



2019 ENERGY & RESOURCE REPORT



Metro



ACKNOWLEDGMENTS

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Image at left: collage titled “Majestic Heights” by New York-based artist Shinique Smith being translated into a mosaic by Metro staff for the MLK Jr. Station

ACRONYMS & ABBREVIATIONS

APTA	American Public Transportation Association	LA	Los Angeles
CAAP	Climate Action and Adaptation Plan	MECA	Metro Environmental Construction Awareness Program
CMF	Central Maintenance Facility	METRO	Los Angeles County Metropolitan Transportation Authority
CNG	Compressed Natural Gas	MJ	Megajoules
CO₂e	Carbon Dioxide Equivalent	MT	Metric Tons
CxA	Commissioning Authority	NOx	Nitrogen Oxides
ETI	Environmental Training Institute	PM	Particulate Matter
GCP	Green Construction Policy	PV	Photovoltaic
GGW	Growing a Greener Workforce	RNG	Renewable Natural Gas
GHG	Greenhouse Gas	UPT	Unlinked Passenger Trips
G-PRO	Green Professional Building Skills Training	VMT	Vehicle Miles Traveled
HC	Hydrocarbon	VRM	Vehicle Revenue Miles
kWh	Kilowatt Hour	ZEBs	Zero-Emissions Buses



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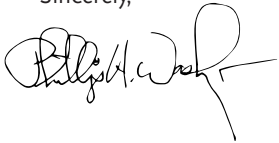
MESSAGE FROM THE CEO

Metro is leading a movement to build the LA County of tomorrow. Our strong leadership on environmental stewardship ensures that we create a secure and reliable infrastructure for future generations.

Today, we are seizing the moment to identify and adopt solutions to combat the impact of climate change while improving air quality. Since 2012, Metro has reduced total NOx emissions by 50% and, in 2018, our expanded use of renewable natural gas for bus fuel reduced Metro's greenhouse gas emissions by 13%, while reducing operating costs. These are just two examples of how Metro is working internally and with local government partners to design long-range transportation solutions that help us achieve our regional sustainability and mobility goals.

Our environmental and sustainability efforts play a critical role in implementing Metro's *Vision 2028 Strategic Plan*. We will meet environmental, social and fiscal challenges by reducing the impact and enhancing the resilience of our transportation network.

Sincerely,



Phillip A. Washington



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MESSAGE FROM THE INCOMING BOARD CHAIR

Metro strives to think and act holistically as we shape our community and environment for the better. We are responsible for planning, building and managing the fastest growing transportation system in the nation while putting equity and sustainability at the forefront of our decision making. As emphasized in Metro's new *Equity Platform Framework*, we have renewed our focus on authentic engagement with the diverse communities we serve. This is key in delivering transportation solutions that enhance mobility, improve air quality and public health and contribute to community vitality.

These priorities are evident in our work, particularly in our ongoing effort to restructure and redesign our bus network to be more effective and accessible to our customers.

Metro is engaging community organizations to identify system improvements and first/last mile solutions that will make reaching our transit system easier, safer and more environmentally responsible.

I am proud to work with the dedicated public servants at LA Metro to create a more equitable and sustainable Los Angeles.

Sincerely,



Mayor James T. Butts Jr.



INTRODUCTION

Operating a world-class transportation system requires resolute commitment to meeting the evolving mobility needs of LA County. It also requires a dynamic and holistic approach to system-wide sustainability. Metro's work must go beyond measuring reductions in our environmental footprint. To this end, we actively embrace the principles of collaboration, diversity, equity and inclusion in how we design, operate and move, creating a more accessible and resilient transit system for all Angelenos.

Metro's Energy & Resource Report provides an annual evaluation of our sustainability performance, measured across ten specific performance metrics and through updates on program impact. In line with our commitment to transparency and accountability, this report communicates progress and provides insight on opportunities for continual improvement.







This 2019 report is the tenth installment of the *Energy & Resource Report* and will be the final report in its current format. Throughout 2019, Metro is developing an agency-wide sustainability strategic plan, establishing an updated vision and roadmap for our efforts going forward. Accordingly, this annual report will be reimagined in future years to reflect the next generation of Metro's sustainability program, including performance updates on new long-term sustainability goals. Focusing on the transition ahead, this year's report serves as a performance update to the *2018 Energy & Resource Report*.

Performance in 2018 across the ten sustainability indicators is summarized in the table on the right. During this era of expansion, the continued adoption of best practices has enabled positive trending across several performance areas. Since 2017, Metro has reduced its greenhouse gas (GHG) and criteria air pollutant emissions through the transition to renewable natural gas and "near-zero emission" engines. We reduced energy use and increased waste diversion from landfills, even as the system is expanding.

As Metro plans for the future, this performance summary reveals areas of opportunity to be prioritized in Metro's sustainability strategic plan. These include identifying new and innovative ways to reduce water use and waste generation that will ensure continued progress in these areas.

Several case studies and program highlights are featured in this year's report, illustrating how our forward-thinking approach to sustainability is driving a decentralized change in Metro's internal culture and how this is building a sustainability movement within Metro and across the region. These programs illustrate how people are at the core of Metro's sustainability vision. From air quality improvements to green workforce development, Metro's programs focus on collaboration and inclusion, encouraging positive and restorative changes to our communities and the environment.



Performance Metrics		2017	2018	Year-to-Year Change
 OPERATIONAL EFFICIENCY	Unlinked Passenger Trips <i>(Per Capita x 100)</i>	3,904	3,766	-3.5%
	Vehicle Miles Traveled <i>(Per Capita x 100)</i>	79.1	79.0	-0.1%
	Operating Expenses <i>(Dollars per Vehicle Revenue Mile)</i>	\$13.97	\$14.01	0.3%
 AIR QUALITY	Criteria Air Pollutant Emissions <i>(Pounds per 10,000 Vehicle Revenue Miles)</i>	45.0	38.6	-14.2%
 CLIMATE	Greenhouse Gas Emissions <i>(Pounds CO₂e per Vehicle Revenue Mile)</i>	7.18	6.46	-10.0%
	Greenhouse Gas Displacement <i>(Net Emissions, Metric Tons CO₂e)</i>	-604,613	-615,579	1.8%
 ENERGY	Energy Use <i>(Megajoules per Vehicle Revenue Mile)</i>	55.8	52.2	-6.5%
 WATER	Water Use <i>(Gallons per Vehicle Revenue Mile)</i>	2.11	2.19	3.8%
 WASTE	Total Solid Waste <i>(Tons per 100,000 Vehicle Revenue Miles)</i>	9.55	10.09	5.7%
	Diversion from Landfill <i>(Percent Diverted)</i>	28%	39%	39.3%

 Indicates Improvement

METHODOLOGY

REPORTING FRAMEWORK

As a founding member of the American Public Transportation Association's (APTA) Sustainability Commitment, Metro has long valued sustainability as a key agency priority. As a result, Metro annually reports on a framework of performance metrics that enable all APTA members to measure and report progress related to sustainability over time. This rigorous reporting also allows Metro to remain transparent with its customers and business partners across LA County, demonstrating alignment with regional and statewide policy and targets on climate and environment. These metrics include:

- > Unlinked passenger trips
- > Vehicle miles traveled
- > Operating expenses
- > Criteria air pollutant emissions
- > Greenhouse gas emissions
- > Greenhouse gas displacement
- > Energy use
- > Water use
- > Total solid waste
- > Diversion from landfill

The reporting framework and methodology used in this report conform to APTA's *Recommended Practice* "Quantifying and Reporting Transit Sustainability Metrics." The report encompasses activities and performance for the 2018 calendar year. Metro implemented rigorous data management processes governing the collection and analysis of the data found in this report, which is derived from utility bills, fuel and mileage reports, waste weight tickets, transit metrics and program data. These processes ensure that the performance metrics are as accurate and complete as the available data sources allow. References to US dollars throughout the report are presented as 2018 US dollars unless otherwise noted. Technical appendices containing the current and historical data used for this report are available online at metro.net/sustainability.

Metro reports annually on a framework of **10** performance metrics

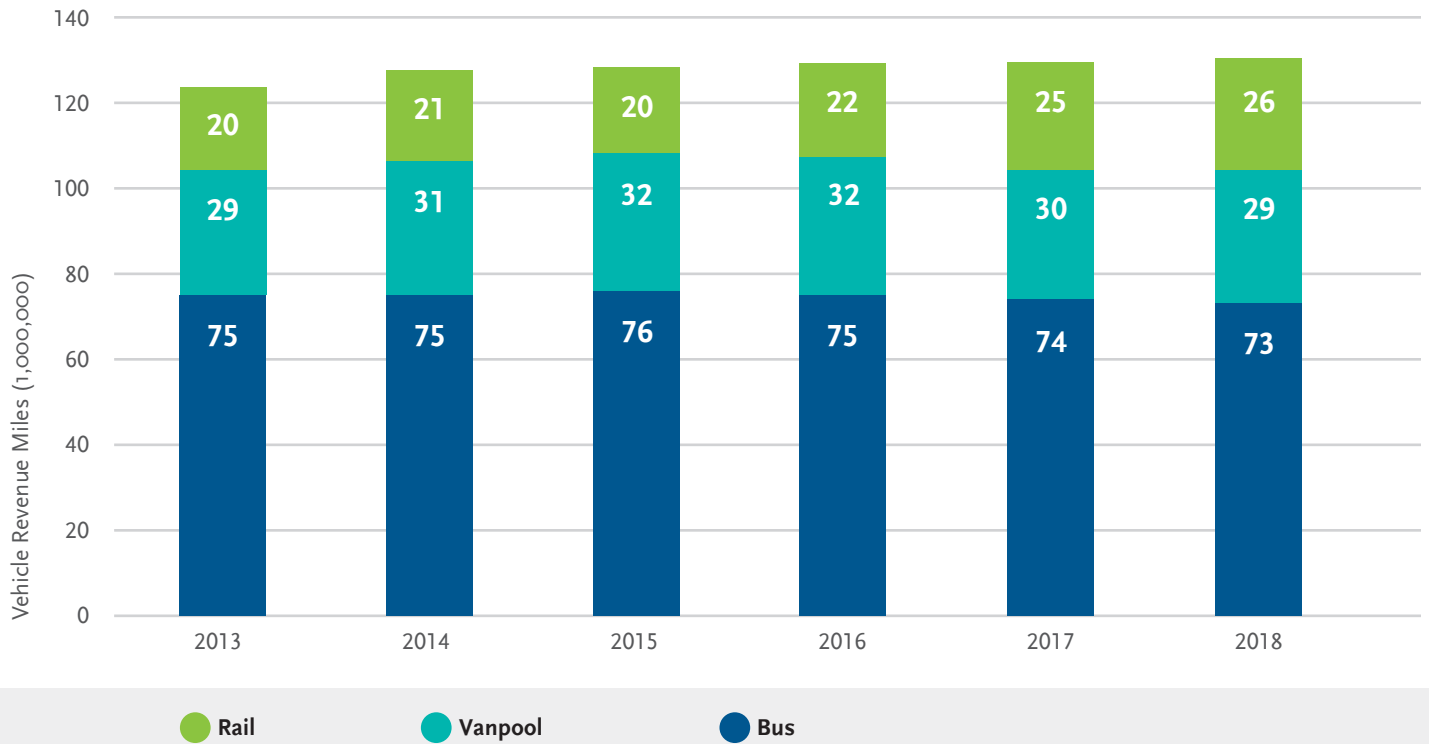


NORMALIZATION FACTORS

APTA recommends that transit agencies use normalization factors when reporting performance metrics in order to account for changes in service size and scale. These factors are applied when calculating annual performance to more effectively measure and compare sustainability performance over time, especially during years of service growth or change. Metro applies Vehicle Revenue Miles as the normalization factor for all metrics in this report, unless otherwise noted.

Vehicle Revenue Miles (VRM) represents the total number of miles Metro vehicles traveled during revenue service (e.g., the time when a vehicle is available to the public and is expected to carry passengers). By normalizing sustainability performance for VRM, Metro can more accurately compare performance trends year-to-year. Below shows the breakdown of total VRM by mode. Since 2013, Metro's annual VRM has remained relatively consistent. However, the addition of new rail lines and efficiency improvements to bus service have affected the breakdown of VRM by mode. Each mode has different resource demands, so changes in service are also associated with changes in Metro's normalized sustainability performance.

Vehicle Revenue Miles



OPERATIONAL EFFICIENCY



PERFORMANCE METRICS

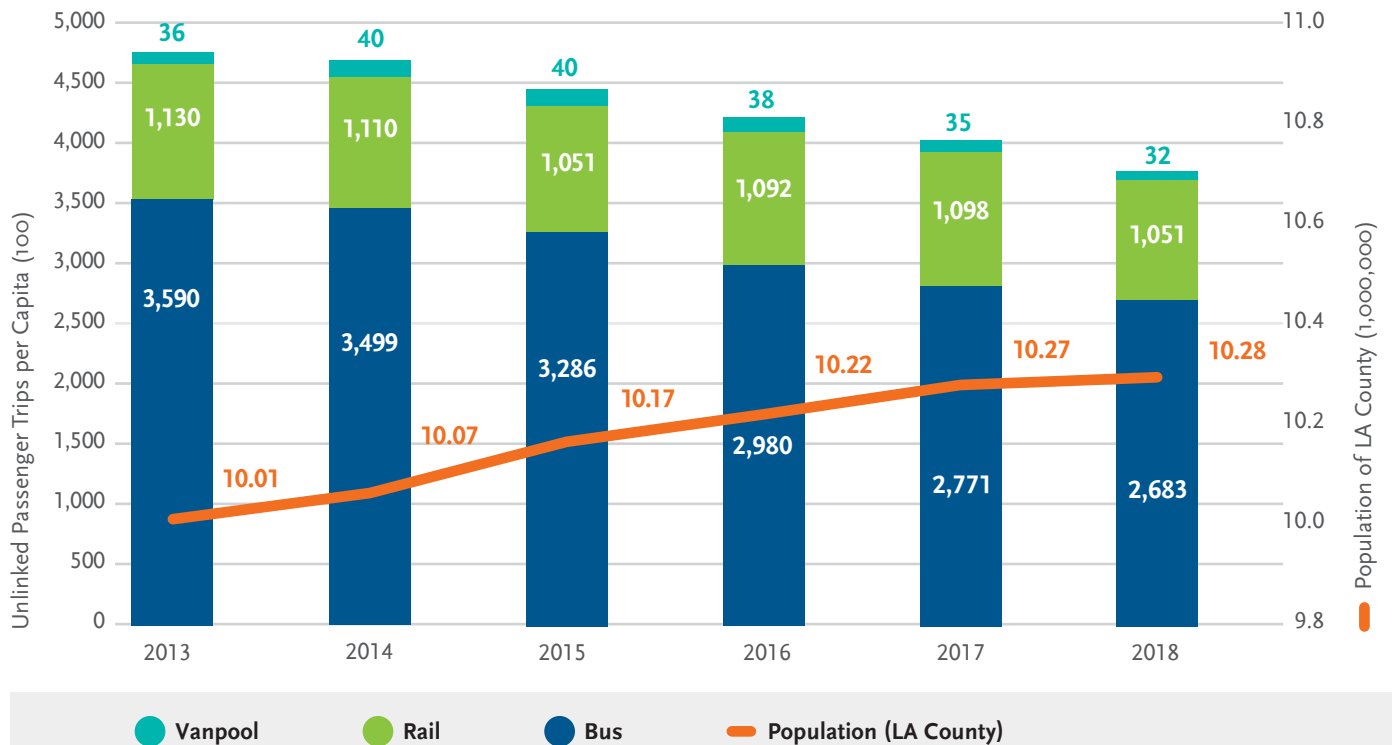
- **Unlinked Passenger Trips**
- **Vehicle Miles Traveled**
- **Operating Expenses**
- The operational efficiency metrics measure trends in ridership, regional travel behavior and agency financial sustainability. The metrics are normalized for transit system size and population growth.

RIDERSHIP TRENDS

Aligned with APTA guidance, Metro reports annually on three metrics related to the operational efficiency of our core transit services. Together, these metrics help Metro identify and contextualize operational and regional trends.

Unlinked Passenger Trips (UPT) reflect the total number of times passengers board public transportation vehicles. Consistent with trends nationwide, Metro has experienced a decline in passenger trips over the last several years. While the cause of this trend is multi-faceted, the U.S. Department of Transportation identifies strong economic growth relating to a rise in personal vehicle ownership and increased driving in recent years. Despite identified trends, regional **Vehicle Miles Traveled (VMT)** have remained largely unchanged. This may be a result of slowing population growth in LA County, reflecting a larger trend in slow growth rates across California in 2018.

Unlinked Passenger Trips



ADAPTING FOR THE FUTURE

Metro is tackling ridership challenges head on and adapting services to provide mobility solutions for a new generation. Over the course of 2018, Metro launched the NextGen Bus Study, aiming to re-imagine and restructure the agency's bus system to better meet the needs of current and future riders. Metro is continuing to engage with communities across LA County in 2019 and beyond in order to design a new bus network that prioritizes access, improves reliability and reflects the way people travel today.

NEXTGEN is one of many ways Metro is engaging with the community to re-imagine LA County.

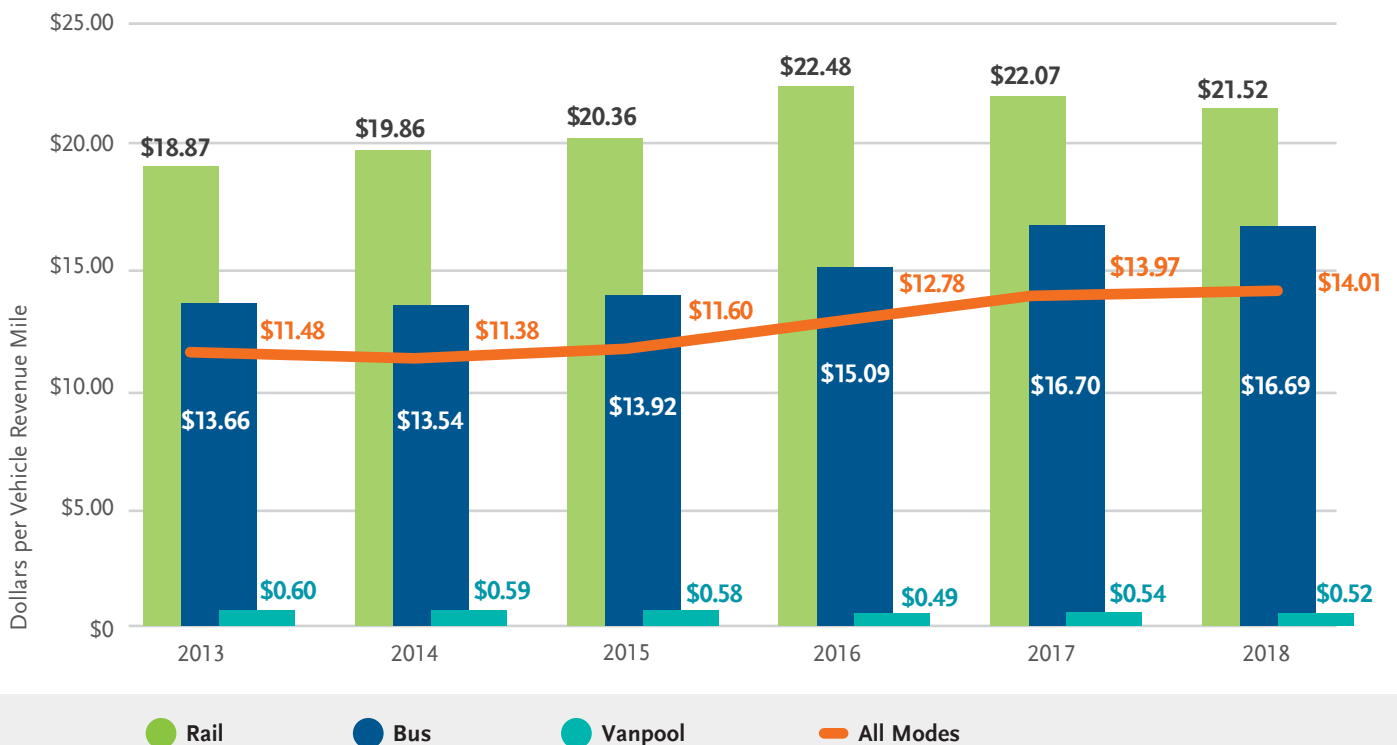
We want to change this paradigm by providing a package of high-quality transit options along with pricing to reduce congestion, improve mobility and air quality and ultimately provide a more sustainable and resilient LA County.

Phillip A. Washington
LA Metro Chief Executive Officer

OPERATING EXPENSES

Fiscal responsibility is a key component of sustainability at Metro. Average operating expenses leveled out in 2018, with slight decreases across all transit modes. Though operating costs per vehicle revenue mile have increased since 2013, these increases are accompanied by rapid growth in Metro's services, including new rail lines, bus routes and active transportation programs such as Bike Share. These are the programs that provide a more flexible and robust transit system.

Operating Expenses



AIR QUALITY



PERFORMANCE METRIC

- **Criteria Air Pollutant Emissions**
- The criteria air pollutant emissions metric measures *tailpipe emissions* from Metro's bus fleet and support vehicles. The major criteria air pollutants are hydrocarbons (HC), nitrogen oxides (NOx) and particulate matter (PM).

Since 2012, Metro has reduced total NOx emissions by **50%**

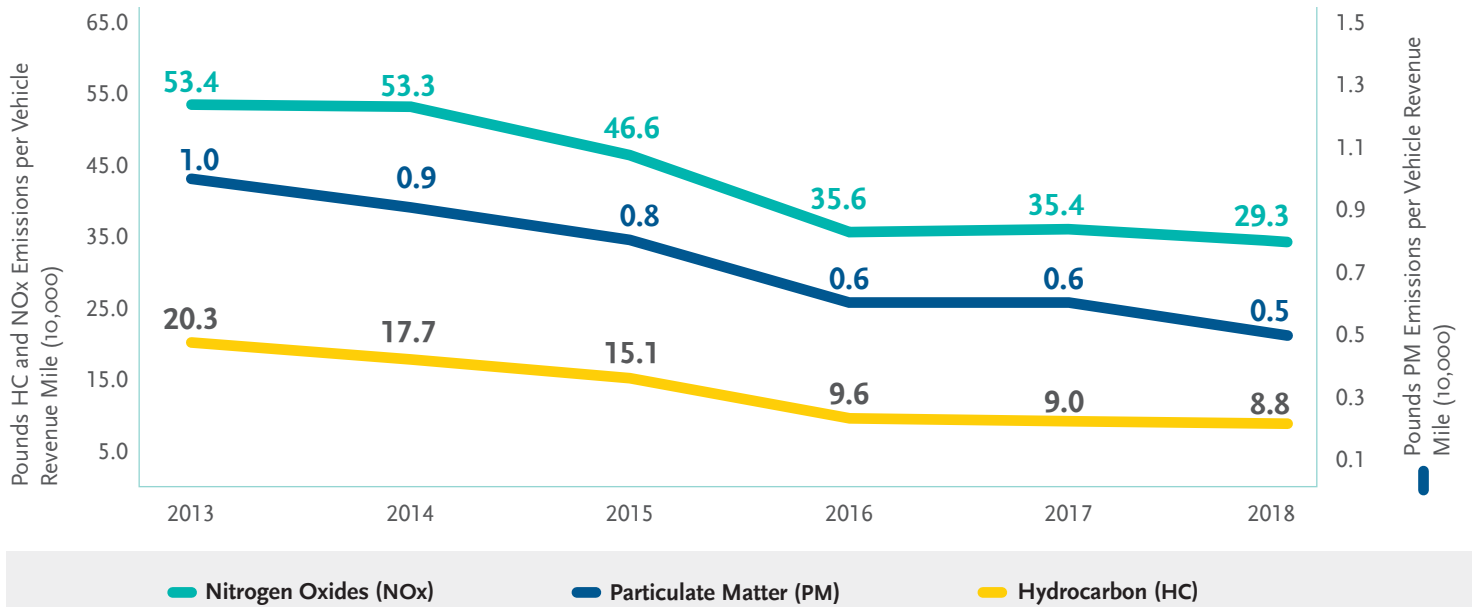
2018 PERFORMANCE

Metro continues to support regional air quality goals by upgrading our fleet, already one of the cleanest in the industry. Since 2013, Metro has leveraged clean vehicle technology to reduce NOx, HC and PM emissions from its bus fleet by 47%, 58% and 51% respectively.

In 2018, Metro took another significant step to reduce vehicle tailpipe emissions by replacing 173 aging compressed natural gas (CNG) engines with new near zero emission engines. These engines not only increase the operating life of existing buses but have reduced Metro's NOx emissions by an additional 18% since 2017 without sacrificing performance.

As a next step, Metro is turning its attention to its fleet of non-revenue vehicles and contracted bus partners. Non-revenue fleet vehicles used for field operations are being upgraded to battery electric, hybrid and cleaner diesel vehicles. We are also partnering with our contracted bus providers to retire the last diesel buses in operation and build CNG fueling stations, further improving air quality in LA County and beyond.

Criteria Air Pollutant Emissions



Data Update: Metro's criteria air pollutant emissions were updated in 2018 to include emissions from Metro's contracted bus fleet and to reflect corrected information as a result of improved data tracking processes.



Construction equipment powered by renewable diesel in use at the Metro Regional Connector project

CASE STUDY

RENEWABLE DIESEL

Shifting Gears

New innovations in fuel and vehicle technology provide Metro with an opportunity to spearhead air quality improvements across LA County. Following Metro's leadership, partners on the Regional Connector and Purple Line Extension construction projects are now using renewable diesel, a cleaner burning and petroleum-free fuel substitute, to power their construction equipment. Renewable diesel reduces NOx and PM pollutant emissions by 10% and 30% respectively, improving air quality in areas that need it most. Combined, these two projects have reduced NOx and PM emissions by 2,399 and 126 pounds respectively, which is equivalent to removing 68.8 passenger vehicles from the road for a year.

Inspiring Innovation

Metro's Green Construction Policy (GCP) works with contractors to adopt new technologies that mitigate the significant public health risks posed by air pollution. Despite the fact that diesel exhaust significantly contributes to the total known cancer risk in Southern California¹, most construction equipment still operates using diesel fuel. Starting in 2018, Metro implemented new GCP requirements that contractors use renewable diesel for all diesel engines. Since

many of Metro's construction activities are concentrated in neighborhoods already disproportionately affected by the negative impacts of air pollution, reducing these impacts is a high priority.

In addition to bolstering construction requirements, Metro hosted an industry roundtable discussion in 2018 on the use of renewable diesel. This diverse forum provided Metro's staff and major construction partners with a unique opportunity to engage with renewable diesel users, regulators, fuel distributors and fuel producers from across California in understanding the potential and benefits of renewable diesel. Metro is proud to partner with innovative and responsible contractors that help preserve, protect and restore LA.

Starting in **2018**, Metro began requiring the use of **renewable diesel** – a cleaner and more sustainable fuel – **on all capital construction projects.**

¹South Coast Air Quality Management District. (2016). Air Quality Management Plan. <http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf?sfvrsn=15>

CLIMATE

PERFORMANCE METRICS

- Greenhouse Gas Emissions
- Greenhouse Gas Displacement

The climate performance metrics measure trends in greenhouse gas emissions *produced* by transit and greenhouse gas emissions *displaced* by transit through reductions in regional VMT. These metrics are indicators of Metro's net impact on greenhouse gas emissions, measured in carbon dioxide equivalent (CO₂e).

In 2018, Metro reduced its total GHG emissions by **13%**

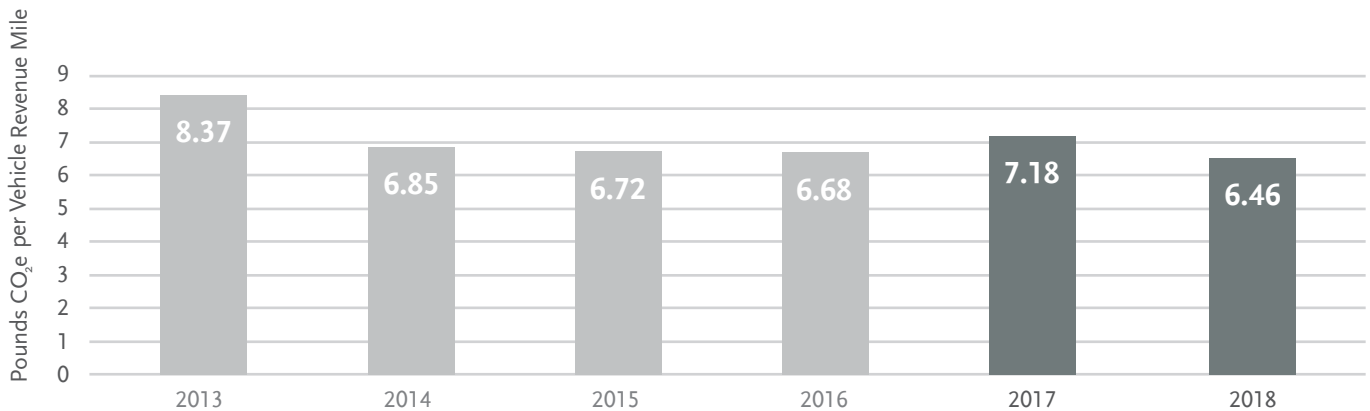
2018 PERFORMANCE

Since 2013, Metro has steadily reduced systemwide GHG emissions, in line with LA's climate mitigation goals and the agency's 2012 Climate Action and Adaptation Plan (CAAP). In 2018, Metro reduced its total GHG emissions by an additional 13% from 2017 through vehicle electrification and the ongoing transition to low carbon fuel sources, including renewable natural gas.

This progress is even more noteworthy in the context of Metro's new GHG emissions baseline. Established in 2017, Metro's updated baseline reflects more accurate utility-specific emissions factors and new APTA guidance on quantifying emissions displacement. With the addition of land use as a source of displacement, Metro's transit system now displaces 2.5 times the emissions that it generates through operations.

Looking forward, the release of our updated CAAP in 2019 will establish the next phase of climate action, with a focus on specific strategies that will prepare the agency to withstand hazards due to climate change.

Greenhouse Gas Emissions



Data Update: The color change in 2017 indicates Metro's adoption of a new GHG emissions inventory reflecting updated utility emissions factors.

Greenhouse Gas Displacement

GHG EMISSIONS BALANCE (MT CO ₂ e)	2013	2014	2015	2016	2017	2018
Total Emissions	471,932	396,380	391,275	390,840	415,872	371,911
Total Displacement	-475,865	-482,813	-465,101	-448,301	-1,020,485	-987,490
Mode Shift to Transit	-475,865	-482,813	-465,101	-448,301	-207,374	-200,669
Land Use					-813,110	-786,820
Net Emissions	-3,933	-86,433	-73,827	-57,461	-604,613	-615,579

Data Update: The color change in 2017 indicates Metro's adoption of a new GHG emissions inventory reflecting the addition of land use as a source of emissions displacement.



Technician refueling a Metro bus with renewable natural gas

CASE STUDY

RENEWABLE NATURAL GAS

Low-Carbon, High Impact

85% of Metro's GHG emissions result from vehicle fuel, making the transition to low-carbon fuels a critical step in reducing our GHG emissions. Renewable Natural Gas (RNG) is a cost-effective, low-carbon alternative form of natural gas derived from waste sources such as landfills. The use of RNG doesn't require modification to Metro's existing vehicles or fueling processes, making this an optimal strategy for reaching the goals outlined in Metro's 2012 CAAP.

Implementing Climate Solutions

In 2017, Metro piloted the use of RNG for approximately 10% of its bus fleet. The pilot resulted in a 3.5% reduction in fleet emissions while also reducing fuel costs by 19%. Last year, Metro expanded its use of RNG to nearly half the agency's bus fleet, contributing to a 10% reduction in agency-wide GHG emissions. The use of RNG also reduced fuel costs by nearly \$500,000, while generating additional revenues from carbon credits.

Building on this success, Metro is preparing to expand use of RNG to 100% in 2019 and is identifying even lower-carbon sources of RNG for future use. This initiative is part of a broader set of GHG mitigation strategies being developed for the Metro 2019 CAAP. The update will outline how Metro can achieve zero carbon emissions by 2050, which includes transforming its fleet to 100% zero-emission buses (ZEBs) by 2030 and ensuring 100% renewable energy use by 2035. Metro is moving full speed to a cleaner, greener future.

The use of **RNG** has helped Metro **save nearly \$500,000 in fuel costs** while also generating **revenue** from carbon credits.

HIGHLIGHT: SUSTAINABLE WORKFORCE DEVELOPMENT



ENVIRONMENTAL TRAINING INSTITUTE (ETI)

Metro is investing in the future of the LA region, which starts with investing in our greatest asset – people. Metro’s Environmental Training Institute (ETI) offers environmental and sustainability-focused trainings designed to build support for sustainability

initiatives, ensure regulatory compliance and foster an agency-wide culture of sustainability. ETI not only ensures the success of Metro’s sustainability program over time but also helps develop a regional workforce equipped for the expanding green economy.



METRO ENVIRONMENTAL CONSTRUCTION AWARENESS (MECA)

Contractors and sub-contractors play a critical role in helping Metro transform Los Angeles into a more livable and sustainable ecosystem. Launched at the end of 2017, MECA provides contractors with the knowledge they need about environmental topics to effectively work with Metro. By communicating expectations and upholding Metro’s foundational commitment to protecting the environment, MECA ensures that contractors understand the importance of sustainability from project design through construction.

MECA is an online platform featuring videos and downloadable resources focused on specific environmental topics covering jurisdictional regulations and Metro policies, such as Metro’s Green Construction Policy. MECA launched with three modules and continues to expand, offering a range of topics from Forming your Environmental Team to Stormwater Best Practices and Metro’s Response to AB 2800 on Climate Change. Over 65% of site visitors return to the site more than once, illustrating the value of this resource to the local community and how Metro is building a greener workforce.



MECA's online platform

Over **65%** of site visitors return to the site to access the extensive resources MECA offers.



Through the Environmental Training Institute, Metro is driving a cultural revolution and transforming Metro employees and community members alike into agents of change.



GROWING A GREENER WORKFORCE (GGW)

Launched in 2017 with courses in the Envision Rating System and Green Professional Fundamentals (G-PRO), Metro expanded its Growing a Greener Workforce program in 2018 to include courses in environmental resiliency, G-PRO Operations and Maintenance and selecting native plants for water conservation.

In just two years, GGW has trained employees across a wide range of job classifications in over 80 departments and has reached over 260 community members, including many of Metro's small business partners.

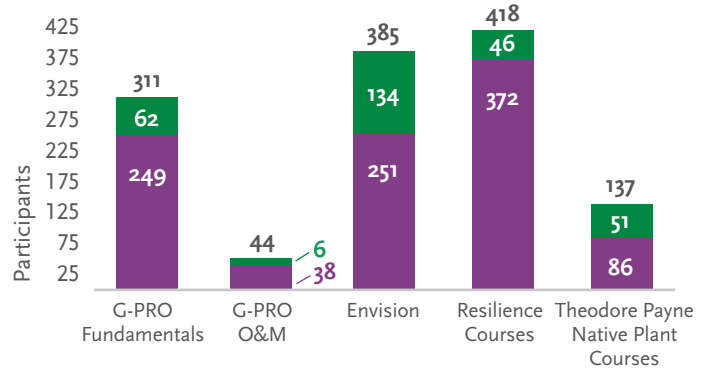
Built through a collaboration between internal Metro departments and external community partners, GGW provides tools for Angelenos to translate their personal expertise into sustainability solutions. Metro's Greener Working Group exemplifies these solutions in action. Employees certified in G-PRO or Envision meet quarterly to share ideas and identify opportunities to further embed sustainability solutions across the agency. This authentic engagement is driving a cultural revolution that is transforming all Metro employees into agents of change.



SUSTAINABILITY PROGRAM SUPPORT

Sustainability training informs employees about how sustainability innovations operate in order to enhance performance. As Metro deploys pilot programs and new technologies, such as permeable pavement and on-site solar photovoltaics (PV), it must also ensure program continuity and equipment operational efficiency through the development of staff skills. Metro's PV Operations and Maintenance Program is a unique example of building staff capabilities by providing on-site training on system maintenance. By engaging employees in strategic problem-solving, this program equips Metro staff to deliver effective sustainability solutions.

GGW Course Attendance (Inception through December 2018)



● Community Members

● Metro Staff



A series of GGW awareness campaign posters featuring Metro employees from across the agency



ENVIRONMENTAL COMPLIANCE TRAINING

Metro is dedicated to ensuring that staff understand regulatory requirements and are equipped to meet environmental compliance requirements. Compliance training courses target stormwater, industrial wastewater, hazardous waste, universal waste and storage tanks. In 2018, Metro launched its first online compliance training to increase access to the same high-quality instruction during all work shifts. The pilot increased annual training attendance by 11% and has prompted the development of additional online trainings.

ENERGY



PERFORMANCE METRIC

- **Energy Use**
- The energy use metric measures the efficiency by which Metro uses energy to provide its transit service. Sources of energy include electricity, natural gas, diesel and gasoline, which are used in a variety of ways to operate and maintain Metro's system.

Since 2017, Metro has reduced vehicle fuel energy use by **7.5%**

2018 PERFORMANCE

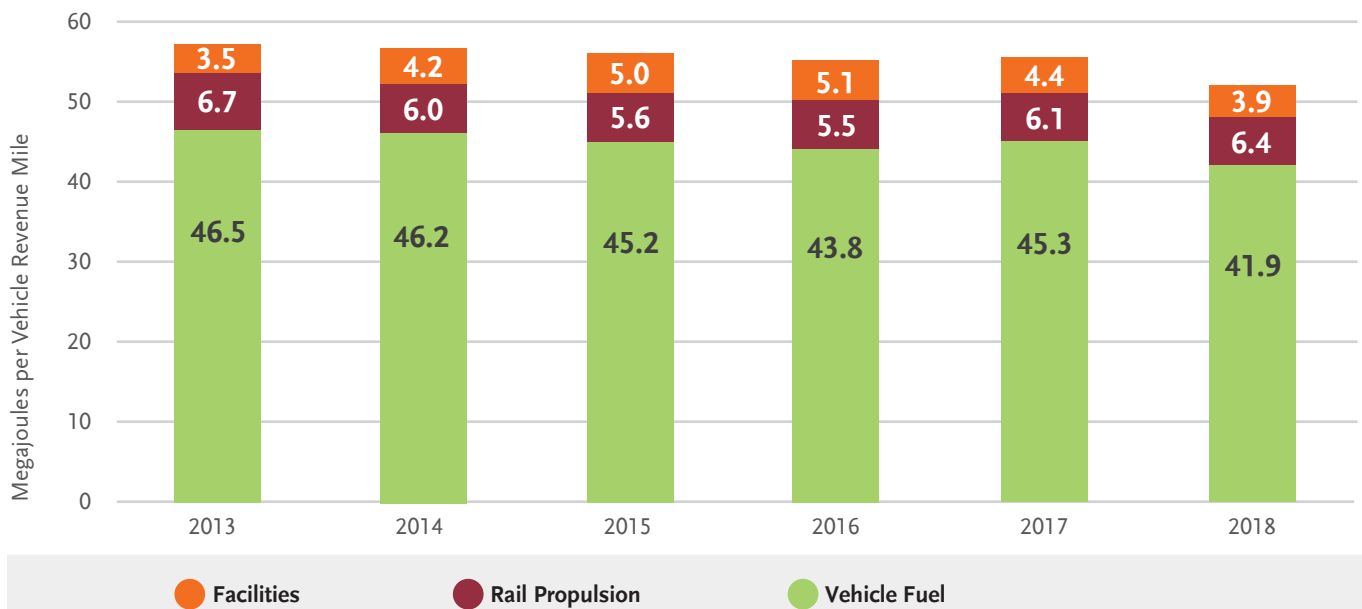
Since 2013, Metro has steadily reduced energy consumption through conservation measures, efficient building design and improved fuel efficiency. In 2018 alone, Metro reduced total energy consumption by 7.9% compared to 2017 as a result of reduced vehicle fuel consumption by buses and support vehicles.

Metro is on pace to surpass its goal of 33% renewable energy consumption by 2020. In 2018, 31% of Metro's electricity came from renewable energy sources, including its own solar PV systems. These strategies actively reduce GHG emissions, 95% of which are derived from energy use.

Metro is increasing its focus on energy efficiency in buildings as operations grow to meet the demands of a larger transit system. Integrated lighting controls, advanced energy management systems and reliance on renewable energy are included in design requirements to ensure new facilities will be equipped with efficient and effective technologies. As these new facilities become operational, Metro is also expanding its workforce training to build on current internal expertise. This training will ensure staff can troubleshoot and support these systems, maintaining their effectiveness long into the future.



Energy Use



Data Update: Metro's historical energy consumption has been updated to reflect additional information obtained as a result of improved data tracking processes established in 2018.



Metro staff conducting on-site PV maintenance training

CASE STUDY

SOLAR PV OPERATIONS AND MAINTENANCE PROGRAM

Clean Energy Future

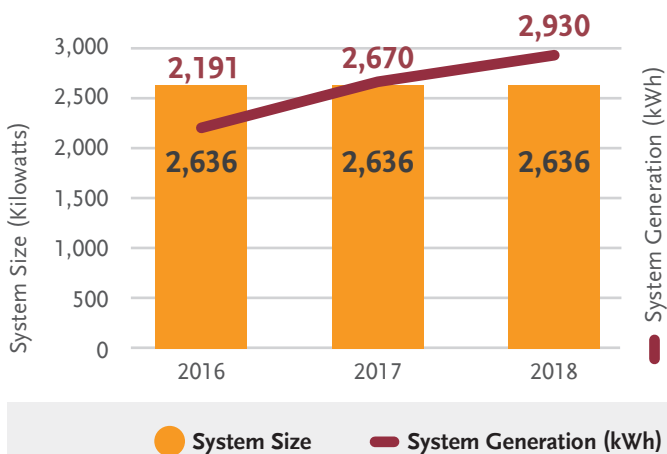
In 2011, Metro committed to using 33% renewable electricity by 2030. We are on track to achieve this goal, having reached 31% renewable electricity in 2018. Solar PV technology is a key component of Metro's overall renewable energy strategy. Metro generated 2.9 million kilowatt hours (kWh) from our PV installations in 2018 and is expecting additional PV systems to begin generating renewable energy in 2019 and beyond.

Maximizing Performance

To support our renewable energy investments, Metro launched the PV Operations and Maintenance Program in 2014, providing technical training and resources to Metro maintenance personnel at facilities that host PV systems. Since program inception, Metro has provided over 700 hours of training to 120 personnel, resulting in faster response times and more system uptime.

Working side by side with industry experts, this program teaches Metro staff to benchmark energy generation and troubleshoot issues, ensuring that the PV systems safely perform at peak capacity. As a result, system performance has improved year over year. The system output in 2018 represents a 25% increase since 2016 and a 9% increase since 2017. In 2018, Metro expanded the PV program by creating site-specific operation and maintenance resources and developed standard operating procedures, helping Metro care for its sustainability assets for the long term.

Solar System Size and Production



Metro has provided over **700 hours** of **green workforce training** to over **120** Metro personnel since 2014.

HIGHLIGHT: HOLISTIC BUILDING DESIGN AND PERFORMANCE



BUILDING COMMISSIONING

Metro's facilities play a critical role in delivering safe and reliable transit services across LA County. Our building commissioning process ensures new facilities are equipped for this task by embedding sustainability and performance considerations into every phase of a project, from design through operations. This holistic project delivery model supports extensive collaboration between project stakeholders, laying the foundation for long-term sustainability.

The Commissioning process used for Metro's newest maintenance facility, Location 64, was the most collaborative and successful to date. As the first of twenty expansion projects planned by 2028, Location 64 demonstrates how Commissioning advances Metro's regional mobility goals.

1 PLANNING AND DESIGN

The process begins with establishment of a project vision. At Location 64, system requirements and personnel work functions drove decision making, ensuring that facility design would support expected performance. Lessons learned from prior projects were reviewed during this phase to drive continual improvement.



2 SPECIFICATION REVIEW

The project Commissioning Authority (CxA) works with contractors to develop a Commissioning Plan and conduct a complete review of building specifications and construction drawings. For Location 64, this process verified the facility would meet project specifications and achieve ambitious LEED Gold certification requirements.



3 CONSTRUCTION

Once designs are approved, the CxA provides oversight throughout the construction process, confirming the facility is constructed to match the approved design and specifications. Construction at Location 64 began in winter 2018.



4 PERFORMANCE EVALUATION

Prior to occupancy, the CxA oversees performance testing of equipment, such as lighting controls and solar PV systems, validating that all systems perform as intended. This process is critical for high-activity facilities like Location 64 that operate 24/7 and rely on these systems to deliver service.



5 OPERATIONS AND MAINTENANCE

Commissioning continues long after a facility opens for business. The CxA monitors systems and equipment over time, ensuring optimal performance. This ongoing oversight at Location 64 enables Metro to support its expanding transit system safely and efficiently.



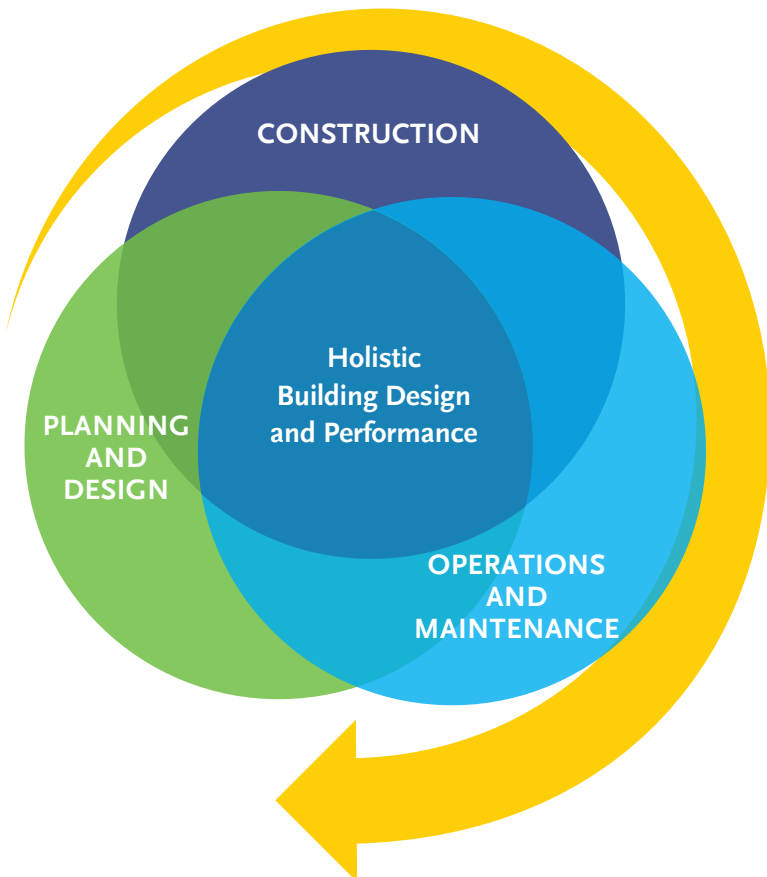
COLLABORATIVE COMMISSIONING— LOCATION 64

Building commissioning is emblematic of the broader, more collaborative process Metro uses when constructing projects like Location 64. This approach facilitates ongoing interaction between building designers, construction managers, operations staff and other key stakeholders such as local community members.

Using an iterative project development process, Location 64 effectively integrated community feedback into the final design by engaging passengers, local artists and community groups who contributed diverse perspectives and vision. When coupled with a thorough building commissioning process, Metro and its contracting partners produced an environmentally and socially responsible facility that fulfills the needs of transit operations and the local community.

How we work is emblematic of the culture Metro is building, as we strive to engage authentically and empower the community to be involved in our work connecting LA County.

Collaborative Commissioning Process



Commemorating collaboration at Location 64, Glyssa Alcazar, Construction Relations Officer, and Jim Cohen, Executive Officer, sign a beam

AGENTS OF CHANGE

- > Metro engineers, architects and designers developed designs and specifications.
- > Metro planners and environmental staff identified project expectations and sustainability strategies.
- > The **Commissioning Agent** represented Metro to ensure design and planning expectations were met.
- > The **Resident Engineer** represented Metro by supervising construction activities.
- > **Contractors and sub-contractors** helped Metro carry out the commissioning process and set the stage for a collaborative working environment.
- > The **Design Advisory Working Group**, comprised of community leaders and artists, reviewed the building's exterior design.

CONTINUOUS IMPROVEMENT AT WORK

This Commissioning process illustrates a well-developed culture of collaboration and innovation. To replicate the success of this project, Metro is including updated commissioning specifications in many of its upcoming projects and is developing agency-wide commissioning guidelines. It is essential for all Metro teams to have strong, cohesive working relationships like those developed at Location 64. As Metro cultivates this commissioning culture, these relationships will continue to strengthen across future projects, bringing Metro's Vision 2028 into full focus.

WATER



PERFORMANCE METRIC

- **Water Use**
- The water performance metric measures the agency's use of potable water for domestic plumbing, irrigation and other processes. The responsible use of water resources is critical in drought-prone Southern California.

Since 2013, water use has decreased by **34%**

2018 PERFORMANCE

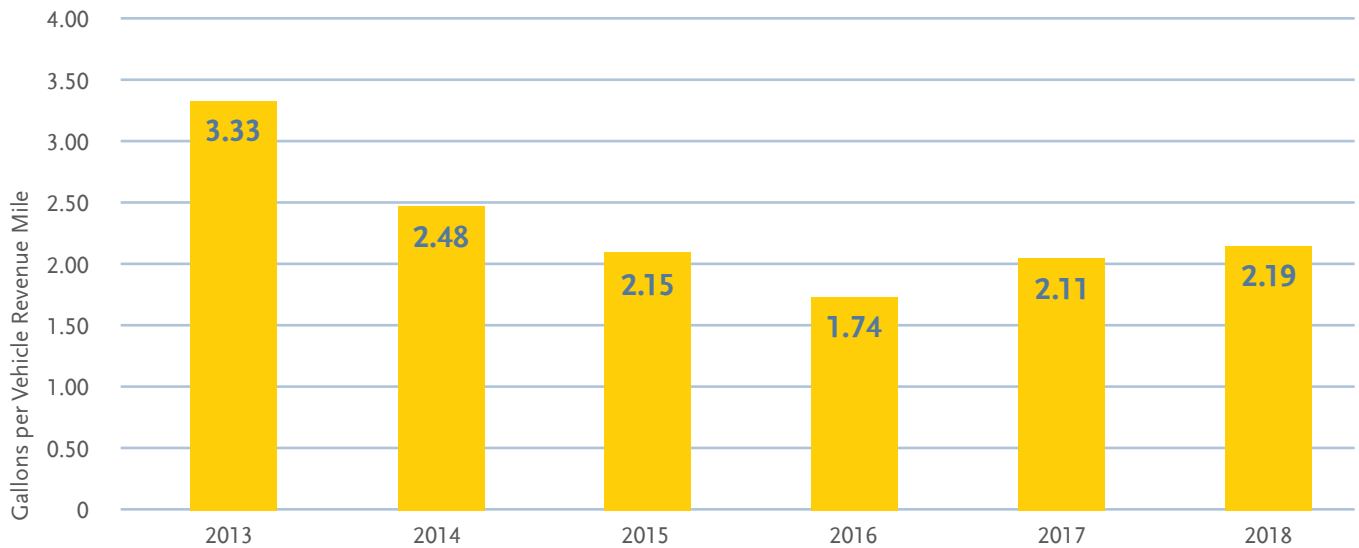
Metro has implemented water conservation measures, efficiency upgrades and enhanced water monitoring and management systems, resulting in a 34% reduction in water use since 2013. In 2018, Metro's baseline water use remained consistent with 2017 levels, although there was a slight increase in total water use resulting from the addition of new water services.

Metro continually works to update its data tracking processes to ensure that as transit services expand, new resources are appropriately documented and included in annual performance metrics. This rigorous process identified several water meters along the Expo Line expansion that are now quantified and reported for the first time in 2018.

As Metro continues to grow, reducing water consumption will require innovative systems to reduce demand and improve water use efficiency. In 2018, Metro continued implementing water-saving strategies such as retrofitting bus wash systems and installing smart irrigation controllers to reduce the water needs of essential functions. We will continue replicating these successful initiatives across the Metro System to further reduce water consumption in line with regional conservation goals.



Water Use



● Reported Consumption

Data Update: Metro's 2018 water consumption includes newly collected data obtained as a result of improved data tracking processes established in 2018.

Permeable pavement helps us conserve water and reduce the amount of stormwater runoff fees we pay. The money saved can be put to use elsewhere to improve sustainable service operations.

Cris Liban
*LA Metro Executive Officer
Environmental Compliance & Sustainability*

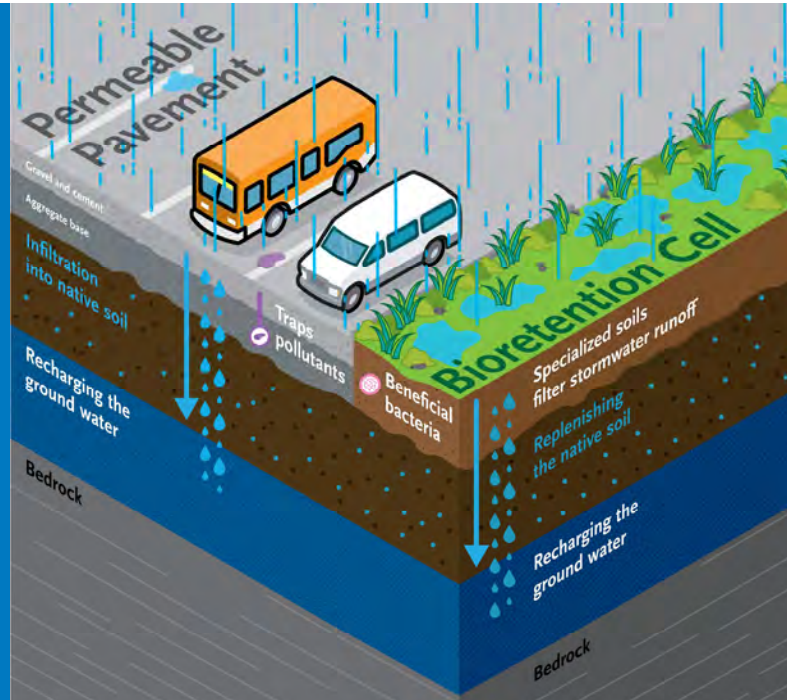


Diagram of permeable pavement and bioretention cell installation at the Division 4 bus facility

CASE STUDY

PERMEABLE PAVEMENT AND BIORETENTION PILOT PROJECT

Paving the Way Forward

In LA's drought-prone climate, stormwater capture presents a significant opportunity to reuse existing water resources. In 2018, Metro replaced 40,000 square feet of asphalt at the Metro Division 4 bus facility in Downey with permeable pavement and a landscaped bioretention area. This new installation can capture and filter more than 300,000 gallons of water during a single rain event, allowing this water to safely infiltrate into the ground to replenish local groundwater and aquifer systems.

Bus facilities require a large area of paved ground to store vehicles. Using this space to also capture stormwater helps Metro manage stormwater runoff while turning the space into a significant opportunity for water conservation. By directing water into the aquifer, away from storm drains, operating expenses and stormwater runoff fees are avoided and this water is cleaned and stored naturally for future use. Through this grant-funded pilot, Metro is working with regional partners to ensure the protection and management of local water resources.

Protecting Our Water and Wildlife

Responsible water management requires us to understand how we consume water and how our practices affect regional water resources and neighboring ecosystems. Stormwater runoff can carry pollutants that are hazardous to local wildlife. This pilot project was designed to stop pollutants such as oil and grease, metals and fertilizers from entering the LA River Estuary in Long Beach Harbor, where they could potentially harm native birds and marine life.

Unlike conventional pavement, permeable pavement uses a protective layer of larger rocks beneath the surface to trap pollutants, ensuring that the water is free of contaminants before infiltrating into our native soil and groundwater. Metro continues its commitment to testing and implementing low-impact development that protects our water resources.

Permeable pavement is an innovative stormwater management technique that allows water to **pass freely** through soil layers so it can **replenish groundwater**, while providing a **usable** and **lasting surface** for vehicle parking and operations.

WASTE



PERFORMANCE METRICS

- **Diversion from Landfill**
- **Total Solid Waste**

- The total solid waste and diversion from landfill metrics measure Metro’s municipal solid waste (MSW) generation and diversion resulting from Metro’s daily operations.
- Diversion from Landfill compares the total amount of MSW generated with the amount of solid waste that was diverted from landfill through reduction, reuse, recycling and organic waste recycling efforts.

In 2018, Metro increased total tons of diverted waste by **71%**

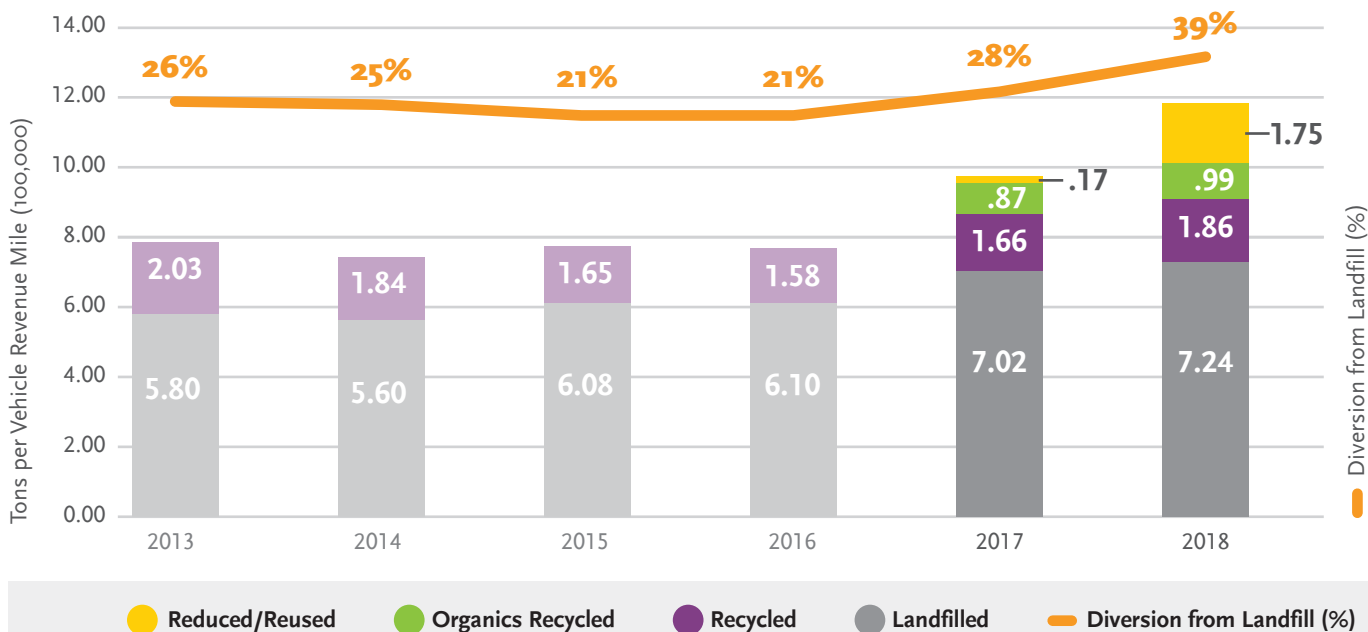
2018 PERFORMANCE

Metro increased the diversion rate from landfills in 2018 from 28% in 2017 to 39% by advancing recycling efforts agency-wide and identifying additional organic waste and waste prevention programs. As a result, Metro increased total tons of diverted waste by 71% in 2018. The disposal of solid waste in landfills is widely recognized as a significant source of GHG emissions, so these initiatives have a positive impact on regional GHG emissions reductions.

With the establishment of a solid waste baseline in 2017, Metro renewed its focus on increasing diversion from landfills while simultaneously decreasing the generation of waste through prevention and sustainable procurement efforts. While recycling continues to play a role in Metro’s waste management strategy, changes in the international recycling market over the last year highlight that relying on recycling is not a perfect solution. Metro recognizes the need to prioritize waste prevention and understands that upstream solutions, such as thoughtful purchasing and vendor partnerships, will play an increasingly important role in Metro’s waste management program in the future.



Diversion from Landfill Total Solid Waste



Data Update: The color change in 2017 indicates Metro’s adoption of a new solid waste baseline including reduced/reused materials and organics recycling.



Heavy-duty block wooden pallets stored at Metro's Central Maintenance Facility

CASE STUDY

PALLET RETURN PROGRAM

Breaking the Cycle

Metro's Central Maintenance Facility (CMF) relies on wooden pallets to distribute materials and supplies to support daily operations at its facilities across LA County. In 2018, Metro's Pallet Return Program prevented approximately 2,100 tons of wood waste from going to landfills, substantially reducing the GHG emissions associated with organic waste disposal.

CMF implemented a program to replace the standard wooden pallets used for inventory storage and distribution with heavy-duty block wooden pallets. The new pallets are far more durable than conventional slatted pallets and can survive an average of five times the number of trips, increasing opportunities for reuse. CMF's automated storage and retrieval system safely stores the pallets, further extending their useful life.

CMF's warehouse inventory contains 95% of the replacement parts required by bus and rail divisions to ensure vehicles operate safely and efficiently. Consequently, CMF fulfills nearly 360,000 inventory requests per year. Minimizing the material packaging and goods movement in this distribution process has a significant impact on reducing solid waste and greenhouse gas emissions.

Being Resourceful

Reducing waste begins with throwing less away, but it also requires considering material lifecycle and sustainability goals in agency-wide procurement decisions. The Pallet Return Program is not only a waste prevention measure, but it is also one of Metro's many sustainable procurement initiatives.

The heavy-duty wooden block pallets were purchased with upstream and downstream impacts in mind. They contain recycled wood materials and are strictly evaluated for usability before being slated for disposal. This reduces raw material extraction, keeps wood waste out of landfills and substantially reduces operational expenses.

CMF's heavy-duty pallets last nearly **five times as long** as their standard wooden counterparts, preventing approximately **2,100 tons of wood waste** from going to landfills each year.

CONCLUSION

Since the inception of the *Energy & Resource Report* in 2009, Metro has made tremendous progress advancing mobility solutions that enhance quality of life, while addressing the most pressing social, economic and environmental issues of our time. The past ten years represent an era of expansion at Metro. Throughout our growth, our sustainability programs have been successful at improving performance across all our sustainability metrics.

In 2018, we are proud to report improvements across several areas, including reductions in GHG and criteria air pollutant emissions, advancements in energy efficiency and an increase in waste diversion. Our progress over the last year highlights the importance of collaboration and innovation within Metro and across our community. The growth and impact of Metro's Environmental Training Institute and building commissioning practices exemplify what is possible when we bring people to the forefront and build diverse partnerships that enable real transformation.

While we celebrate these accomplishments, we also recognize the need to re-envision the future of Metro's sustainability movement. The trends in this report help us identify opportunities for improvement, such as optimizing water use, so we can identify strategic solutions to address these areas moving forward. However, Metro understands that we must look beyond conventional resource management and expand the scope of sustainability in order to enhance the quality of life for all who live, work and play within LA County.

Looking ahead, we are prioritizing adaptation and resilience in our decision-making to ensure that our transit infrastructure is prepared for the impacts of climate change. We are improving public health and addressing environmental justice. We are seeking additional ways to engage with all of our stakeholders, including the most vulnerable.

These principles lie at the foundation of Metro's upcoming plan, *Moving Beyond Sustainability*, which will outline a comprehensive sustainability strategy for the next ten years. The plan will combine the robust sustainability efforts of Metro's Environmental Compliance and Sustainability and Countywide Planning and Development departments, while strategically aligning Metro's sustainability program with other key guidance documents, including *Vision 2028*, the *Long-Range Transportation Plan*, the 2019 *Climate Adaptation and Action Plan*, the *Equity Platform Framework* and the *Resiliency Indicator Framework*.

Metro's annual sustainability report will be transformed in the coming years to reflect a unified approach to sustainability. We will continue reporting on the APTA sustainability metrics, while expanding the scope of the report to fully integrate sustainability into Metro's planning functions and inspiring partnerships that lead to more sustainable communities. This broader scope better reflects Metro's holistic approach to sustainability, including how we prioritize equity, develop authentic community partnerships and embed sustainability into every agency function.



MOVING BEYOND SUSTAINABILITY

formally strengthens our commitments to **environmental stewardship, diversity, inclusion and community resilience.**

This is the next bold step Metro is taking to **improve quality of life for all Angelenos.**



To North Hollywood
To Wilshire/Western



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