voters. Measure M authorizes a new one-half cent sales tax starting in 2017 that will help fund 40 major highway and transit projects. This source of funding via sales tax will continue indefinitely unless LA County voters decide to rescind it. Measure M would permanently extend Metro’s previous Measure R and add another permanent half-cent tax increase. This accumulation would raise the tax for Metro to two cents per dollar spent, bringing in around \$3.4 billion a year²². This money will be utilized to build over a dozen major transportation projects, such as new rail lines through San Fernando Valley between Aresia and downtown Los Angeles and over Sepulveda Pass.

²¹Metro, “Measure R Local Return Guidelines”

²² The Times Editorial Board. “L.A. County Residents Need Alternatives to Sitting in Soul-Crushing Traffic. Vote Yes on Measure M.” Los Angeles Times. Los Angeles Times, September 29, 2016. <https://www.latimes.com/opinion/editorials/la-ed-measure-m-20160927-snap-story.html>.

Altogether, this would be a highly significant transformative investment to both promote the usage of transit and to make transportation in Los Angeles safer, easier and more convenient.

v. *Metro's Climate Action and Adaptation Plan (CAAP)*

Los Angeles County Metropolitan Transportation Authority, or Metro, prepared an updated 2019 Climate Action and Adaption Plan (CAAP).²³ In 2012, Metro had originally prepared a Climate Action and Adaption Plan to establish the framework to reduce greenhouse gases (GHG) and prepare for impacts of climate change in its facilities and operations.²⁴ Metro updated the document in 2019 to report the results of the programs previously implemented from the 2012 CAAP and to include new strategies and programs for its growing public transportation system.

The CAAP builds on Metro's existing commitments to environmental and sustainability stewardship by creating a visionary path for minimizing contributions to climate change while building resilience to a changing climate. It further outlines how Metro is "fighting climate change and preparing for a changing climate"²⁵. The CAAP sets goals as well as identifies ways the agency can reduce GHG emissions that contributes to global warming. The plan further identifies steps to increase the ability of the Metro transit system to withstand extreme weather and long-term climate impacts.

In order to prepare and proactively address climate impacts Metro aims to be zero-emissions by 2050. To achieve this goal, 13 measures are listed to be implement: switch directly operated buses to battery-powered technologies, deploy battery-powered buses in the contracted

²³ Anna Chen et al., "Leading the Way for a Greener La - Metro Board Adopts 2019 Climate Action and Adaptation Plan," The Source, July 26, 2019, <https://thesource.metro.net/2019/07/26/leading-the-way-for-a-greener-la-metro-board-adopts-2019-climate-action-and-adaptation-plan/>.

²⁴ Anna Chen et al., "Leading the Way for a Greener La - Metro Board Adopts 2019 Climate Action and Adaptation Plan," The Source,

²⁵ Chen, Anna, and Beaver, Rick— Streetsblog Los Angeles: "Leading the Way for a Greener La - Metro Board Adopts 2019 Climate Action and Adaptation Plan." The Source, July 26, 2019. <https://thesource.metro.net/2019/07/26/leading-the-way-for-a-greener-la-metro-board-adopts-2019-climate-action-and-adaptation-plan/>.

fleet, switch vanpool vehicles to battery-powered vehicles, replace non-revenue vehicles with battery powered vehicles, install systems to store energy captured from trains, buy 100% renewable energy, install photovoltaic systems, install water-saving fixtures, install non-potable recycled water systems, install LED lights at facilities, install electric heating systems, replace facilities appliances with more efficient electric appliances, install electric vehicle charging at Metro facilities and implement an employee electric vehicle outreach plan. In addition, within the CAAP, Metro identified five principles to guide policy implementation: Embrace climate leadership, secure funding and prioritize resources, integrate climate knowledge into existing decision-making processes, monitor and evaluate progress, engage with community stakeholders.

III. Literature Review

In order to understand how strategic transport projects, funded by Measure R & M, implement decarbonization policies set by Metro's 2019 Climate Action and Adaptation Plan (CAAP) in Los Angeles, it is important to establish an understanding of how designated funding revenues are crucial to policy implementation to decarbonize transit. This literature review offers insight into pre-existing research on the importance of funding on transit sustainability and the benefits of dedicated funding as a tool to accomplish policy goals. I will first discuss the importance of funding as a tool toward modal shift and for additional public transit infrastructure in order to adapt to climate change. Next, I will synthesize why specific allocated funding provides a more reliable method towards transit decarbonization. Los Angeles County's tax ordinances of Measure R and Measure M will be utilized as specific examples of designated funding. While there is research on why funding is vital for transit projects and policy implementation, there is a gap in research on the current effects funding has on present Metro projects and the implementation of strategies in Los Angeles. Majority of the Metro projects

being funded by 2008 Measure R and 2016 Measure M are incomplete with end dates in the tentative future. With only a few projects completed, comprehensive studies of the sustainability and climate effects are not thoroughly researched. Although there is no way to fully analyze the degree of impact till projects' completion, this research aims to explicate the current tactics Metro utilizes to decarbonize and meet their 2019 CAAP within the present stages of the projects.

i. Importance of Transit Investment

Throughout the pre-existing literature, investment and funding are studied as the predominant essential factors that sustain decarbonization projects and help implement set policies at all levels of government.²⁶ As Los Angeles is infamously known as a city with an overreliance on the single use vehicle for everyday use, high levels of congestion and greenhouse gas emissions are prominent. One way to reduce transportation emissions is to invest more infrastructure dollars in projects that contribute to a low-carbon and resilient future.²⁷ In the past, three quarters of all transportation infrastructure funding has come from state and local governments.²⁸ As a result, there has been disproportionate development into convenient travel in private cars compared to investment in public transit infrastructure. Resulting in fewer than 5 percent of Americans using public transit to commute to work.²⁹ In order to bend the curve on transportation related GHG emissions, cities need to “increase funding for transit, correct hidden subsidies that encourage private vehicle use, and encourage innovation in shared mobility”.³⁰ Additionally, it is essential to include investments aimed at favoring the electrification of transportation, the expansion and

²⁶ American Public Transportation Association (APTA). Rep. *Economic Impact of Public Transportation Investment 2020 Update* . American Public Transportation Association (APTA), April 2020.

²⁷ Lah, Oliver, Arioli, Magdala, and Lew Fulton.

²⁸ Bianco, N., F. Litz, D. Saha, T. Clevenger, and D. Lashof, 20

²⁹ Lah, Oliver, Arioli, Magdala, and Lew Fulton.

³⁰ Goldman, Joshua. “A New Framework for Transportation Decarbonization .” Aspen Institute Energy and Environment . Aspen Institute, June 21, 2021. <https://www.aspeninstitute.org/blog-posts/a-new-framework-for-transportation-decarbonization/>.

efficient use of public transportation, and the construction of bicycle lanes and mass transport lanes³¹. In many cases that will mean investing in transit infrastructure and high-volume fixed-route transit services such as commuter rail, light rail, and bus rapid transit, along with reliable local bus services.

ii. Designated Funding as a Secure Route Toward Transit Decarbonization

Transport economists Barry Ubbels and Peter Nijkamp highlights that support for transit infrastructure has typically been from various forms of general taxations. Varying amounts of revenues from a wide number of subsidies, local taxes and charges have been primary sources of transit funding. As there is unpredictability with this method, transit is more vulnerable to yearly cash flows causing agencies to prioritize developments and make unpopular and challenging decisions to cut service or raise fares during periods of low revenues.³² As most of the funds originate from the same assortment of revenue sources for other public services, like education and health, there is no direct link between the source of revenue and its dedication.³³ Such unpredictability is also a cause for unpredictable project funding with no assurance for continual financing. Competition for funding then creates a major problem with this form of financing. This becomes problematic due to the need for sizeable amounts of money, over long periods of time, to build and develop public transit projects. The necessary investments in sustainable infrastructure systems cannot be made without suitable funding mechanisms. For this reason, authorities and transit operators are prioritizing new designated sources of funding for transit like

³¹ Eguino, Huáscar. "Public Investment in Decarbonization: Opportunities and Strategies for Economic Recovery." *Gestión fiscal*, August 19, 2020. <https://blogs.iadb.org/gestion-fiscal/en/public-investment-in-decarbonization-opportunities-and-strategies-for-economic-recovery/>.

³² Lacono, Michael. "Dedicated Funding and Urban Transit Performance: Some Empirical Evidence." ResearchGate. Hubert H. Humphrey Institute of Public Affairs, The University of Minnesota, February 22, 2006. https://www.researchgate.net/profile/MichaelLacono/publication/255571134_Dedicated_Funding_and_Urban_Transit_Performance_Some_Empirical_Evidence/links/00b495372ac3f1338a000000/Dedicated-Funding-and-Urban-Transit-Performance-Some-Empirical-Evidence.pdf.

³³ Ubbels, Barry, and Peter Nijkamp "Unconventional Funding of Urban Public Transport." Essay. In *Transportation Research Part D: Transport and Environment* 7, 5th ed., 7:317-29. Amsterdam, Netherlands: Department of Regional Economics, Free University, 2002.

hypothecated local taxation.³⁴ Hypothecated local taxation refers to an assortment of local taxes and charges whose revenue is directly hypothecated and dedicated to finance the operation, development, and investment of public transport and its costs.³⁵ Most commonly, after obtaining voter approval, local sales taxes (applied to goods and services) can provide a dedicated funding source for transit agencies. The idea is that by having designated funding, transit policy and projects are then prioritized by having a set source of funding in order to implement climate policy goals and transit projects.³⁶ Through the taxes' implementation, agencies can then collect substantial revenues for operational and capital costs. Additionally, popularity of local sales tax measures is due to the stipulation that the funds pay for a predetermined list of projects that are built within a set timeframe in the local jurisdiction of the voters that pay the tax and assure congestion reduction. As a result, this creates the sense that “those who pay directly benefit from the tax.”³⁷

a. Measure R and M as Decarbonization Tool

As the two main policy goals in Metro's CAAP are “reducing Metro's greenhouse gas (GHG) emissions, which contribute to climate change, 2. Making the Metro system more resilient to extreme weather events and long-term climate impacts”³⁸ investment in the tax ordinances of Measure R and Measure M, the countywide ½ cent sales tax devoted to transportation infrastructure, were passed in 2008 and 2016.³⁹ In addition to these measures, two permanent local options from 1980 and 1990 of Proposition A and Proposition C were already in

³⁴ Ubbels, Barry, and Peter Nijkamp., 320

³⁵Ubbels, Barry, and Peter Nijkamp., 319

³⁶Ubbels, Barry, and Peter Nijkamp., 320

³⁷ Huerta, Claudia P. “Transit Funding; Why the Politics? A Comparative Study of Public Transportation Infrastructure Funding in New York City and Los Angeles.” Thesis, Columbia University, 2012

³⁸ Environmental Compliance and Sustainability Department (ECSD). Rep. *Metro Climate Action and Adaptation Plan 2019 (CAAP)*. Los Angeles Metro, 2019. https://media.metro.net/projects_studies/sustainability/images/Climate_Action_Plan.pdf.

³⁹ Metro. “Proposed Ordinance #16-01 2 Measure M 3 Los Angeles County Traffic Improvement Plan.” Los Angeles Metro. Accessed October 27, 2021. https://theplan.metro.net/wp-content/uploads/2016/09/measurem_ordinance_16-01.pdf.

effect. Measure R is estimated to provide \$30 - \$40 billion over its lifetime. Additionally, it is estimated that Measure M will generate \$860 million a year, or more than \$120 billion over 40 years. 65% of its funding are for transit, and as the measures are multimodal, it will fund road projects, as well as bicycle and pedestrian infrastructure.⁴⁰ All of these Measures devoted at least a plurality of its revenue to transit. The expected annual benefits of the plan are 77 million additional transit trips, 521,000 fewer pounds of transportation-related pollution emissions, 10.3 million fewer gallons of gasoline used, and 191 million fewer vehicle miles traveled.⁴¹ These benefits would impact the 88 cities within Los Angeles County. Furthermore, cities would also receive funds to support transportation needs such as bikeways, pedestrian improvements, streetscapes, traffic signal synchronization and local transit services.

These two Measures being implemented with no expiration on this funding is a key factor in being able to implement strategic projects in accordance with decarbonization policies. For example, Proposition A, the transportation tax voters approved in 1980, contained a provision mandating that in its first five years, the revenue collected for rail would be used to subsidize bus fares. Only when those five years ended would the money be used for rail construction. Because of this provision, bus fares were cut in half, and ridership increased. When the fare subsidy ended in 1985, the tax revenue was spent on rail, bus fares rose, and ridership declined.⁴² Demonstrated through this, the continual investment of funds toward public transit infrastructure to support this modal shift toward public transit to aid policy efforts in decarbonization is vital. With set policy guidelines and a source of funding to implement these policies through

⁴⁰ Manville, Michael. "MEASURE M AND THE POTENTIAL TRANSFORMATION OF MOBILITY IN LOS ANGELES." University of California Institute of Transportation Studies, January 2019. <https://www.its.ucla.edu/wp-content/uploads/sites/6/2019/01/Measure-M-and-the-Potential-Transformation-of-Mobility-in-Los-Angeles.pdf>.

⁴¹ Huerta, Claudia P. "Transit Funding; Why the Politics? A Comparative Study of Public Transportation Infrastructure Funding in New York City and Los Angeles." Thesis, Columbia University, 2012

⁴² Manville, Michael, 13

strategic projects, the deliberate framework can be used to help direct resources towards the strategic priorities of the government in the areas of climate, environment, and decarbonization.⁴³

A distinction between a mass market mobility model of transit, places where transit is a relatively convenient way to move around, and a social service model, places where transit is a safety net for people locked out of the dominant form of mobility, is highlighted within LA's public transit infrastructure. In absolute terms, Los Angeles has large transit ridership but its "built environment and transportation culture are oriented resolutely around the automobile"⁴⁴, and as a result transit in Los Angeles is used primarily by people who lack access to private cars. Public transportation in Los Angeles is then more a social service than a widely shared form of accessible and efficient mobility. To address this, Measure R and M's goal is to transition LA from a social service model of transit to one where transit is a more universal way of moving.⁴⁵ Measure R ballot measure coalesced labor, environmental, and business interests behind transportation improvements. The need to simultaneously alleviate congestion and create jobs within the region allowed political will across jurisdictions. It is found that voters are more willing to support local tax measures when they are tied to tangible local benefits like local public transportation infrastructure improvements. By capitalizing on this Measure R and M, in sum, demonstrated Angelinos' strong willingness and consensus about financing transit.

IV. Methodology

The objective of my research is to evaluate the decarbonization in transportation efforts in Los Angeles, specifically examining the case of Metro. I examined the question of: *What strategies are utilized by specific transport programs funded by Measure R and M to implement*

⁴³ Manville, Michael, 14

⁴⁴ Manville, Michael, 14

⁴⁵ Manville, Michael, 14

the decarbonization policies set by 2019 Climate Action and Adaptation Plan (CAAP) in Los Angeles?

Semi-structured interviews with Metro agency members were employed. Metro agency members that were involved in the creation of CAAP policies and from environmental compliance was interviewed to directly highlight what the specific strategies Metro employs to adhere to both CAAP policy and broader environmental goals of decarbonization. Conversations about why Measure R and Measure M differ from other funding, how they physically manifest in projects, and why they are essential to further transit goals were also discussed. These interviews gave insight into the creation of the policies and projects to get a holistic evaluation of the decarbonization methods by Metro specifically utilizing the 2019 Climate Action and Adaptation Plan as a basis. As having reliable and actual communication with Metro was one of the limitations, the snowball method from my first contact within the Environmental Compliance and Sustainability Department was employed. The examination of documents with descriptions and agendas of finished and ongoing projects of Measure R and Measure M was used. Environmental impact statements (EIS) and environmental impact reports (EIR) was analyzed to quantify the carbon impact of each project of Measure M.

Additionally, semi-structured interviews with advocacy groups such as *Climate Resolve* and *Streets for All* were conducted. As each advocacy group has a specific and differing perspective, questions pertaining to both the individual and the group they represent knowledge of Metro's 2019 *Climate Action and Adaptation Plan*, opinion on policy efforts Metro has been making to decarbonize, and familiarity with Measure R and Measure M were asked to capture their opinion on the success or lack thereof of Metro's decarbonization efforts. Additionally, questions as to why, in their opinion, Measure R and Measure M differ from other transportation

funds were asked. As the strategies toward decarbonization that Metro describes was using tax ordinance funding to build out more public transit infrastructure, the question of whether this is an effective strategy and why was asked to these advocacy groups.

i. Interviewees List

Name	Group
Interviewee A	<i>Metro</i> : Environmental Services Department
Interviewee B	<i>Metro</i> : Environmental Compliance Department and Sustainability Department
Interviewee C	<i>Metro</i> : Environmental Compliance and Sustainability Department
Interviewee D	<i>Metro</i> : Office of Sustainability
Michael Schneider	<i>Advocacy Group</i> : Streets for All <ul style="list-style-type: none"> - 527 federally registered political action committee - “Dedicated to building a transportation revolution in LA”⁴⁶
Chase Engelhardt	<i>Advocacy Group</i> : Climate Resolve <ul style="list-style-type: none"> - Advocates sustainable mobility options by investing in better transit options in LA

Limitations of the project included limited sample size of participants, bureaucratic answers when interviewing some Metro members, unanswered interview requests, relevant links and documents from Metro’s official website that did not work, and inability to have reliable communication with Metro, such as unanswered phone calls and emails. Moreover, incomplete or nonexistent data from Measure R & M projects as well as various links that highlight Measure R and Measure M project details did not work on the official Metro website.

⁴⁶ Joe Linton and Damien Newton, “Interview with Michael Schneider, Founder of Streets for All,” Streetsblog Los Angeles, November 7, 2019, <https://la.streetsblog.org/2019/11/07/interview-with-michael-schneider-founder-of-streets-for-all/>.

V. Findings

For my research, I conducted four interviews with Metro agency members within the Environmental Services Department as well as the Sustainability and Environmental Compliance Departments between January and February 2022. Additionally, I interviewed 2 members of various climate and transit advocacy groups. I interviewed one member of the organization *Streets for All* and another from *Climate Resolve*. For the purpose of this paper, all Metro interviewees are anonymous, but all departments pertain to CAAP, Measure R and Measure M.

Through the interviews conducted with both advocacy groups and Metro agency members, there was a general consensus of acceptance of the infrastructure and operations decarbonization strategies and the 2019 Climate Action and Adaptation Plan from Metro. The plan and its contents pertaining to decarbonizing operations and policy goals were generally well-received and deemed realistically implementable. Both Metro and advocacy members agreed on the need for more accessible and affordable public transit infrastructure as well as mutual goals of transit decarbonization. Although the political implications on the realistic ability for Metro to utilize funding for projects that expands chiefly public transit infrastructure is acknowledged, the Metro project agenda that contains numerous highway expansion projects, funded by Measure R and Measure M, contradicts stated decarbonization goals.

Findings:

Order to answer the research question of: *What strategies are utilized by specific transport programs that are funded by Measures R and Measures M to implement the decarbonization policies set by Metro's 2019 Climate Action and Adaptation Plan in LA?*, the main findings are as follows:

Metro	Advocacy Groups
-------	-----------------

<ol style="list-style-type: none"> 1. Tax ordinances 2008 Measure R and 2016 Measure M provide funding for the expansion of building out transit infrastructure. Built in accordance with Metro’s Sustainability Plan, which contains CAAP within it, as the main strategy to decarbonize 2. Within that, 2019 CAAP policies also help reduce operational emissions by guiding the standards of operational functions, like water reduction and quality/standards of materials, that further promote decarbonization within the projects 3. CAAP policies were aimed at being implementable and feasible 	<ol style="list-style-type: none"> 1. Refocus funding 2. Move away from using funds to develop Highway Expansion Plan that is included in Measure M 3. Main concern is Metro actively building more transit infrastructure but simultaneously negating the benefits by expanding highways 4. Prioritize building accessible and affordable public transit 5. Bridge gap in social consciousness 6. CAAP policies were aimed at being implementable and feasible
---	---

- i. *In order to decrease GHG emissions and meet CAAP Policy goals, Metro utilizes increased tax ordinance funding to build out transit infrastructure projects and decarbonize operations*

a. Strategy 1: Building Transit Infrastructure Projects

Throughout the interviews with Metro and transit advocacy groups, one of the two main strategies identified toward decarbonization, that increased tax ordinance funding supports, is the ability to continue projects which essentially build out transit infrastructure in Los Angeles. Interviewee A states, “We, the voters of LA county, approved the funding and expansion of our rail/transit system.” They explain this statement more with expanding on how Measure R and Measure M doesn’t directly in the ordinance literature support Metro’s *Climate Action and Adaptation Plan*, but the overall benefit of increased funding aids Metro in the implementation of policies toward decarbonization. They further indicate that they are aiming toward the goal of having more transit infrastructure that is accessible in order for more vehicles to not be on the road:

I don’t think there’s any specific aspect of Measure R or M that is towards sustainability

because like you said it is kind of divided up into many different pieces some more municipalities, some for rail, some for bus, some for access services, all over the place. I don't think there's any specific carve out for sustainability. But if you look at the transportation system as a whole, one of the benefits of Measure R and Measure M it will reduce the amount of vehicles on the road or the vehicles that are on the road will hopefully move efficiently and thereby reducing carbon emissions.

Furthermore, to support this claim of increased transit infrastructure, the Interviewee D mentions that Measure M's key developments include the Purple (D Line) Extension Project Sections 1-3, the Airport Metro Connector, and the Metro Rail Foothill Extension Project. They also break down how funding increases construction:

Project Category	Funded by Measure R	Funded by Measure M	Alignment with CAAP policy
Construction of new public transit projects - Rail	Yes	Yes	NA
Construction of new public transit projects - Bus	Yes	Yes	NA
Operation and Maintenance of existing public transit projects – Purchase of clean fuel (Renewable Natural Gas) powered and Zero Emission (Electric) Buses	Yes	Yes	Yes
Increasing carpool lanes (HOV and ExpressLanes)	Yes	Yes	NA
Active transportation projects (walking and cycling)	Yes	Yes	NA
Traffic Reduction initiatives (signal synchronization,	Yes	Yes	NA

However, transit advocacy groups like *Climate Resolve* and *Streets for All* identified the issue of including highway expansion projects with the funding from Measure M as one of the drawbacks of this strategy. Both advocacy groups strongly indicated that it is an incompatible strategy to aim to build out infrastructure for public use to lower GHG while simultaneously building out infrastructure that supports single use vehicles. Michael Schneider of *Streets for All* also strongly promotes his opinion for funding being primarily utilized for building out public transit only and not expansion of infrastructure for vehicles. He states:

In my opinion, in 2022 when we know climate change is very real and induced demand is proven, it should not be in the highway building business but in the business of building systems that people want to use, enjoy using, and keep them safe and very efficient to get around.

Additionally, Chase Engelhardt of Climate Action summarizes:

Not only are we trying to decarbonize but not to re-carbonize...Metro had a meeting about their different strategies included the projected footprint of expanding freeways. The inclusion of freeway money and impetus for expansion there really jeopardizes climate action. The quantity of greenhouse gases that would be emitted related to planned expansion of freeways is greater than all of the infrastructural investments of Metro combined, that is what their draft estimates say. It's nice when you tie active transit to highway improvements, but if your inducing demand for driving it promotes a sense of a zero-sum game. Can't encourage driving and riding a bike at the same time.

Increased funding from Measure R and Measure M is the Next Step for Transit

Within the interviews, there was a general consensus that tax ordinance Measure R and Measure M is a benefit to Metro and the transit system as a whole. These two Measures were analyzed specifically as they are viewed as the next step for transit funding projects in LA. Measure M is utilized as an expansion of the original Measure R tax ordinance. It is distinct due to the large scale of funds and no sunset date. This large increase in available funding is critical to the continual building of present and future transit projects. For Interviewee B states:

Ultimately Measure M was taking Measure R to the next level in terms of the projects it wants to provide to LA County. Like two of the highlights of that specific tax measures is 20 or so projects they want to enact up until 2050. Even with those projects in mind we want to get done, there is no sunset date on that measure which means that in the future if we still have tax revenue coming into Metro and there is obviously still need for transit projects, here's an opportunity to continue to improve our decarbonization efforts in the future. I think that is a highlight of it.

They also go on to explain that the Measures allow more projects to be added to expand the transit infrastructure across LA County.

Measure M when it comes to the planning portion of it, a lot of newer projects on that list are still being planned through. But, in terms of goals it expands the system in a way that I think brings in more people into the central goals and increase the transportation across LA County.

In addition, the Interviewee D further emphasizes that aspects of Measure R and M Metro can utilize is funds to: a) Shifting people from using their personal automobiles to using public transit (reducing GHG emissions), and b) Reducing Metro's operational GHG emissions by

adopting clean fuel and technology alternatives to decarbonize the transit system by 2050.⁴⁷

When asked about the intersection between the tax measures and CAAP, Interviewee B describes,

Because Measure M and R does a lot of the heavy lifting of the EMT reductions, the CAAP is how we improve upon that. How can Metro make projects more sustainable and helpful through these smaller measures?

Additionally, although Measures R and Measure M do not directly support CAAP's policies, they do overall support Metro's aim toward achieving climate and sustainability goals in more transit projects. For Interviewee A states:

The CAAP came after Measures R and M, the CAAP refers to Measure R and Measure M in terms of its like helping us to get to decarbonization goals. But Measure R and Measure M don't necessarily deal with the CAAP. It helps us get those goals in more transit projects, which reduces EMT, which reduces vehicle emissions in LA county. We did have a CAAP in 2012, but that CAAP rly had to be focused on maintenance facilities and operations. and since MR and MM are more toward capital projects, it didn't really align with our goals. So, in that way it helped meet our goal but not specific toward the CAAP.

b. Strategy 2: Operations

As building transit infrastructure is the main broad strategy, the second specific strategy Metro adheres to in efforts toward decarbonization is changes in operational functions and construction guidelines. Interviewee B states,

We have a list of goals. Most of those goals are more operations and maintenance heavy because it's easier to control the operations side of things because it's all Metro owned. Contracts are harder but we try to make those work.... We have specific emissions and pollution control in here [CAAP] and energy goals, more solar panels on buildings, increasing renewables and increasing electrification across the projects. I think right now orange line is electrified. Electrification is a big part of decarbonization.

In regard to Metro's efforts toward changing the construction guidelines and materials on transit projects in line with CAAP policies, Interviewee A explains that Metro aims to hold contractors

⁴⁷ Data Request Doc

to sustainability goals and the materials being utilized to more sustainable. Contracts are held to fulfilling specific goals in place. For example, air quality standpoint for the construction process is held at a standard the constructor has to meet. With water conservation, all projects in some shape or form must have low impact development. Metro’s operations aim to have a “certain amount of imperviousness” included within all projects and its facilities. In addition, facilities are then analyzed on how to be improved. For Interviewee B further states,

There are then small projects, like changing out lights to LV. Working with the city we worked with them to get grants to change the lighting around bus systems. Improving lighting in general. Solid waste, although not specific to decarbonization, there is a part where landfills are part of the problem to emissions in general. We have specific goals to reduce our landfills and divert our construction waste from landfills to more recyclable options. And all our new buildings have to be at least Leeds Silver, and in the future, must be gold...we are also working to apply for Envision certification on certain projects. It’s the institute of sustainable infrastructure. They have specific decarbonization goals that we try and reach.⁴⁸

Additionally, Interviewee D further highlights the two project categories that support CAAP and operations in transit.

Project Category	Funded by Measure R	Funded by Measure M	Alignment with CAAP policy
Purchase of Clean Fuel (Renewable Natural Gas)	Yes	Yes	Yes
Purchase of Clean Fleet (Natural gas powered and Zero Emission (Electric) Buses)	Yes	Yes	Yes

Climate Action and Adaptation Plan seen as a “Plan of Feasible Operational Actions”

Based off interviews, both policy organizer Chase Engelhardt and representatives of Metro views CAAP as a plan of feasible operational actions within Metro’s facilities and projects as well as a “pretty comprehensive look at what we can do to reduce our carbon.”⁴⁹ According to Interviewee A “it got us to 96% of reducing carbon from our system and we are looking at how do we close that gap of 4%”. Interviewee B also states, “We came up with this CAAP plan as our

⁴⁸ Interviewee B, Interviewed January 12, 2022

⁴⁹ Interviewee A, Interviewed January 10, 2022

‘wants’ as an agency with what is possible to pursue given most of our large projects have already started and already underway and give it more specific changes and goals.” In accordance with this, Engelhardt states, “Overall, most of the climate action plan is good and implementable. Small details that are crucial.” The 13 measures located in CAAP aim at being able to adapt to the increasing climate change effects in Los Angeles and reducing emissions through the operation processes and standards when building transit projects. They further stated, "in terms of the goals of CAAP, two of the main things that are supposed to help is 1) in terms of adaptation... 2) And then a lot of it is how do we improve the facilities.” The CAAP predominantly shaped how Metro viewed operational practices moving forward within the context of the progression of climate change in specifically Los Angeles. Throughout the interviews CAAP was viewed as additional routes to make transit projects further sustainable. In support of this belief, Interviewee D puts CAAP’s effect in perspective and outlines that if CAAP’s thirteen measures are all fully implemented:

These measures are projected to avoid more than 416,000 MTCO₂e annually.⁵⁰ This is the equivalent of removing more than 88,000 passenger vehicles from the road for a year, while also providing net cost savings and environmental co-benefits like improved air quality and drought resilience.

Furthermore, both Interviewee C and Interviewee D highlighted that CAAP is only one part of Metro’s sustainability efforts and is subsumed under the broader Metro Sustainability Plan, indicating that these CAAP policies are further being integrated into current and future sustainability framework. For interviewee D states,

Additionally, Metro’s 10-year sustainability strategic plan, Moving Beyond Sustainability (MBS), is consistent with our 2019 CAAP goals of becoming carbon neutral and displacing over 780,000 Metric Tons of Carbon Dioxide Equivalent (MTCO₂e) by 2050. MBS targets related to energy and strategies related to emissions displacement outline Metro’s efforts toward a decarbonized future.

⁵⁰ Estimated using US EPA’s Greenhouse Gas Equivalencies Calculator

However, all of the interviewees agreed CAAP is a beneficial operations guidebook on action toward reducing emissions, one critique of CAAP that came up during the interview, is that there could be more specificity on goals on projects. For Interviewee B states,

the CAAP tries to do a lot in the sense it is very broad. It says XYZ some of those want but don't have any specific projects behind them. There are still some improvements to be made in terms of goal setting. But that requires a little bit more input and support from different departments within the agency.

VI. Analysis

- i. As Metro utilizes strategies of building transit infrastructure and decarbonizing operations from increased funding in order to meet CAAP decarbonization policy goals, further comprehensive development on prioritizing public transit projects is needed*
- Throughout the interviews with agency members on how Metro aims to decarbonize in

compliance with the 2019 Climate Action and Adaptation Plan policies, the strategies of using increased tax funding to build out transit infrastructure and to decarbonize operations were

identified. Additionally, Metro transit infrastructure includes both public transit infrastructure projects, as well as road projects. Both Measure R and Measure M are some of the largest funding sources that create considerable potential for the development of transit projects.

However, as Measure R was created with only 30 years in mind, Measure M is specifically distinct due to the exponential amount of funding over time with no sunset date. One of the biggest critiques of Metro's use of funding for infrastructure strategies was the inclusion of road infrastructure expansion projects, specifically the Highway Expansion Project in Measure M. It is crucial to differentiate that road projects, like maintenance and repairs, is not the main issue being addressed as it doesn't induce demand of vehicle use but it is the expansion aspect specifically.⁵¹

⁵¹ Climate Resolve, Chase Engelhardt Interview, 7 February 2022

As the Measure M document states, “The \$860 million a year Measure M is estimated to raise will now fund a variety of projects throughout Los Angeles County including: highway improvements and expansion, bus operations and maintenance, transit and rail improvements and upgrades, airport connections, and bike and pedestrian connections.”⁵² One of the main arguments for the inclusion of road projects is that these projects can also expand potential for “alternative mobility”, like bikes or scooters. Although this is a possibility, it is simultaneously argued that the expansion of infrastructure potentially expands the usage of single use vehicles. Within the interviews and documents pertaining to the Measures, Metro states that the agency utilizes the funds from Measure M to aim toward accomplishing the following two goals:

- a) Shifting people from using their personal automobiles to using public transit (reducing GHG emissions)
- b) Reducing Metro’s operational GHG emissions by adopting clean fuel and technology alternatives to decarbonize the transit system by 2050

In contradiction to this specifically the first statement, one of the goals from Measure M states, “widening I-5 between the 605 and 710 freeways. Two more lanes, including a carpool lane. Starting in 2019; work scheduled to be complete by 2023.”⁵³ Another example of the highway expansion project is the Crenshaw Northern Extension project. It is funded with SB1, federal dollars and through a combination of Measure R and Measure M funding specifically set aside for road and highway projects. Improvements include the addition of “one High Occupancy Vehicle (HOV) lane in each direction along with other improvements in the 14-mile corridor between State Route 14 in Santa Clarita and Parker Road in Castaic”.⁵⁴ The adding of more lanes on freeways inherently increases the appeal of single use vehicles use as well as supporting a

⁵² “Measure M,” RebuildSoCal, September 22, 2020, <https://rebuildsocial.org/initiatives/measure-m/#:~:text=With%20the%20support%20of%20nearly,set%20to%20expire%20in%202039.>

⁵³ “Measure M,” RebuildSoCal, September 22, 2020, <https://rebuildsocial.org/initiatives/measure-m/#:~:text=With%20the%20support%20of%20nearly,set%20to%20expire%20in%202039.>

⁵⁴ “Crenshaw Northern Extension,” LA Metro, March 23, 2022, [https://www.metro.net/projects/crenshaw-northern-extension/.](https://www.metro.net/projects/crenshaw-northern-extension/)

larger quantity of cars on the freeways. These highway expansion projects inherently contradict statements of Metro's goals of moving people away from vehicle use. For example, in an article about Metro's progress on the I-5 North County Enhancement Project that widens the highway with another High Occupancy Vehicle lane (HOV), Los Angeles County Supervisor and Metro Board Member Kathryn Barger states:

It is critical that we ensure the safe and efficient operation of the I-5, which is the backbone of commerce in the Western United States... These improvements will help safeguard the economic vitality of the entire region while providing key safety improvements for all who use this corridor.⁵⁵

Demonstrated through this released statement, political and economic implications for the inclusion of road and highway expansion projects are highlighted. Throughout the interviews, one of the main political influences was the role of labor groups and their pivotal in passing that piece of legislation and economic implications were identified. Engelhardt from *Climate Action* emphasizes:

labor groups are a powerful grassroots source of energy and make or break politicians in California and advance the livelihood of a lot of people. But when they want the inclusion for freeway expansion to guarantee labor pool for themselves, that is then the reality.

Although Metro's strategies of building out transit infrastructure and decarbonizing operations are slowly moving toward climate goals, strategies could reach more competitive goals if all funding were dedicated to the development of accessible, affordable, interconnected and safe public transit infrastructure. Through Metro emphasizing building public transit infrastructure to reduce GHG emissions, while simultaneously siphoning funds toward highway expansion projects, creates a contradictory predicament that inhibits Metro's ability to undertake and

⁵⁵ LA Metro, "Metro Breaks Ground on I-5 North County Enhancements Project," *The Source*, December 2, 2021, <https://thesource.metro.net/2021/12/01/metro-breaks-ground-on-i-5-north-county-enhancements-project/>.

accomplish more comprehensive climate goals. This increase of infrastructure for more volume of vehicles negates the potential for lowering GHG emissions with public transit infrastructure.

Metro had a meeting about their different strategies included the projected footprint of expanding freeways. Feedback that they are taking into mind. The inclusion of freeway money and impetus for expansion there really jeopardizes climate action. The quantity of greenhouse gases that would be emitted related to planned expansion of freeways is greater than all of the infrastructural investments of Metro combined. That is what their draft estimates say.

This critique is supported by advocacy groups like *Climate Resolve* and *Streets for All* further indicates that the highway expansion projects were part of political concessions made in order to pass the tax ordinances. Although there is a general acknowledgement of the political need to include these funding for projects, it is still recognized that these political concessions prevent Metro's decarbonization strategies of building public transit infrastructure to become as aggressive and comprehensive as possible. Choosing a substandard project due to political and public pressures can compromise efficacy and prevent LA from meeting climate goals. Furthermore, to realistically implement these changes, it is not as simple as to just remove freeway expansions. As the freeway expansion was partly included due to its ties on the tangible consequences on people's livelihoods, the need for conversations on labor and job creation that does not involve freeway expansion is needed. Jobs that generate respectable wages and benefits that also move toward decarbonizing transportation.

ii. Within Metro, more active anticipation of planning of projects and inter-departmental collaboration is needed to more effectively implement decarbonization and sustainability objectives within transit projects

Throughout the examination of Metro's aim to implement and accomplish decarbonization goals and projects, the effectiveness of Metro's departments is evaluated as needing more interdepartmental collaboration and emphasis of common goals and standards of green and decarbonization initiatives. Planning doesn't necessarily anticipate for sustainability when

organizing and designing projects and its operations and often it is left up to the Sustainability and Environmental Compliance department to “solely” push for sustainable projects and infrastructure even within the newer Measure M projects. Moreover, within projects, there are specifications that cover the basic requirements but any additional green projects pertaining to further green specifications, for example climate adaptation strategies, is left up to the Sustainability department to push for and find the funding for. Through this, most of the goals from the CAAP are maintenance and operations heavy due to the ability for the department within Metro to actually have agency over decisions due to it being Metro owned made compared to contracts. As the Sustainability and Environmental Compliance departments are the majority actively involved with planning for sustainable practices within Metro projects, there is no inherent criteria for sustainability being built in when creating the structural system. This severely restricts the sustainable effectiveness, efficiency, and comprehensiveness within current and future transit projects as sustainable practices are then added as an addition and not being prioritized during project conception.

VII. Policy Recommendations

In order to improve the overall effectiveness of Metro’s strategies and operational projects to implement more aggressive and comprehensive decarbonization policy goals I recommend the following:

Operations	Policy	Social
1. Prioritize planning the foundation of future transit projects with sustainability and environmental compliance mandates in mind	4. Metro emphasis on creation of sustainable jobs to address labor groups employment concerns that does not support expansion of highway infrastructure	5. Metro can create more public outreach campaigns to help develop cultural consciousness and policy literacy 6. Metro can have clearer public transparency about

2. More interdepartmental collaboration and support for the implementation of standardized decarbonization and sustainability practices in projects		transit projects, data, and operations
3. Contracts have predetermined and standardized requirements + specifications for materials and building practices		

i. Operations

In order to realistically combat climate change with future transit projects, standardized sustainable and decarbonization values are vital within interdepartmental cooperation. Instead of relying on only a few departments to manage green operations and guidelines for transit projects, Metro must start the foundations of projects with sustainable standards, practices, and operations at the forefront of planning within all stages of the development. Doing so would implement more comprehensive and effective climate policies and decarbonization goals if all departments had green specifications and requirements built in at every stage of transit development.

As the *Climate Action and Adaptation Plan* emphasizes decarbonization of Metro controlled operations within transit projects, Metro must additionally aim to create more assertive green standards for operations, equipment, and project construction with their contractors. Currently, Metro has reconstruction through policy, which requires contractors to bring in specific kinds of equipment. Contractors are not allowed to bring in equipment under a certain tier based off several laws but due to COVID shortages and inability to change current equipment and materials, exemptions depending on the project are made. Although this is a promising start, for eventually the full standardization of requirements for materials and operations, more regulated

rules and a strategy to source and purchase certain supplies need to be employed as Metro aims to move toward more assertive climate goals and sustainability practices.

ii. Policy of Sustainable Job Creation

One of the main critiques of the strategies employed by Metro was the inclusion of highway expansion projects due to political and economic concessions. As the highway expansion projects were included partly due to its potential for job creation over years, Metro needs to emphasize the creation of sustainable jobs with a good wage and benefits to address labor groups employment concerns in a way that does not support the expansion of highways within LA. Furthermore, the *CAAP*, Measure R, and Measure M contains policies and projects that advocate for the modal shift of single use vehicles to public transit. To accomplish this, there needs to be a simultaneous effort to develop jobs to support this advancing and to decrease the need for highway projects.

iii. Development of Public Transparency Cultural Consciousness, and Policy Literacy with more Public Outreach

a. Public Transparency

One of the key issues encountered was the lack of public awareness and available information into Metro's projects, departments, organization, and data. Additionally, there could potentially be a gap in people's ability to navigate Metro's website and understand the rhetoric and documents presented. Unless one was directly pointed toward a specific link or document, it was challenging to find pertinent information. Majority of the links that contained public information about projects were on the official website yet did not work. If one aimed to contact a specific department at Metro, there was no records of who specifically was in the department or in charge of which projects. If one aimed to go physically into the Metro library to acquire data, the location was physically closed. Additionally, attempting to speak with a Metro agency

member from departments, like Sustainability, took multiple tries. The sheer number of documents and volume of technical layers within trying to access information and communication highlights the need for Metro to consolidate and transform their website with accessible, relevant, accurate, and working links that promotes data and communication transparency. Without this level of transparency, it makes it extremely difficult for Metro to be held accountable and be comprehensible to its citizens.

b. Cultural Consciousness and Policy Literacy

The “missing piece of cultural consciousness” was also identified within interviews as the observation of LA society. On paper people are supportive and acknowledge climate change is real and a pressing factor in the development of infrastructure in LA. Choosing how people move around is one of the biggest impacts of Californians. To access and utilize this social power of public engagement when making further transit decisions toward decarbonization, Metro can work to on furthering public outreach and knowledge. More town-halls and meetings detailing how transit decisions and policies are being created, implemented, passed, and physically manifested is a huge step towards public knowledge and understanding.

VIII. Conclusions

As there has been numerous funding sources and Metro policies stating climate and sustainability goals for Los Angeles, it can be difficult to see any physical implementation of these ideals. However, recent tax ordinances Measure R and Measure M and policies through the 2019 Climate Action and Adaptation Plan can be analyzed. In order to answer my research question of: *What strategies are utilized by specific transport programs that are funded by Measures R and Measures M to implement the decarbonization policies set by Metro’s 2019 Climate Action and Adaptation Plan in LA?* I have concluded that the Measure funded strategies

that Metro utilizes towards policy goals of decarbonization can be become further comprehensible.

Found within interviews with Metro members, the main strategy of building out transit infrastructure, that was funded by Measure R and specifically Measure M, was identified. Additionally, within these transit projects, Metro has implemented and adopted the 2019 CAAP. A plan which is focused to emphasize the decarbonization of operations in transit projects. While these operational policies are deemed beneficial, the larger concept of building transit infrastructure to combat GHG emissions through modal shift can be more comprehensive. To make building public transit infrastructure as advantageous as it could possibly be, Metro needs to address the political and economic concessions that led to the inclusion of the highway expansion projects. Building more infrastructure for highways while simultaneously constructing more public transit infrastructure can be contradictory and possibly negate decarbonization goals. Policy recommendations include creating sustainable good paying jobs for labor groups, the creation of common sustainable values that Metro departments adhere to in the development of transit projects, providing data transparency, and bridging the social consciousness of its citizens to create more comprehensive and attainable climate goals.

IX. Bibliography

- American Public Transportation Association (APTA). Rep. *Economic Impact of Public Transportation Investment 2020 Update*. American Public Transportation Association (APTA), April 2020.
- Bianco, N., F. Litz, D. Saha, T. Clewenger, and D. Lashof. 2020. “New Climate Federalism: Defining Federal, State, and Local Roles in a U.S. Policy Framework to Achieve Decarbonization” Working Paper. Washington, DC: World Resources Institute.
- CALCOG. “Los Angeles County Metropolitan Transportation Authority (Metro).” California Association of Councils of Governments. CALCOG, January 19, 2021. <https://calcog.org/los-angeles-county-metropolitan-transportation-authority-metro/>.
- Chen, Anna, and Beaver, Rick– Streetsblog Los Angeles: “Leading the Way for a Greener La - Metro Board Adopts 2019 Climate Action and Adaptation Plan.” *The Source*, July 26, 2019. <https://thesource.metro.net/2019/07/26/leading-the-way-for-a-greener-la-metro-board-adopts-2019-climate-action-and-adaptation-plan/>.
- Climate Resolve, Chase Engelhardt Interview, 7 February 2022
- “Crenshaw Northern Extension.” LA Metro, March 23, 2022. <https://www.metro.net/projects/crenshaw-northern-extension/>.
- Data Request Doc, Interviewee D, Interviewed February 2, 2022
- EPA. “Sources of Greenhouse Gas Emissions.” EPA. Environmental Protection Agency. Accessed April 1, 2022. [https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=Transportation%20\(29%20percent%20of%202019,ships%2C%20trains%2C%20and%20planes.](https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=Transportation%20(29%20percent%20of%202019,ships%2C%20trains%2C%20and%20planes.)
- EPA. “Fast Facts on Transportation Greenhouse Gas Emissions.” EPA. Environmental Protection Agency. Accessed December 1, 2021. <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.>
- Goldman, Joshua. “A New Framework for Transportation Decarbonization.” Aspen Institute Energy and Environment. Aspen Institute, June 21, 2021. <https://www.aspeninstitute.org/blog-posts/a-new-framework-for-transportation-decarbonization/>.
- Holmes, Nathan S. “La Regional Transportation, Explained.” Medium. Medium, February 1, 2020. <https://nsholmes21.medium.com/la-regional-transportation-explained-a33253f3627b.>
- The Housing Innovative Collaborative. “Los Angeles County Metropolitan Transportation Authority (Metro).” Housing Innovation Collaborative, April 28, 2020. <https://housinginnovation.co/collaborative/metro/>.

- Huerta, Claudia P. "Transit Funding ; Why the Politics? A Comparative Study of Public Transportation Infrastructure Funding in New York City and Los Angeles." Thesis, COLUMBIA UNIVERSITY, 2012.
- Hymon, Steve, "Metro Retires Last Diesel Bus, Becomes World's First Major Transit Agency to Operate Only Clean Fuel Buses." *The Source*, January 12, 2011. <https://thesource.metro.net/2011/01/12/metro-retires-last-diesel-bus-becomes-worlds-first-major-transit-agency-to-operate-only-clean-fuel-buses/>.
- Jonathan. "PlanItMetro: LA Metro Thinking and Investing BIG ." *PlanItMetro: Metro's Planning Blog* , 2014. <https://planitmetro.com/tag/los-angeles/>.
- Joe Linton and Damien Newton, "Interview with Michael Schneider, Founder of Streets for All," *Streetsblog Los Angeles*, November 7, 2019, <https://la.streetsblog.org/2019/11/07/interview-with-michael-schneider-founder-of-streets-for-all/>.
- Ku, Anthony Y, Andrew de Souza, Jordan McRobie, Jimmy X Li, and Jaimie Levin. "Zero-Emission Public Transit Could Be a Catalyst for Decarbonization of the Transportation and Power Sectors." OUP Academic. Oxford University Press, September 27, 2021. <https://academic.oup.com/ce/article/5/3/492/6375879?login=true>.
- LA Metro, "Metro Breaks Ground on I-5 North County Enhancements Project," *The Source*, December 2, 2021, <https://thesource.metro.net/2021/12/01/metro-breaks-ground-on-i-5-north-county-enhancements-project/>.
- LA Metro. "Measure R." LA Metro, March 21, 2022. <https://www.metro.net/about/measure-r/#:~:text=A%20two%2Dthirds%20majority%20of,those%20already%20in%20the%20pipeline.>
- Lacono, Michael. "Dedicated Funding and Urban Transit Performance: Some Empirical Evidence." *ResearchGate*. Hubert H. Humphrey Institute of Public Affairs, The University of Minnesota , February 22, 2006. https://www.researchgate.net/profile/MichaelIacono/publication/255571134_Dedicated_Funding_and_Urban_Transit_Performance_Some_Empirical_Evidence/links/00b495372ac3f1338a000000/Dedicated-Funding-and-Urban-Transit-Performance-Some-Empirical-Evidence.pdf.
- Lah, Oliver, and Barbara Lah. "Chapter 4: Opportunities for Synergies and Cobenefits." Essay. In *Sustainable Urban Mobility Pathways: Policies, Institutions, and Coalitions*, edited by Oliver Lah, n.d. Accessed October 27, 2021.
- Lawson, Ashley, and Fatima Maria Ahmad. "Decarbonizing U.S. Transportation." Center for Climate and Energy Solutions, February 4, 2020. <https://www.c2es.org/document/decarbonizing-u-s-transportation/>.

- Linton, Joe, and Damien Newton. "Interview with Michael Schneider, Founder of Streets for All." Streetsblog Los Angeles, November 7, 2019. <https://la.streetsblog.org/2019/11/07/interview-with-michael-schneider-founder-of-streets-for-all/>.
- Los Angeles County Metropolitan Transportation Authority. Rep. *Metro Funding Sources Guide 2020*. Los Angeles County Metropolitan Transportation Authority, May 2021. <http://media.metro.net/2020/Metro-Funding-Sources-Guide-2020.pdf>.
- Manville, Michael. "MEASURE M AND THE POTENTIAL TRANSFORMATION OF MOBILITY IN LOS ANGELES." University of California Institute of Transportation Studies, January 2019. <https://www.its.ucla.edu/wp-content/uploads/sites/6/2019/01/Measure-M-and-the-Potential-Transformation-of-Mobility-in-Los-Angeles.pdf>.
- "Measure M." RebuildSoCal, September 22, 2020. <https://rebuildsocial.org/initiatives/measure-m/#:~:text=With%20the%20support%20of%20nearly,set%20to%20expire%20in%202039.>
- Metro, LA. "Metro Breaks Ground on I-5 North County Enhancements Project." The Source, December 2, 2021. <https://thesource.metro.net/2021/12/01/metro-breaks-ground-on-i-5-north-county-enhancements-project/>.
- Metro. "About Metro Archive." LA Metro. Metro, 2022. <https://www.metro.net/about/>.
- "Metro Funding Sources Guide 2020" (Los Angeles County Metropolitan Transportation Authority, May 2021), <http://media.metro.net/2020/Metro-Funding-Sources-Guide-2020.pdf>.
- Metro. "Measure R and the Financing Plan." Measure R Overview - Munk School of Global Affairs. Los Angeles County Metropolitan Transportation Authority. Accessed March 30, 2022. https://munkschool.utoronto.ca/imfg/uploads/191/measure_r_overview_presentation_march_2012_katz_2.pdf.
- Metro. Rep. *Measure R Local Return Guidelines*. Los Angeles County Metropolitan Transportation Authority, 2010. <https://www.dropbox.com/s/2632gijuj65fz6f/2009-Measure-R-Local-Return-Guidelines.pdf?dl=0>.
- Move LA. "About Us: Move LA." Move LA. Accessed March 29, 2022. https://www.movelat.org/about_us#:~:text=Measure%20R%20was%20a%2030,236%20miles%20and%20200%20stations.
- Newton, Damien, and Joe Linton. "Metro Board: Let the People Vote on Extending Sales Tax." Streetsblog Los Angeles, June 28, 2012. <https://la.streetsblog.org/2012/06/28/metro-board-let-the-people-vote-on-extending-sales-tax/>.

Ubbels, Barry, and Peter Nijkamp. "Unconventional Funding of Urban Public Transport." Essay. In *Transportation Research Part D: Transport and Environment* 7, 5th ed., 7:317–29. Amsterdam, Netherlands: Department of Regional Economics, Free University, 2002.

WayBack Machine. "Facts At a Glance." Wayback Machine: Internet Archive, November 18, 2016. <https://web.archive.org/web/20161225081954/https://www.metro.net/news/facts-glance/>.

X. Appendix

Questionnaire:

Interview Questions for Agency Members:

1. How would you describe your role within the agency?
2. What department within the agency do you work in? How long have you worked within the agency?
3. What is your familiarity with the *2019 Climate Action and Adaption Plan (CAAP)* policy plan?
4. How is Metro aiming toward goals of decarbonization based off these CAAP policies?
5. What is your familiarity with Measure R and Measure M?
6. What aspects of Measure R and Measure M are aimed at goals of decarbonization? And CAAP policies?
7. What specific projects funded by R & M aim to implement CAAP policies?
8. What strategies does these projects support or implement specifically?
 - a. The completion of Gold line (L Line) has been completed using 2008 Measure R funds, what specific strategies from this project how have you seen aim toward completing policy goals of CAAP and goals of overall decarbonization?
9. How would you describe the success or lack thereof of Metro's decarbonization efforts?
 - a. How would you describe the success or lack thereof of these projects strategies on decarbonization and CAAP policies?
10. Could the strategies through these projects be improved to implement CAAP policies?
11. Is there anything you would like to share?
12. Do you have any questions for me?

Interview Questions for Advocacy Groups:

1. What is your background and how would you describe your role in this organization?
2. What is your familiarity with Metro's 2019 Climate Action and Adaptation Plan?
3. What is your opinion on the policy efforts Metro has been making to decarbonize?
4. What is your familiarity with Measure R and Measure M?
 - a. What makes them different from other transit funding?
5. A strategy toward decarbonization that Metro describes from previous interviews is using these tax ordinance funding to build out more public transit infrastructure. In your perspective, is this an effective strategy toward decarbonization? Why or why not?
 - a. Do you see Metro implementing these strategies?
 - b. As funding is objectively beneficial in the process to complete policy goals, in your perspective, is there another strategy [either a project or policy] that would combat emissions more effectively with this funding?
6. How would you describe the success or lack thereof of Metro's decarbonization efforts?
7. Is there anything you would like to share?
8. Do you have any questions for me?