CHAPTER 07

TRANSPORTATION

THE CITY OF LAKEWOOD and its residents recognize and value the importance of multiple safe, reliable, and affordable transportation choices for all users in order to foster a healthy and thriving community. Lakewood envisions a future with a convenient and resilient transportation system that improves our quality of life by making our streets safer, our air cleaner, and our community better connected.

GOALS

- Develop, maintain, and operate sustainable transportation systems and infrastructure.
- Foster sustainable transportation choices in Lakewood.

TARGETS

- Convert all streetlights to LED or other high efficiency lighting technologies by 2025.
- Reduce Lakewood's daily per capita vehicle-miles-traveled by 10 percent by 2025.*
- Reduce the percent of trips to work by single-occupancy vehicles from 75 percent to 65 percent by 2025.*
- Reduce petroleum-based fuel consumption of the City fleet by 10 percent by 2025.**

* Baseline: 2007
** Baseline: 2014

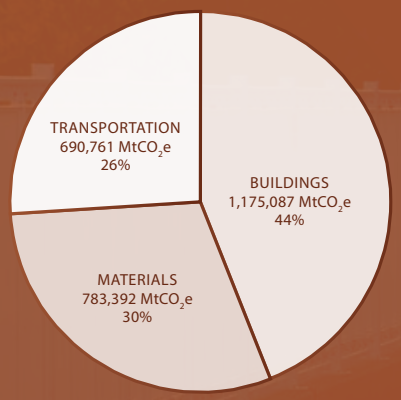
TRANSPORTATION: GREENHOUSE GAS EMISSIONS REDUCTION POTENTIAL

BASELINE		
EMISSIONS BY SECTOR – MT CO_2E		
BUILDINGS	1,175,087	44%
MATERIALS	783,392	30%
TRANSPORTATION	690,761	26%
TOTAL GHG	**2,649,240**	**100%**

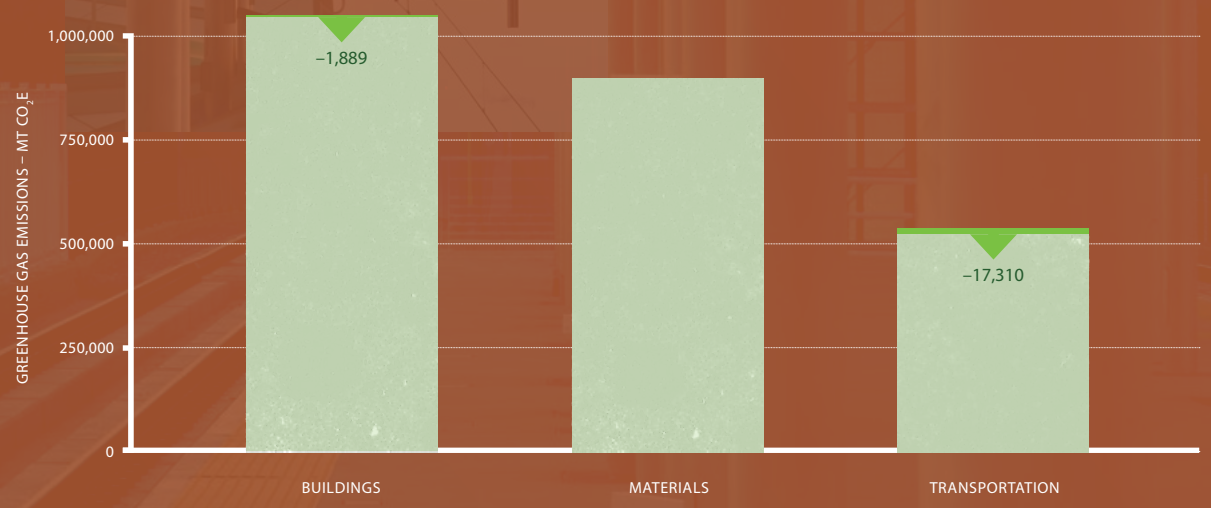
2025 BUSINESS AS USUAL (BAU)			
EMISSIONS BY SECTOR – MT CO_2E			CHANGE
BUILDINGS	1,053,368	42%	– 121,719
MATERIALS	903,600	36%	+ 120,209
TRANSPORTATION	539,165	22%	– 151,596
TOTAL GHG	**2,496,133**	**100%**	**–153,107**

2025 AFTER TRANSPORTATION STRATEGIES ARE IMPLEMENTED			
EMISSIONS BY SECTOR – MT CO_2E			CHANGE
BUILDINGS	1,051,479	42%	– 1,889
MATERIALS	903,600	36%	0
TRANSPORTATION	521,854	21%	– 17,310
TOTAL GHG	**2,476,934**	**100%**	**– 19,199**

2007 BASELINE EMISSION BREAKDOWN



IMPACT OF TRANSPORTATION STRATEGIES ON 2025 BUSINESS AS USUAL (BAU)



A SUSTAINABLE TRANSPORTATION SYSTEM ENHANCES THE CONNECTION BETWEEN PEOPLE AND PLACES.

RESOURCE EFFICIENT INFRASTRUCTURE, effective maintenance, and low impact-travel produces accessible and affordable multimodal transportation options. Sustainable transportation systems provide the infrastructure and systems that people need to choose travel options that reduce greenhouse gas emissions and are healthier and more affordable than the traditional single-occupancy vehicle.

Today's transportation system is predominantly focused on an efficient network of highways and roads that connect communities and businesses. In Lakewood, 77 percent of commuters drive alone to work, creating traffic congestion and releasing pollutants and greenhouse gas emissions into the air.[1] The transportation sector contributes 27 percent of Lakewood's greenhouse gas emissions, 19 percent of which comes from gasoline vehicles. Reducing the number of vehicle-miles-traveled and switching to cleaner fuels protects air quality and reduces greenhouse gas emissions.

The Comprehensive Plan includes the chapter, *Lakewood Moves*, to address multimodal transportation systems, future transportation planning, complete streets, and transportation signage. These concepts lay a strong foundation for a sustainable transportation system that fuels our economy and is accessible by all. The strategies in the Sustainability Plan support, complement, and expand on the concepts found in the Comprehensive Plan.

[1] Denver Regional Council of Governments. "Lakewood Community Profile." Last Updated: March 2014. http://gis.drcog.org/datacatalog/content/lakewood-community-profile.

TRENDS AND OPPORTUNITIES

SUSTAINABLE TRANSPORTATION SYSTEMS AND INFRASTRUCTURE

Transportation systems require continuous maintenance and repair in order to ensure safe and efficient travel. Operations, such as snow and ice removal, traffic signal timing, and road repair, can significantly affect the natural environment through chemical use and vehicle emissions. In the last decade, a variety of technologies and techniques have been developed to more effectively manage the use of materials, improve route efficiency, and extend the life span of roads.

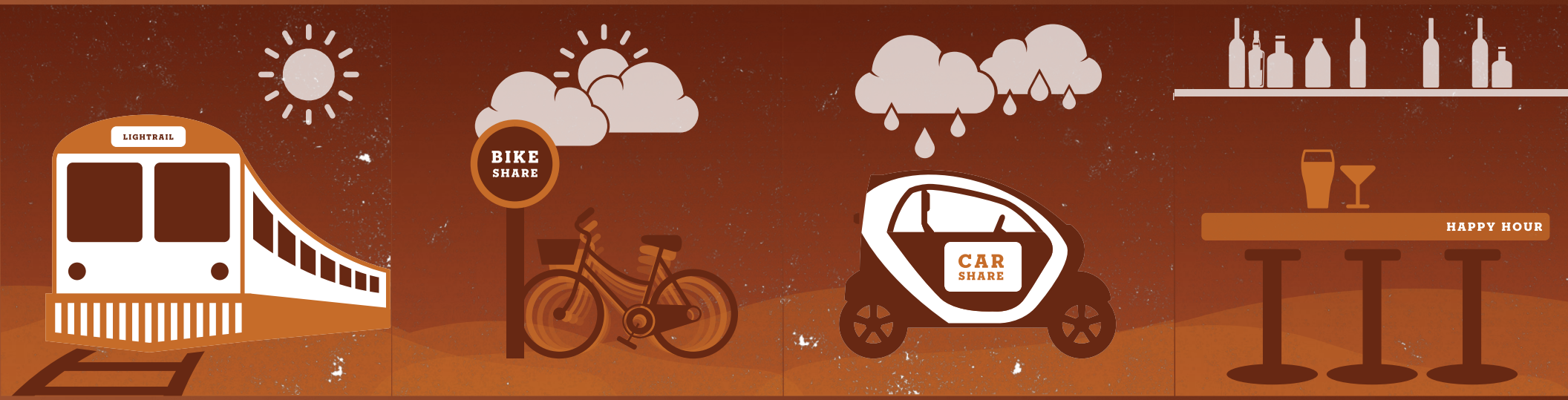
Electronic fleet management systems are an increasingly popular choice for organizations seeking more efficient ways to track vehicle and driver performance. On-board diagnostics and GPS technology enable both a fleet manager and an operations manager to coordinate schedules and anticipate needs. For the street maintenance division, this has the potential to reduce vehicle miles traveled, and idling and to help manage the amount of materials used for snow and ice removal.

The City of Lakewood is continuously seeking ways to incorporate sustainable features into its transportation systems. From LED traffic signals to recycling asphalt, the City recognizes the impact of its transportation system on the social, environmental, and economic well-being of the community.

MULTIMODAL NETWORKS

A multimodal transportation system provides infrastructure for pedestrians, bicycles, automobile, and transit. Expanding that system to

INTEGRATED NETWORKS OF TRANSPORTATION OPTIONS CAN MAKE TRAVEL EASY, AFFORDABLE, AND FUN



COMMUTE by light rail or bus.

BIKE for short trips and errands.

CAR SHARE for when the weather doesn't cooperate and other convenience trips.

RIDE SHARE services for when you want someone else to do the driving for you.

create a network involves creating connections between the various modes in order to increase accessibility and build awareness. The City of Lakewood covers more than 27,000 acres of land, which requires a mix of well-connected travel modes to provide access for people with different travel preferences and abilities. This network looks different throughout the city. While some neighborhood streets might be suited for a shared road and sidewalk, more urban areas might include a separate bicycle lane, sidewalks, automobile traffic lanes, and transit routes. The network as a whole should be planned and designed to safely facilitate all types of uses and users.

Multimodal transportation also ensures that active transportation infrastructure is available to support public health. Many who might choose to walk or bike are often deterred by barriers that affect safety or result in significantly increased travel times. Sustainable, multimodal transportation networks address these concerns through education, infrastructure, and supportive facilities, ensuring accessibility for all users.

RIDE SHARING

Ride sharing is a rapidly growing facet of the sharing economy. Ride sharing ranges from informal carpooling between neighbors to formal car share memberships, such as Car2Go and Zipcar. As more people participate in the trend and the industry grows, convenience and reliability improves, making it an attractive alternative to the expenses of car ownership. Many organizations coordinate ride sharing as part of their commuting programs, which saves employees money, reduces parking and traffic congestion, and improves air quality by taking vehicles off the road.

> The network as a whole should be designed to safely facilitate all types of uses.

Common barriers to ride sharing include lack of awareness and perceived inflexibility that comes with coordinating with another's schedule. Researchers have shown that a variety of improvements and incentives can remove these barriers and increase participation. Some

examples include priority parking spaces and ride matching, which identifies people who live and work close to each other. Ride sharing programs can attract between 10 to 30 percent of commuter trips if they offer information, engagement, and financial incentives.[2]

ALTERNATIVE FUELS

Over a dozen alternative fuels are in production or under development for use in the United States.[3] Compared to conventional fuels, which are derived from petroleum, alternative fuels reduce air pollution and other vehicle emissions. Although public and private vehicle fleets are the primary users of alternative fuel vehicles, individuals are increasingly joining the alternative fuel market. In 2013, 32 new alternative fuel incentives were established by public and private entities, and 54 new laws and regulations were enacted.[4] The most popular alternatives include ethanol blends (E85), propane, compressed natural gas, and electricity.[5] In Colorado, there are approximately 1,300 plug-in electric vehicles, and such cars are expected to grow over the next 10 years.[6] Community partners, such as the Denver Metro Clean Cities Coalition, are working to increase that number, along with other alternative fuel vehicles through education, policy development, and partnerships. The City of Lakewood actively collaborates with regional partners to further this mission and currently has four electric vehicles. The City recognizes the environmental and economic benefits from alternative fuels and continues to explore opportunities to expand its alternative fuel vehicle fleet. ■

RIDE SHARING

Ride sharing programs can attract between 10 to 30 percent of commuter trips.

[2] Victoria Transport Policy Institute. "Ridesharing: Carpooling and Vanpooling." TDM Encyclopedia. Last Updated: June 4, 2014. http://www.vtpi.org/tdm/tdm34.htm.
[3] U.S. Department of Energy. "Alternative Fuels and Advanced Vehicles." Last Updated: November 22, 2014.
[4] U.S. Department of Energy. "State Alternative Fuel and Advanced Vehicle Laws and Incentives: 2013 Year in Review." Last Updated: August 6, 2014.
[5] Energy Information Administration. Alternative Fuel Data. http://www.eia.gov/renewable/afv/users.cfm#tabs_charts-2.
[6] Denver Metro Clean Cities Coalition. "Project FEVER." 2014. http://www.denvercleancities.org/project_fever.html.

GOAL **T1**

DEVELOP, MAINTAIN, AND OPERATE SUSTAINABLE TRANSPORTATION SYSTEMS AND INFRASTRUCTURE.

TARGETS

- Convert all streetlights to LED or other high efficiency lighting technologies by 2025.

OBJECTIVES & INDICATORS

- **OBJECTIVE:** Ensure efficient and effective street maintenance operations that protect the environment.
  - INDICATOR: Annual vehicle miles traveled (VMT) in street maintenance operations
  - INDICATOR: Concentration of criteria air pollutants

- **OBJECTIVE:** Enhance resource efficiency of lighting, street construction materials, and other transportation infrastructure.
  - INDICATOR: Street construction waste diversion rates
  - INDICATOR: Percentage of recycled materials used in street maintenance and construction
  - INDICATOR: Street and signal lighting energy use

IMPLEMENTATION STRATEGIES

T1-A ENVIRONMENTALLY FRIENDLY AND EFFICIENT STREET MAINTENANCE OPERATIONS

Protect the environment, reduce air and water pollution, and improve vehicle efficiency while maintaining a high level of service in street maintenance operations. Specifically:

- Use electronic fleet management systems to improve route and resource efficiency in City fleet;
- Use on-board technologies to manage and track materials used in snow and ice operations; and
- Update standards and procedures for street sweeping and snow and ice operations regularly.

T1-B ROADSIDE VEGETATION

Increase the viability and extent of roadside landscaping and vegetation through coordinated planning efforts to assess infrastructure, design, plant selection, and street maintenance operations.

T1-C STREET AND SIGNAL LIGHTS

Convert street and signal lights to LEDs or other high-efficiency technologies. Specifically:

- Customize streetlight replacement programs through acquisition of existing infrastructure, metering, or tariff adjustments;
- Work with Xcel to install LED or other high-efficiency technologies for all new street and signal lights; and
- Research and, when appropriate, pilot emerging high-efficiency streetlighting technologies and design (e.g., solar, motion detection, ambient light detection).

T1-D SUSTAINABLE STREET REPAIR AND CONSTRUCTION

Ensure sustainable street repair and construction. Specifically:

- Explore opportunities to use sustainable technologies and materials; and
- Incorporate zero waste principles for projects that maximize local and recycled material sources, recycle waste materials, and maximize the lifespan of materials through an efficient street repair schedule.

SUPPORTING STRATEGIES	
COLLABORATION	■ Work with nearby jurisdictions and agencies to share best practices and maximize networks (e.g., signal timing efficiency).
EDUCATION & PROMOTION	■ Educate the public about sustainable street maintenance, including snow removal chemicals and signal light timing and route efficiency.
TOOLS & TECHNOLOGY	■ Monitor emerging technologies and data-analysis tools to support efficient and adaptive transportation systems.
RESEARCH & TRACKING	■ Research environmentally friendly transportation materials and technology, including treatments, signage, striping, and lighting. ■ Research technologies, materials, and design that improve stormwater drainage, including permeable pavements, heated streets, and green infrastructure.

CROSSCUTTING STRATEGIES	
SUSTAINABLE BUSINESS HUB SE1-E | P. 61	■ Transfer sustainable transportation infrastructure and operational knowledge from the City to property owners and managers responsible for surface maintenance on private property.

TABLE TE1-1: STRATEGY BENEFITS

STRATEGY	ENVIRONMENTAL BENEFITS		ECONOMIC BENEFITS		SOCIAL BENEFITS	
	GHG REDUCTION POTENTIAL	ECOSYSTEM HEALTH	SELF-RELIANCE	HOUSEHOLD BENEFITS	COMMUNITY COHESION	PUBLIC HEALTH
T1-A: Environmentally Friendly and Efficient Street Maintenance Operations	🍃	■■■	■	⊘	■	■■
T1-B: Roadside Vegetation	🍃	■■■	■	⊘	■	■■■
T1-C: Street and Signal Lights	🍃	■■	■	⊘	■	■■
T1-D: Sustainable Street Repair and Construction	🍃	■■■	■■	⊘	■	■■■

🍃 <5,000 $MtCO_2e$ Greenhouse Gas Emissions 🍃 ~10,000 $MtCO_2e$ Greenhouse Gas Emissions

■■■ High ■■ Medium ■ Low ⊘ Does Not Apply

TABLE TE1-2: STRATEGY FEASIBILITY

STRATEGY	CITY OF LAKEWOOD			COMMUNITY	
	UPFRONT COSTS	ONGOING COSTS	PAYBACK / REVENUE POTENTIAL	FINANCIAL BENEFIT FOR RESIDENTS	FINANCIAL BENEFIT FOR BUSINESSES
T1-A: Environmentally Friendly and Efficient Street Maintenance Operations	$ $	✓	✓	–	–
T1-B: Roadside Vegetation	$	✓	–	–	–
T1-C: Street and Signal Lights	$$$$	–	✓	–	–
T1-D: Sustainable Street Repair and Construction	$	✓	–	–	–

$** < 50,000 **$$** = 50,000–100,000 **$$$** = 100,000–1,000,000 **$$$$ > 1,000,000

GOAL **T2**

FOSTER SUSTAINABLE TRANSPORTATION CHOICES IN LAKEWOOD.

TARGETS

- Reduce Lakewood's daily per capita vehicle-miles-traveled by 10 percent by 2025.*
- Reduce the percent of trips to work by single-occupancy vehicles from 75 percent to 65 percent by 2025.*
- Decrease petroleum-based fuel consumption of the City fleet by 10 percent by 2025.**

OBJECTIVES & INDICATORS

- **OBJECTIVE:** Facilitate the use of an affordable and accessible, multimodal transportation system.
  - INDICATOR: Commuter mode split
  - INDICATOR: Transit ridership
  - INDICATOR: Percentage of household income spent on transportation
  - INDICATOR: Bicycle level of service
  - INDICATOR: Number of miles of bike trails and routes and number and length of missing segments
  - INDICATOR: Bicycle traffic counts

- **OBJECTIVE:** Promote alternative fuel vehicles and fuel efficiency.
  - INDICATOR: Number of alternative fuel vehicles in Lakewood
  - INDICATOR: Number of alternative fuel vehicles in the City's fleet
  - INDICATOR: Number of alternative fuel stations in Lakewood
  - INDICATOR: Average miles per gallon of vehicles in Lakewood

* Baseline: 2007
** Baseline: 2014

IMPLEMENTATION STRATEGIES

T2-A BICYCLE AND PEDESTRIAN PLANNING AND OUTREACH

Remove barriers to bicycle and pedestrian transportation through a comprehensive strategy. Specifically:

- Coordinate with diverse community groups to identify barriers in bicycle and pedestrian networks;
- Facilitate participation in initiatives and programs that encourage residents to use bicycle and pedestrian transportation, including bike to work days, neighborhood challenges, transit riding training, traffic safety workshops, and various school based programs;
- Utilize available technologies to gather bicycle user reviews and feedback to measure bicycle level of service and stress, and encourage bicycle advocates to lead the effort;
- Develop strategies to encourage maintenance of pedestrian and bicycle routes on private and public property, including snow removal and landscape maintenance;
- Incorporate bicycle level of stress, which classifies routes based on perceived safety issues, into a bicycle level of service rating; and
- Support Comprehensive Plan goals to improve the pedestrian and bicycle environment within the city.

COMMUNITY SPOTLIGHT

WAY TO GO: A BETTER WAY TO BUILD COMMUNITY

BY KENNETH BODEN, DENVER REGIONAL COUNCIL OF GOVERNMENTS

ANALYZE AND INFORM

Way to Go understands that organizing a community to do the right thing often leaves one wondering where to start. Whether the decision is to build customized commute plans for participants, to set up the schoolpool program for neighborhood children, or to start a friendly competition to see who can leave their car at home the most, Way to Go has the tools to help launch small or large initiatives and can help organizers ask the right questions and analyze the results to learn what programs are the most effective for the community. Way to Go can provide support every step of the way, helping to explain the nuts and bolts of the program.

COMMUNITY BENEFITS

When communities partner with Way to Go, positive results happen. Participants who pledge to use active transportation (walking or biking) see health benefits and help make their communities a friendlier place to get around. Those who form carpools and vanpools save money, reduce stress, and build their professional networks. Those who take public transportation increase their work productivity, reduce stress, and help to take single-occupancy vehicles off of increasingly congested roads. By seeking greater community connectivity and improving the quality and number of viable transportation options, neighborhoods thrive.

MYWAYTOGO.ORG

MyWayToGo.org is an easy-to-use website where you can learn how to save money, burn more calories, save time, and reduce carbon emissions by adopting smart commuting practices. The Way to Go program helps concerned citizens take those first steps toward building a better community. ■

T2-B TRANSPORTATION MANAGEMENT SERVICES

Collaborate with west metro agencies to develop an approach, or several, to provide sustainable transportation management services. Specifically:

- Develop mode-shift programs;
- Participate in transportation policy monitoring and advocacy;
- Coordinate vehicle share and transit operations;
- Enhance transit facilities and technologies;
- Expand transit pass options and incentives; and
- Support Comprehensive Plan goals related to transportation management, connectivity, transit service, and multimodal transportation.

T2-C WAY TO GO

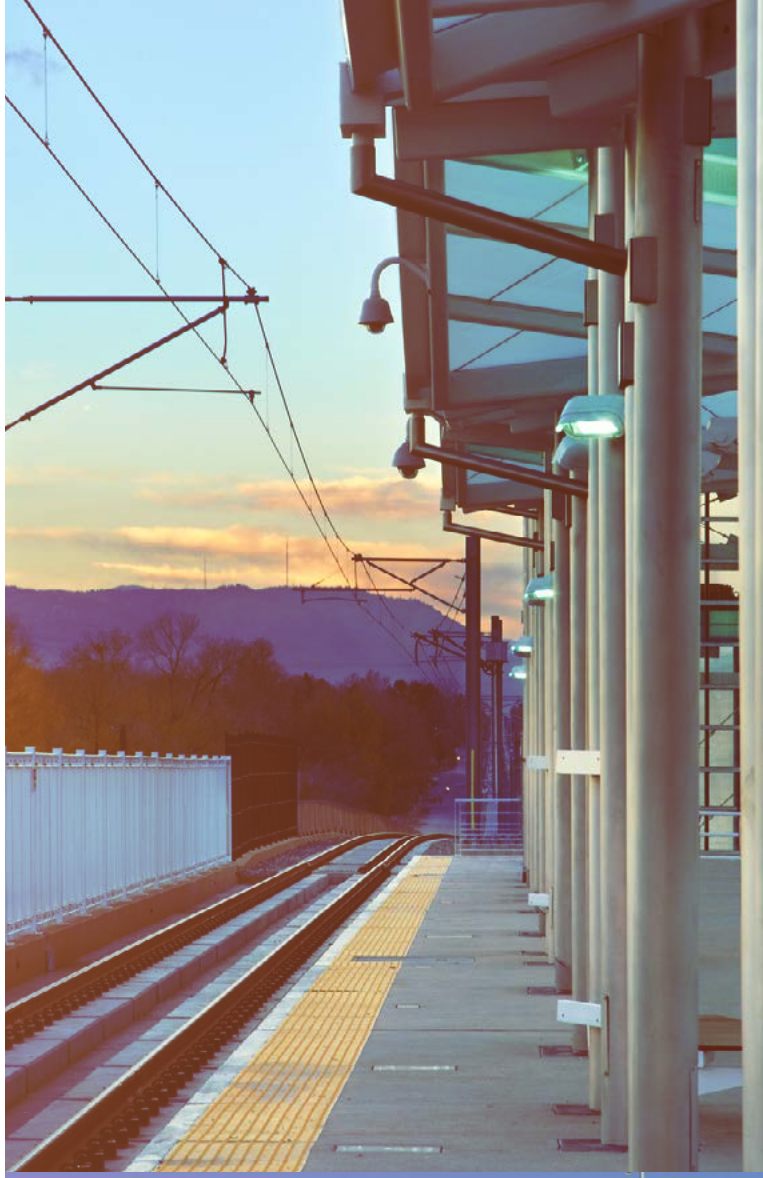
Utilize and promote the suite of transportation management tools available through Denver Regional Council of Governments' Way to Go program. Specifically:

- Use Way to Go employer services and Web-based tools to coordinate transportation options for City employees, including carpool, vanpool, transit, biking, and guaranteed-ride-home programs;
- Identify opportunities to use Way to Go's customizable crowdsourced ride share platform to coordinate transportation to City of Lakewood events;
- Encourage businesses to use Way to Go's employer services;
- Promote the suite of Way to Go tools for daily travel and special events to neighborhood groups, Homeowners Associations, schools, and other community organizations; and
- Support the Comprehensive Plan goals to promote the use of shared transportation options through shared bicycle systems and expanded car share operations.

T2-D CITY FLEET

Develop a strategic plan to increase fuel efficiency and incorporate alternative fuel vehicles into the City vehicle fleet. Specifically:

- Assess the City fleet to understand the range of vehicle classes, roles of vehicles used, and potential for reducing petroleum-based fuel consumption;
- Research and recommend cost effective and maintainable fuel-efficient or alternative fuel vehicle options to departments that are replacing or acquiring new vehicles;
- Educate employees on the benefits of fuel-efficient practices and alternative vehicles;
- Consider adopting vehicle class or use specific strategies to reduce petroleum-based fuel consumption;
- Consider incorporating fuel efficiency or emission requirements during licensing and in contracts for City projects; and
- Explore opportunities to develop and encourage development of alternative fuel infrastructure, including compressed natural gas and electric charging stations.



SUPPORTING STRATEGIES

COLLABORATION	▪ Partner with other jurisdictions and agencies on bike way finding systems, including digital and print resources and signage.
EDUCATION & PROMOTION	▪ Promote the benefits of alternative fuel vehicles and fuel-efficient practices to Lakewood residents and businesses. ▪ Promote transportation management programs to residential property managers to include as an amenity to renters.
TOOLS & TECHNOLOGY	▪ Monitor mobile technologies that facilitate multimodal transportation use and efficiency. ▪ Explore crowdsource data collection tools to inform transportation management and infrastructure.
RESEARCH & TRACKING	▪ Research best practices for incorporating alternative fuel vehicle infrastructure, including electric vehicle charging stations, into site planning requirements. ▪ Monitor resident satisfaction with Lakewood's transportation environment. ▪ Monitor pedestrian and bicycle safety statistics.

CROSSCUTTING STRATEGIES

SUSTAINABLE BUSINESS HUB SE1-E | P. 61	▪ Incorporate sustainable commuting programs aimed at employees into a green business certification program. ▪ Incorporate sustainable commuting programs and infrastructure aimed at customers into a green business certification program.
SUSTAINABLE NEIGHBORHOODS CC1-D | P. 102	▪ Work with neighborhoods to pilot community-based transportation management programs. ▪ Work with neighborhoods to collect bicycle user review and feedback data to measure level of service and stress.

TABLE TE2-1: STRATEGY BENEFITS

STRATEGY	ENVIRONMENTAL BENEFITS		ECONOMIC BENEFITS		SOCIAL BENEFITS	
	GHG REDUCTION POTENTIAL	ECOSYSTEM HEALTH	SELF-RELIANCE	HOUSEHOLD BENEFITS	COMMUNITY COHESION	PUBLIC HEALTH
T2-A: Bicycle and Pedestrian Planning and Outreach	🍃	■	■■	■■	■■	■■■
T2-B: Transportation Management Services	🍃	■■	■■	■■	■■	■■■
T2-C: Way to Go	🍃	■■	■■	■■	■■	■■■
T2-D: City Fleet	🍃	■■	■	⊘	⊘	■

🍃 <5,000 $MtCO_2e$ Greenhouse Gas Emissions 🍃 ~10,000 $MtCO_2e$ Greenhouse Gas Emissions

■■■ High ■■ Medium ■ Low ⊘ Does Not Apply

TABLE TE1-2: STRATEGY FEASIBILITY

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T2-A: Bicycle and Pedestrian Planning and Outreach	$$	✓	–	✓	✓
T2-B: Transportation Management Services	$$	✓	–	✓	✓
T2-C: Way to Go	$	–	–	✓	✓
T2-D: City Fleet	$$$$	✓	–	–	–

$** < 50,000 **$$** = 50,000–100,000 **$$$** = 100,000–1,000,000 **$$$$ > 1,000,000