BENEFITS

CHAPTER 7

7.1 Bicycle Ridership

The City of Merced is a firm advocate for high quality of life for all its residents, and continues to develop its bikeway system. The University of California at Merced opened its newest campus just outside the Merced City limits, less than two miles northeast of Merced, in 2005. The University is considered a "Green" campus, which is highly committed to conservation of energy and the environment. With this level of commitment to the environment, the City expects a number of students and staff will use alternative modes of transportation while commuting to and from the campus. Merced hopes that with the addition of new bikeways and continued unyielding commitment to expand its bikeway network, as well as the anticipated influx of university students and staff, there will be a dramatic increase of bicycle trips.

7.1.1 Estimated Current and Increased Bike Ridership

From the U.S. Census 2006-2010 American Community Survey, there are an estimated 373 bicycle commuters in Merced, or 1.3% of the work force (these figures do not include students commuting to school).

The *Merced County Association of Governments* forecasts that implementation of the *2013 BTP* will expand and enhance the comprehensive, continuous, and well-maintained bikeway network, maximizing bicycling benefits to the area's cycling and non-cycling public; and will raise the percentage of bicycle commuters (employees and students). This increase will be supplemented by a ridership growth of other bicyclists (recreational, avid, short-trippers, shopping, commuting, etc.).

The Merced County Association of Governments (MCAG) prepared the estimated increase in bicycle ridership that would result from implementation of the *City of Merced 2013 Bicycle Transportation Plan*, and was primarily determined using a benefits methodology that has been widely used for evaluating Congestion Mitigation and Air Quality (CMAQ) projects. Most of these estimated increases are from "bicycle commuters."

The CMAQ benefits methodology was developed by the California Air Resources Board (CARB) in cooperation with Caltrans and the California Air Pollution Control Officers Association. The methodology relies on several factors including: (1) average daily traffic (ADT) volumes; (2) adjustment factors based on ADT and facility type (bike path or bike lane); and (3) adjustment credits for proximity to activity centers.

Applying this approach to the plan's prioritized projects numbered 1 to 9, an increase in bicycle ridership of 699 daily bicycle trips is estimated. A second estimate focused on the 5-year life of the plan that assumed implementation of prioritized projects numbered 1 and 2, resulted in an increase in bicycle ridership of 373 daily bicycle trips.

7.2 Improved Air Quality

Air quality is a major problem in the San Joaquin Valley. Being surrounded by mountain ranges, the Valley's bowl-shaped geography creates the unhealthy problem of pollution accumulation. This Valley bowl collects Valley-generated pollution and also some pollution that drifts in from the San Francisco Bay and Sacramento areas.

7.2.1 Annual Pollution from Vehicles

Table 7.1 shows the estimated annual pollution emitted by passenger vehicles.

Table 7.1

	Hydrocarbons (HC)	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)	Carbon Dioxide (CO_2)
Passenger Car	77.1	575	38.2	11,450
Light Truck	108.0	854	55.8	16,035
	Source: EPA, 2000. Annual Pollution Emitted in Pounds.			

As will be shown in the subsequent sections, mobile emissions from passenger cars and light trucks represent a significant portion of pollution that is harmful to people (poor air quality) and to our environment (global warming).

7.2.2 National and State Ambient Air Quality Standards

The Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) set national and state ambient air quality standards to assure healthy air for people to breathe.

Table 7.2		
Pollutant	Federal Standards	State Standards
Ozone - One hour	No Federal Standard	Nonattainment / Severe
Ozone - Eight hour	Nonattainment / Extreme	Nonattainment
PM 10	Attainment	Nonattainment
PM 2.5	Nonattainment	Nonattainment
http://www.valleyair.org/aqinfo.attainment.htm		

The San Joaquin Valley's emission levels for these pollutants are higher than the national and state standards.

These air quality standards affect transportation planning in that, if local regions are not successful in meeting the standards, then plans must be put in place that will provide measurable results in improving air quality. If adopted plans are not successful with improving air quality, then sanctions are imposed. The ultimate sanction is to freeze Highway funds designated to projects reducing traffic congestion and gridlock.

These plans mention measures to reduce vehicle trips by improving and promoting alternative modes of transportation, which include public transit and bicycling (i.e. 2008 PM2.5 PLAN: REMOVE II grant program allows for transit pass subsidies and construction of new bicycle facilities.). Bicycle commuting is definitely an important means of improving air quality.

7.2.3 Ozone

Nitrogen oxides, expelled to the atmosphere from mobile sources, could create ground-level ozone and smog from interacting with hydrocarbons and sunlight. Hydrocarbon emissions result from incomplete fuel combustion and from fuel evaporation. Ground-level ozone can irritate the respiratory tract, induce persistent coughing, cause chest pain, trigger asthmatic symptoms, and increase susceptibility to lung infection. Ozone also can damage trees and plants and reduce visibility. On-road mobile sources account for 34% of the Nitrogen Oxides emitted. On-road mobile sources account for 29% of the hydrocarbons emitted.

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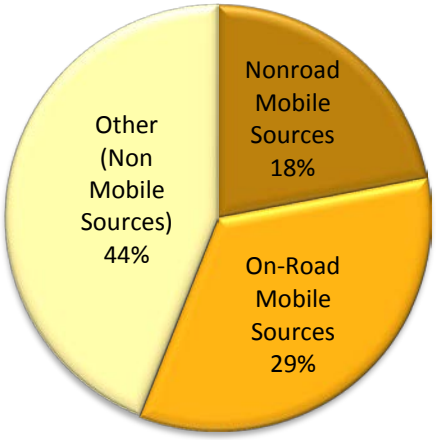
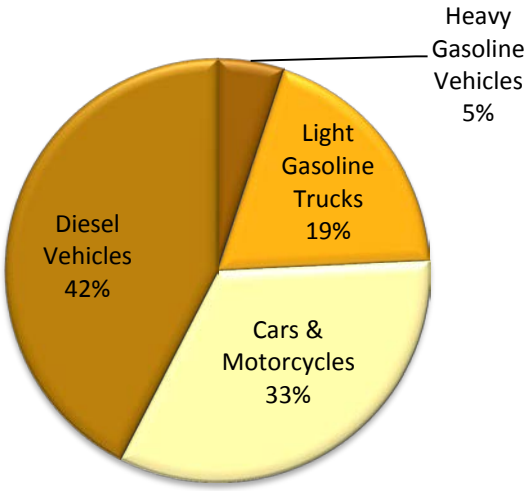
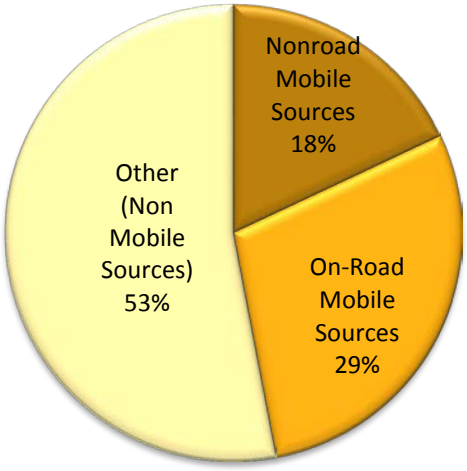
1999 National Emissions by Source: Nitrogen Oxides



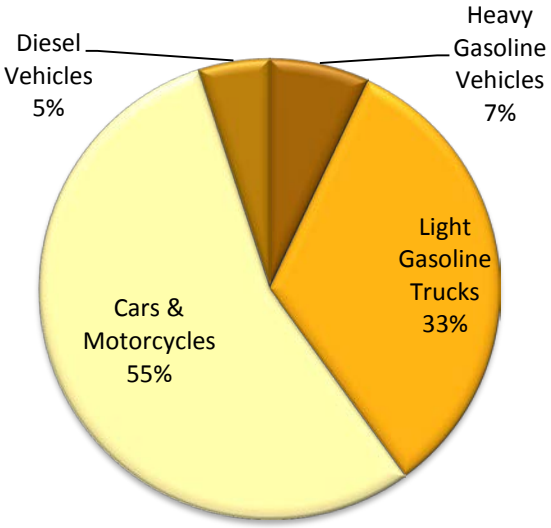
1999 National Emissions by Source: Nitrogen Oxides On-Road Mobile Sources



1999 National Emissions by Source: Hydrocarbons



1999 National Emissions by Source: Hydrocarbons On-Road Mobile Sources

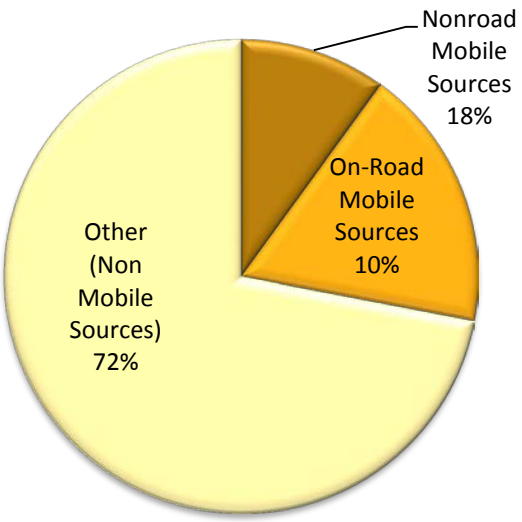


7.2.4 Particulate Matter

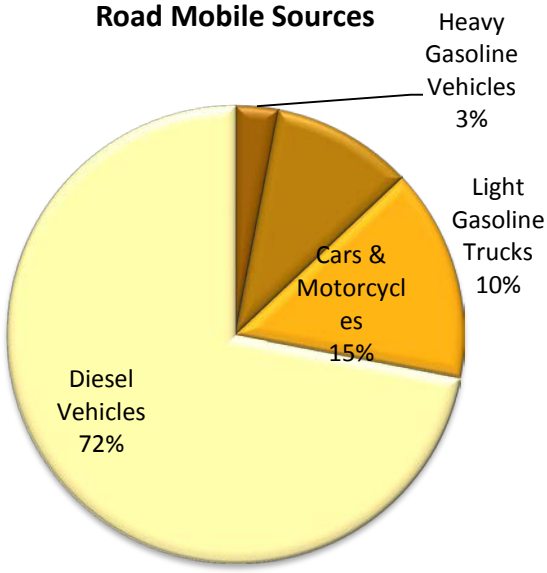
Particulate matter is the term for solid or liquid particles found in the air. These particulate emissions are differentiated by their diameter size in units of microns. PM2.5 refers to particulate matter that is less than 2.5 microns in diameter.

Particulate matter, 10 microns in diameter and smaller, is a health concern, because they can reach the deepest regions of the lungs and possibly into the bloodstream. Health effects may include respiratory symptoms (i.e. irritation of airways, difficult or painful breathing), decreased lung function, aggravated asthma, chronic bronchitis, nonfatal heart attacks, and premature deaths in people with heart/lung disease. Fine particulate matter associated with diesel exhaust is also thought to cause lung cancer. Young children, the elderly, and people with preexisting health conditions are the most vulnerable to particulate matter health risks. On-road mobile sources account for 10% of the PM2.5 produced.

1999 National Emissions by Source: Fine Particulate Matter (PM2.5)



1999 National Emissions by Source: Fine Particulate Matter (PM2.5) On-Road Mobile Sources



Note that "Nonroad Mobile Sources" include a wide variety of categories including industrial, lawn and garden, construction, recreational, and farm equipment. Also note that "Other (Not Mobile)" refers to stationary sources of emissions.

7.3 Enhanced Health Benefits

Bicycling is a great transportation means of getting you from point A to point B. Bike riding is also exercise with wonderful benefits, including the following:

- Improving your cardio-respiratory (meaning heart and lung) fitness and blood circulation. Regular exercise will work your heart and lungs, and will enhance the efficiency of blood circulation as these components pump oxygen and fuel to your muscles.
- Exercising without significant joint stress. Compared to walking and running, bicycling is a lower impact workout.
- Maintains muscle strength and bodily coordination. Bicycling primarily requires leg muscles, and coordination is in the legs (i.e. pedaling) as well as with your visual and upper body coordination (i.e. to make turns).
- Reduces risk of hypertension (high blood pressure) due to weight management and improved blood flow.
- Boosts energy level. As more blood and oxygen are being pumped through your body by the heart and lungs, your energy level rises as a result.
- Enhances immunity. Regular activity maximizes the efficiency of bodily functions.
- Prevents bone loss. Regular physical activity increases bone density.
- Helping to make you feel better: Regular physical activity reduces the level of depression and stress, improves mood, and raises self-esteem.
- Could be social and fun, especially if you ride with friends or with a group (i.e. Merced Bicycle Coalition).
- Decreasing risk for stroke and heart disease. Maintaining a healthy weight and maximizing the efficiency of blood flow through exercise decreases the risk for stroke and heart disease.
- Reducing risk for Type 2 Diabetes. Lack of physical activity increases the likelihood of obesity. Diabetes is being associated with obesity. The gage for obesity is the determination of a person's Body Mass Index (BMI). BMI is calculated based on a person's height and weight.

7.3.1 Obesity and Diabetes

In 2009, for Merced County, there were 41,000 (23.4%) obese adults and an additional 69,000 (39.1%) overweight adults. About 22,000 (12.3%) adults were diagnosed with diabetes. [1] The American Diabetes Association estimates the total cost of diabetes in California to be $24 billion, with $17 billion spent on direct medical care and $7 billion on the indirect associated costs. [1]

In 2012, twelve rural counties were included in a poll as part of an initiative funded by the Centers for Disease Control and Prevention, and the Public Health Institute. Ninety-two percent of county voters described obesity as a "serious problem," and 84 percent agree that neighborhoods play a role in people's risk for obesity, according to the poll. It found that voters strongly support community action to prevent obesity.[2]

For good health, the American Heart Association suggests at least 150 minutes per week of moderate exercise or 75 minutes per week of vigorous exercise (or a combination of moderate and vigorous activity). It is recommended that this be achieved by exercising for 30 minutes a day, five times a week. This weekly exercise will burn away the consumed calories to maintain a healthy weight or to lose the excess weight. Table 7.3 shows the approximate calories spent per hour by a 100-, 150- and 200- pound person doing a particular activity.

Table 7.3: Calories Spent by Various Individuals / Weight by Activity

Activity	100 lb	150 lb	200 lb
Bicycling, 6 mph	**160**	**240**	**312**
Bicycling, 12 mph	**270**	**410**	**534**
Jogging, 7 mph	610	920	1,230
Jumping Rope	500	750	1,000
Running, 5.5 mph	440	660	962
Running, 10 mph	850	1,280	1,664
Swimming, 25 yrds/min	185	275	358
Swimming, 50 yrds/min	325	500	650
Tennis, singles	265	400	535
Walking, 2 mph	160	240	312
Walking, 3 mph	210	320	416
Walking, 4.5 mph	295	440	572

Source: American Heart Association /

http://www.heart.org/HEARTORG/Getting Healthy/PhysicalActivity/Physical-Activity_UCM_001080_SubHomePage.jsp

7.4 Reduced Greenhouse Gas Emissions

Greenhouse gases from vehicles are carbon dioxide, methane, and nitrous oxide. On the other hand, commuting by bike does not generate any GHG emissions, and results in a reduction of GHG emissions that would otherwise occur. Twenty-one percent of the GHG Emissions targeted for reduction in the City's 2012 Climate Action Plan (CAP) are forecasted to occur through enhanced mobility programs and projects. Implementation of the BTP is an important part of that forecast.

Several projects in the *2013 BTP* align with the recommended actions of the CAP, and are listed in the Comprehensive List of all Proposed Bicycle Facility Projects (Appendix E).

A bike commuter GHG reduction calculator can be found at fedbike.org/calc.php, which tracks federal worker commuter reports. For example, 20,259 bicycle miles equates to a GHG reduction of 6.5 metric tons.[3]

BIBLIOGRAPHY

1. UCLA Center for Health Policy Research, *Ask*CHIS, 2009 data http://ask.chis.ucla.edu/]
2. *Merced Sun Star* Article, "Poll results show obesity a concern in Merced area, March 27, 2013.
3. *Fedbike.org/calc.php.*