



Chapel Hill Transit riders using the bike rack. Choosing public transit over single occupancy vehicles reduces greenhouse gas emissions.

A portion of the Latta dairy farm was protected in 2007 through an agricultural conservation easement.



Triangle traffic on I-40

# AIR RESOURCES

In Orange County, air quality and the related impacts on climate change stands out as a pressing environmental issue as county and regional populations continue to expand. Declining air quality can affect the health of all county residents and damage local ecosystems. County emissions also contribute to regional air quality issues like ground-level ozone and international problems like climate change (global warming).

The North Carolina Department of Environment and Natural Resources—Division of Air Quality (NCDAQ) currently produces the only local inventory of air emissions, dividing sources into five major categories based on how they are released into the atmosphere:

- **Area sources** are small stationary sources such as gas stations, dry cleaners and repair shops that alone are not very large, but combined can be significant sources. NCDAQ typically estimates these emissions from per capita or per employee emissions information.
- **Biogenic** emission sources are living organisms such as trees, plants and livestock. In air quality modeling, emissions from biogenic sources are viewed as relatively constant from year to year.
- **Mobile sources** include automobiles and trucks. The NCDAQ's estimates are based on estimated vehicle miles traveled within Orange County.
- **Nonroad mobile sources** come from equipment such as lawn mowers, outboard engines, agricultural equipment and construction machines.
- **Point sources** are large stationary sources like factories and electric power plants. Currently, there are only a few emission point sources in Orange County.

The NCDAQ collects information on the kinds of pollutants released into the air including Carbon Monoxide (CO), Hazardous Pollutants, Nitrogen Oxide (NO<sub>x</sub>), Particulate Matter (PM), Sulfur Dioxide (SO<sub>2</sub>) and Volatile Organic Compounds (VOCs). These pollutants contribute to respiratory illnesses such as asthma; aggravate existing heart and lung diseases; form acid rain; impair visibility; contribute to global warming; and pollute aquatic systems. Improving air quality remains a significant concern for Orange County and the entire Triangle region. In particular, reducing the amount of ground-level ozone is one of the greatest challenges for the area. Ground-level ozone is not emitted directly, but rather formed from NO<sub>x</sub>, VOCs and other pollutants during a photochemical reaction in the atmosphere. In 2004, the U.S. Environmental Protection Agency (EPA) designated Orange County and seven other neighboring counties as nonattainment areas under the EPA's revised ambient air quality standard for ozone. As of 2007 the Triangle is reclassified as being in attainment of the ambient standards as a maintenance area. However, recent regulation changes to a more stringent standard may return the area to the status of non-attainment.

The indicators in the air resources section track the types of pollutants emitted in Orange County and the human behaviors that affect the amount of pollutants released. **Emissions Estimates**, **Greenhouse Gas Emissions** and **Emissions from Point Sources** look at the pollutants emitted from all different sources and then specifically point sources. **Ozone Threshold Exceedances** shows the pattern of ozone exceedance days in the region. **Transportation Modes** discusses how people reach their place of work. **Commuting Patterns**, **Public Transit (Bus) Ridership** and **Daily Vehicle Miles Traveled** track how our transportation patterns in Orange County affect air pollution trends.



# AIR RESOURCES

## Emissions Estimates

Why the indicator was selected

Tracking trends in air pollutant emissions is critical for assessing air quality impacts and for developing strategies to improve air quality. Emissions of nitrogen oxides (NOx), gases formed when fuel is burned at high temperatures in vehicles and industry and volatile organic compounds (VOCs), hydrocarbon compounds such as volatile fuels and solvents, are the primary contributors to ground-level ozone, and the main pollutants of concern in Orange County and the Triangle. Carbon monoxide (CO), a colorless, odorless gas that forms during the incomplete combustion of carbon and hydrocarbons and has its own set of health effects, can also indicate the presence of organic compounds that contribute to ozone formation, although to a lesser extent.

How the indicator was measured

CO, NOx and VOCs are projected along with other pollutant estimates for Orange County. The North Carolina Division of Air Quality (NCDAQ) estimates emissions by looking at the make-up of the county and inserting these data in models. For example, NCDAQ takes information about vehicle miles traveled (VMT) on county roads and inserts these data into the U.S. Environmental Protection Agency’s (EPA) MOBILE6.2 model to predict road vehicle emissions. The EPA’s NONROAD2002a model is used for nonroad emission projections while the county’s population and industry statistics are used to estimate area sources such as gas stations, dry cleaners and repair shops. The NCDAQ also tracks point sources from individual producers such as industrial facilities. Biogenic source emissions are calculated by estimating pollutants released by trees, cattle and other living organisms.

The trend in Orange County

**IMPROVING**

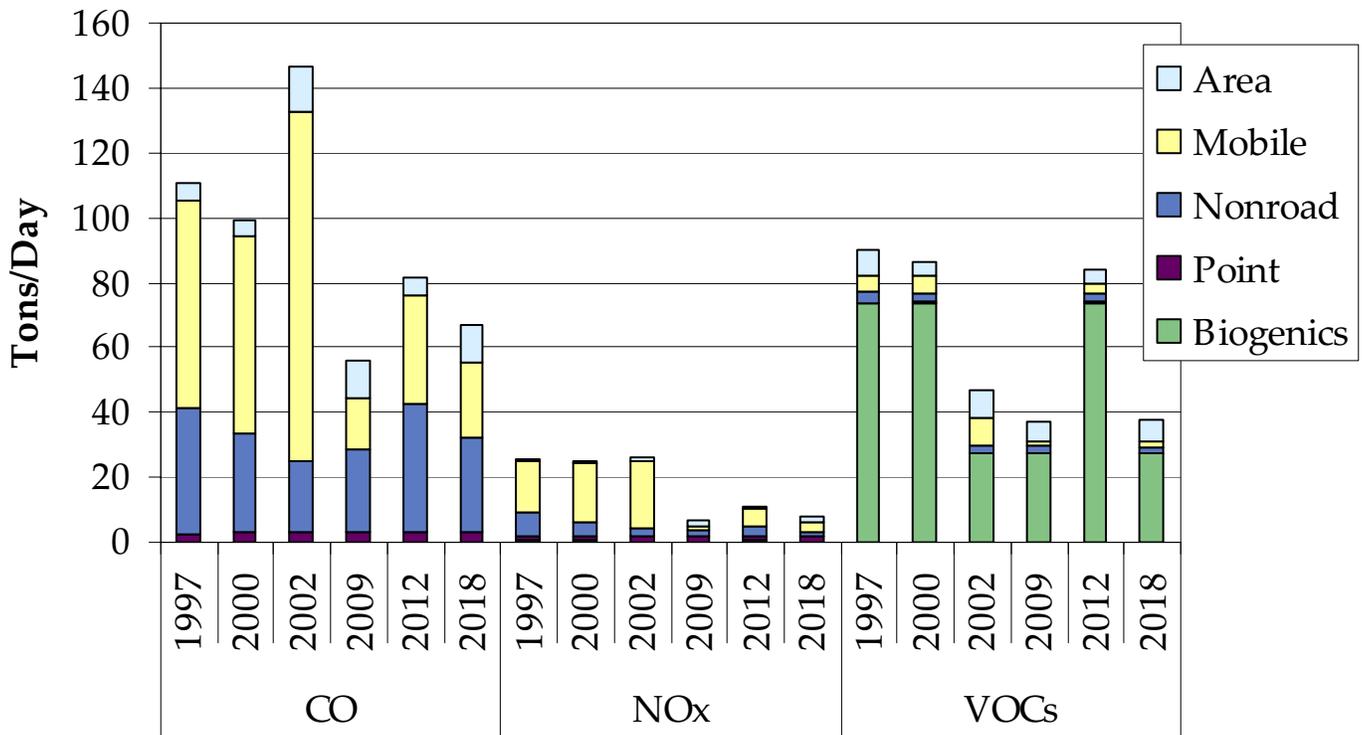
Since the 2004 SOE, NCDAQ has adopted “BaseG” VISTAS/ASIP’s (Visibility Improvement—State & Tribal Association of the Southeast and the Association for Southeastern Integrated Planning) modeling effort for measuring air quality. Any changes in the projections reflect the use of this model. Figure 3 shows the overall trends in emission estimates and Table 2 gives the predicted emissions for CO, NOx and VOCs. Overall, the models predict that Orange County will see continued reductions in NOx emissions over the next 12 years. This projected reduction depends on the accuracy of EPA and NCDAQ estimates regarding new vehicle emission controls, types of cars in use, future growth, travel patterns and other variables. Orange County may differ from a typical North Carolina county in several ways, including the overall levels of growth, the number of interstate vehicle miles traveled (VMT) and local transportation patterns. An understanding of how these variations affect pollutant emissions is vital to achieving and maintaining healthy air quality.

Recommendations

To support a sustainable future, Orange County should:

- Assess and implement the current countywide greenhouse gas (GHG) emissions inventory target reductions and
- Monitor the 2035 Long-Range Transportation Plan from the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, which provides traffic projections for long-range transportation planning and other information related to emissions.

**Figure 3: Inventoried and Projected Emissions by Source, 1997-2018**



**Table 2: Emissions in Tons per Day, 1997-2018**

Pollutant	Type	Estimated			Projected		
		1997	2000	2002	2009	2012	2018
CO	Area	5.0	5.0	14.0	12.1	5.7	11.5
	Mobile	64.0	60.7	107.7	15.4	33.3	23.5
	Nonroad	38.8	30.5	22.3	26.0	39.3	29.2
	Point	2.7	3.2	2.8	2.8	3.2	2.9
	Biogenics	-	-	-	-	-	-
	<b>Total</b>	<b>110.5</b>	<b>99.4</b>	<b>146.7</b>	<b>56.3</b>	<b>81.5</b>	<b>67.1</b>
NOx	Area	0.8	0.4	1.5	1.6	0.5	1.8
	Mobile	15.5	18.8	20.6	1.1	5.7	2.7
	Nonroad	7.3	3.7	2.5	2.1	2.8	1.3
	Point	1.6	1.6	1.5	1.5	1.6	1.5
	Biogenics	0.5	0.5	0.3	0.3	0.5	0.3
	<b>Total</b>	<b>25.7</b>	<b>25.0</b>	<b>26.3</b>	<b>6.3</b>	<b>11.1</b>	<b>7.6</b>
VOCs	Area	7.8	4.5	8.5	6.5	4.3	6.5
	Mobile	5.0	5.2	8.6	1.1	2.5	1.8
	Nonroad	3.8	2.8	2.5	2.4	2.8	1.9
	Point	n/a	0.4	0.2	0.2	0.5	0.3
	Biogenics	73.6	73.6	27.1	27.1	73.6	27.1
	<b>Total</b>	<b>90.2</b>	<b>86.5</b>	<b>46.9</b>	<b>37.2</b>	<b>83.7</b>	<b>37.6</b>

Source: Figure 3 & Table 2 – NCDENR Division of Air Quality -VISTAS/ASIP modeling effort BaseG



# AIR RESOURCES

## Emissions from Point Sources

Why the indicator was selected

Emissions from point sources in Orange County are relatively small compared to emissions from other sources. Yet it is important to track point sources over time because there can be concentrated impacts in one immediate area or cumulative impacts on a surrounding region.

How the indicator was measured

The North Carolina Division of Air Quality (NCDAQ) tracks the number of point sources discharging pollutants in Orange County. Carbon monoxide (CO), hazardous pollutants (includes over 180 kinds of dangerous compounds), nitrogen oxides (NOx), particulate matter of varying sizes (PM), sulfur dioxide (SO<sub>2</sub>) and volatile organic compounds (VOCs) are important pollutants to track because of their potential effects on human health and local ecosystems. PM includes particles such as dust, dirt, soot, smoke and liquid droplets and is defined by the size of its diameter. PM<sub>10</sub> is less than or equal to 10 micrometers, PM<sub>2.5</sub> is less than or equal to 2.5 micrometers and all sizes are included in the total amount of suspended particulate matter (TSP). There has been great concern in recent years about PM<sub>2.5</sub> because these fine particles penetrate deeper into the lungs. SO<sub>2</sub> is a gas that is released when fuels such as coal and oil are burned.

The trend in Orange County

**MIXED**

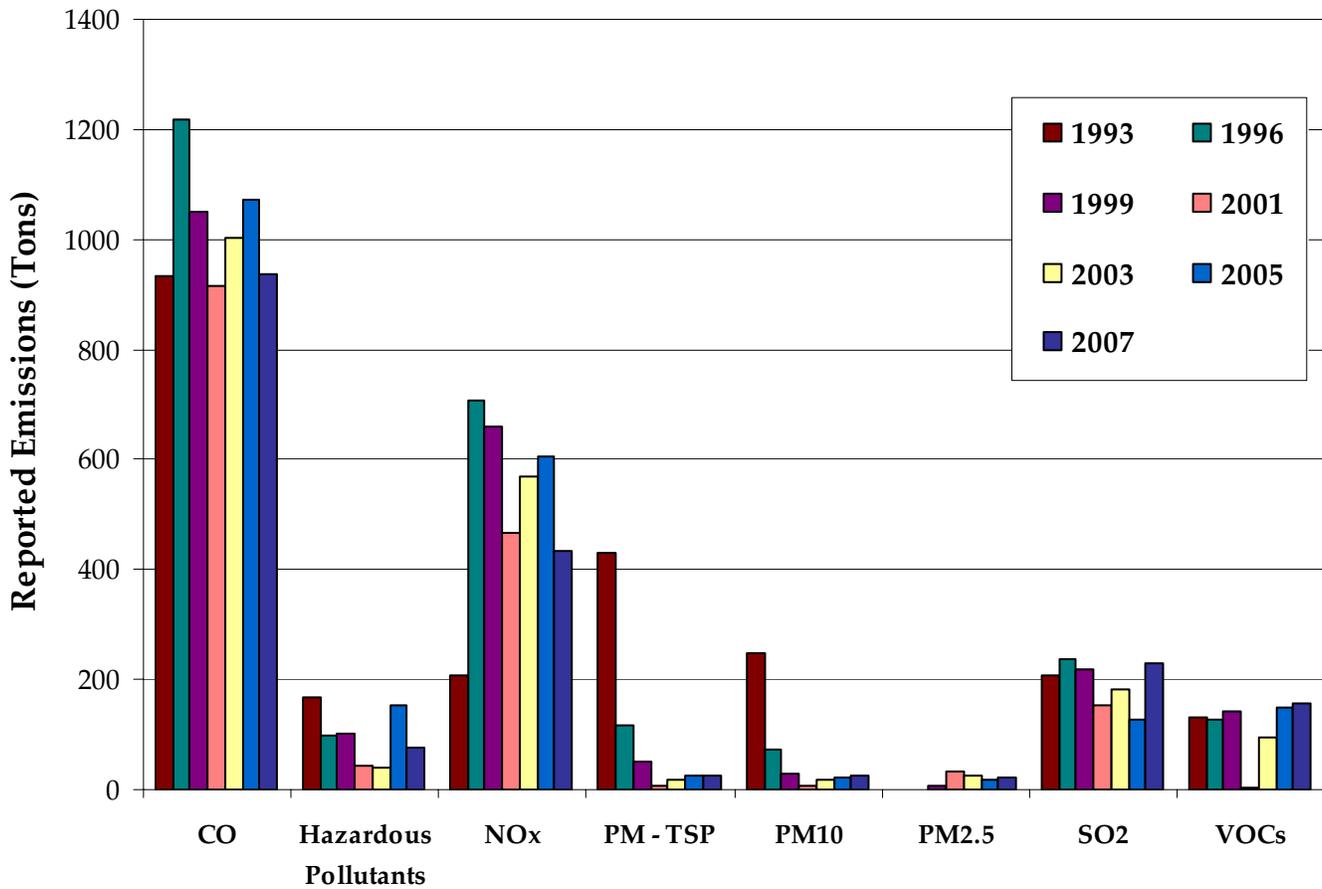
The number of facilities reporting emissions decreased from 18 in 1999 to 8 in 2006, the most recent data available. In general, this reduction in facilities is related to decreases in most pollutant emissions. Figure 4 shows the trend in selected point source pollutants while Table 3 gives the actual data from this time period. As Table 3 indicates, SO<sub>2</sub> and VOCs were substantially reduced between 1999 and 2002 as the number of point source facilities was reduced by 66%. However, overall emissions have increased since 2002 even though the number of point sources has decreased. The figures reflect a reduction in CO and NO<sub>x</sub>, but these levels still remain a concern. Estimates of point source emissions of particulate matter also imply a considerable decline. However, TSP and PM<sub>10</sub> have been shown to be poor indicators of the health impact of particulate matter and concern has shifted to PM<sub>2.5</sub>. Emission and ambient measurements for PM<sub>2.5</sub> did not begin until 1999 and since then have remained steady with slight fluctuations. Future tracking of PM<sub>2.5</sub> emissions is critical.

Recommendations

To support a sustainable future, Orange County should:

- Review potential localized impacts of these sources, including any ambient modeling studies done as part of the relevant state permits.

**Figure 4: Annual Point Source Air Pollution by Pollutant, 1993-2007**



**Table 3: Point Source Air Pollution, 1993-2007**

Pollutant	1993		1996		1999		2002		2007	
	Facilities Reporting	Annual Output (tons)								
CO	10	932.0	10	1,216.0	12	1,051.0	4	1,020.6	3	936.7
Hazardous Pollutants	5	169.0	12	99.0	10	102.0	4	23.8	3	77.7
NOx	11	206.0	11	706.0	13	661.0	4	527.5	3	433.6
PM (TSP)	13	432.0	17	115.0	15	51.0	6	31.4	4	26.4
PM10	12	247.0	16	74.0	15	28.0	6	23.4	4	24.4
PM2.5	-	-	-	-	4	8.0	4	13.3	3	22.3
SO <sub>2</sub>	7	208.0	8	238.0	11	220.0	4	148.7	2	229.8
VOCs	12	133.0	12	129.0	10	143.0	4	71.0	3	156.6
# of facilities reporting at least one pollutant	20		21		18		6		4	

Source: Figure 4 & Table 3 –NCDENR Division of Air Quality



# AIR RESOURCES

## Ozone Threshold Exceedances

Why the indicator was selected

Ground-level ozone pollution is a major concern in Orange County. This harmful pollutant is created through a chemical reaction between sunlight and nitrogen oxides (NOx) and volatile organic compounds (VOCs) emitted by motor vehicles, industries, biogenics and other sources. Ground-level ozone may cause permanent lung damage, trigger health problems and harm plants and ecosystems. (This should not be confused with “useful” ozone, the ozone layer, which is located in the upper atmosphere and protects us from the sun’s harmful radiation.)

How the indicator was measured

Based on U.S. Environmental Protection Agency (EPA) monitoring protocols for urban areas, the North Carolina Division of Air Quality (NCDAQ) currently does not operate an ozone monitor in Orange County. Because urban non-attainment status is assessed at the Metropolitan Statistical Area (MSA) level, Orange County’s official ozone status is generated by assessments of the ten ozone monitors spread throughout the Triangle area. Statistics from individual monitoring stations surrounding Orange County provide a general profile of ozone levels in our area. The monitor locations are seen in Figure 6. Without a monitor, the county cannot track actual ozone levels within its borders.

The trend in Orange County

**INDETERMINATE**

In April 2004, the EPA designated Orange County and seven other counties comprising the Triangle MSA as a non-attainment area under the federal standard for ozone. This designation came with the switch to a more protective 8-hour average standard instead of the previous 1-hour average. The EPA changed the standard because research has shown that longer periods of exposure to ozone, even at lower levels, have negative health effects. As a result, this standard from 1997 to 2007 was based on levels above 0.08 parts per million (ppm) over an 8-hour period (the 2008 standard is 0.075 ppm) instead of above 0.12 ppm over a 1-hour period. To designate nonattainment areas, the EPA looks at the fourth highest daily measurement within a MSA in each year and averages these values over a three-year period. In 2007, the Triangle was upgraded to a “maintenance area.” A maintenance area is an area that has been redesignated to attainment for the 8-hour ozone standard. A change of designation to non-attainment status may be required in the next year due to the more stringent standards.

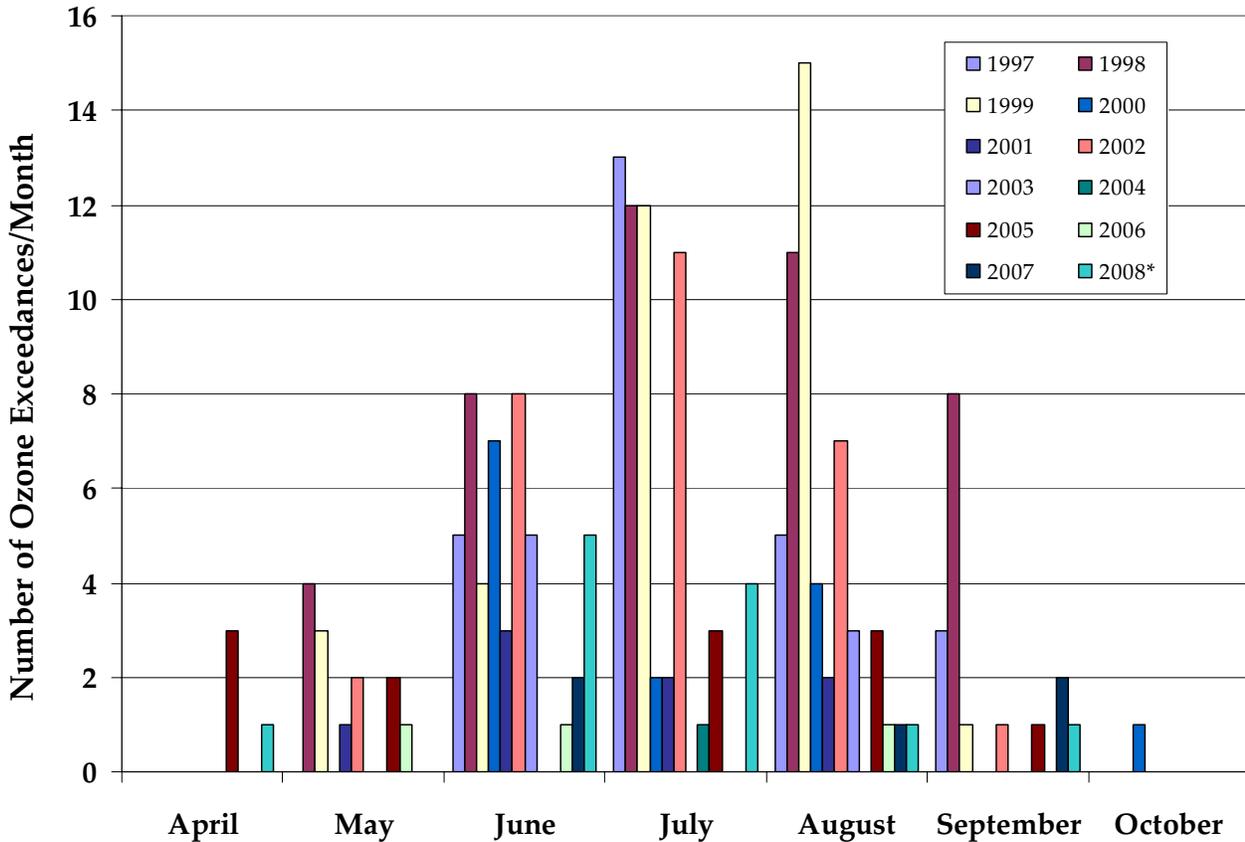
Recommendations

Figure 5 shows the variation experienced in the number of nonattainment days from 1995 to 2008. These variations are most likely related to hot weather extremes favorable for ozone-generating reactions. The majority of exceedance days occur during the summer months.

To support a sustainable future, Orange County should:

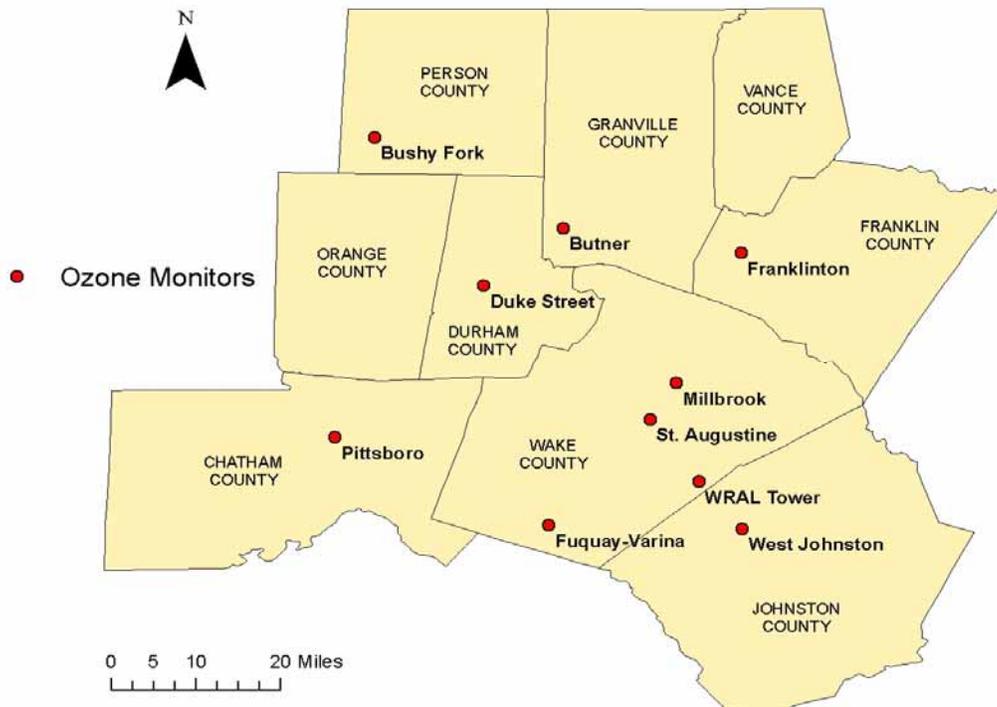
- Stringently follow the NC State Implementation Plan (SIP) to maintain the ozone standard through 2017 in order to remain in attainment;
- Work towards the installation of an ozone monitor and continue to ask employees to take steps to mitigate ozone levels on exceedance days; and
- Develop an ozone action plan that is consistent with the Greenhouse Gas Action Plan.

**Figure 5: Monthly Trends in Ozone Exceedance Days in the Triangle Region, 1997-2008**



\* 2008 data is preliminary. It has not yet been reviewed and approved by the EPA.

**Figure 6: Ozone Monitor Locations in the Triangle Region**



Source: Figures 5 & 6 – NCDENR Division of Air Quality – Planning Unit



# AIR RESOURCES

## Transportation Modes

Why the indicator was selected

Automobile use in Orange County is directly related to air quality because vehicle exhaust contributes a substantial portion of air pollutants to the atmosphere. Therefore, it is important to encourage alternatives to the prevailing single-occupancy automobile. In particular, there are a number of unique aspects of Orange County’s employment base, population distribution and commuting/movement patterns that offer more innovative opportunities in alternative transportation. Tracking the types of transportation modes can be used to gauge the success of policies that support alternative modes of transportation.

How the indicator was measured

The statistic presented here represents the journey-to-work in and out of Orange County. The U.S. Census Bureau provides means of transportation to work data from the 1990 and 2000 census results and the American Community Survey provides data estimates for the years between censuses.

The trend in Orange County  
**IMPROVING**

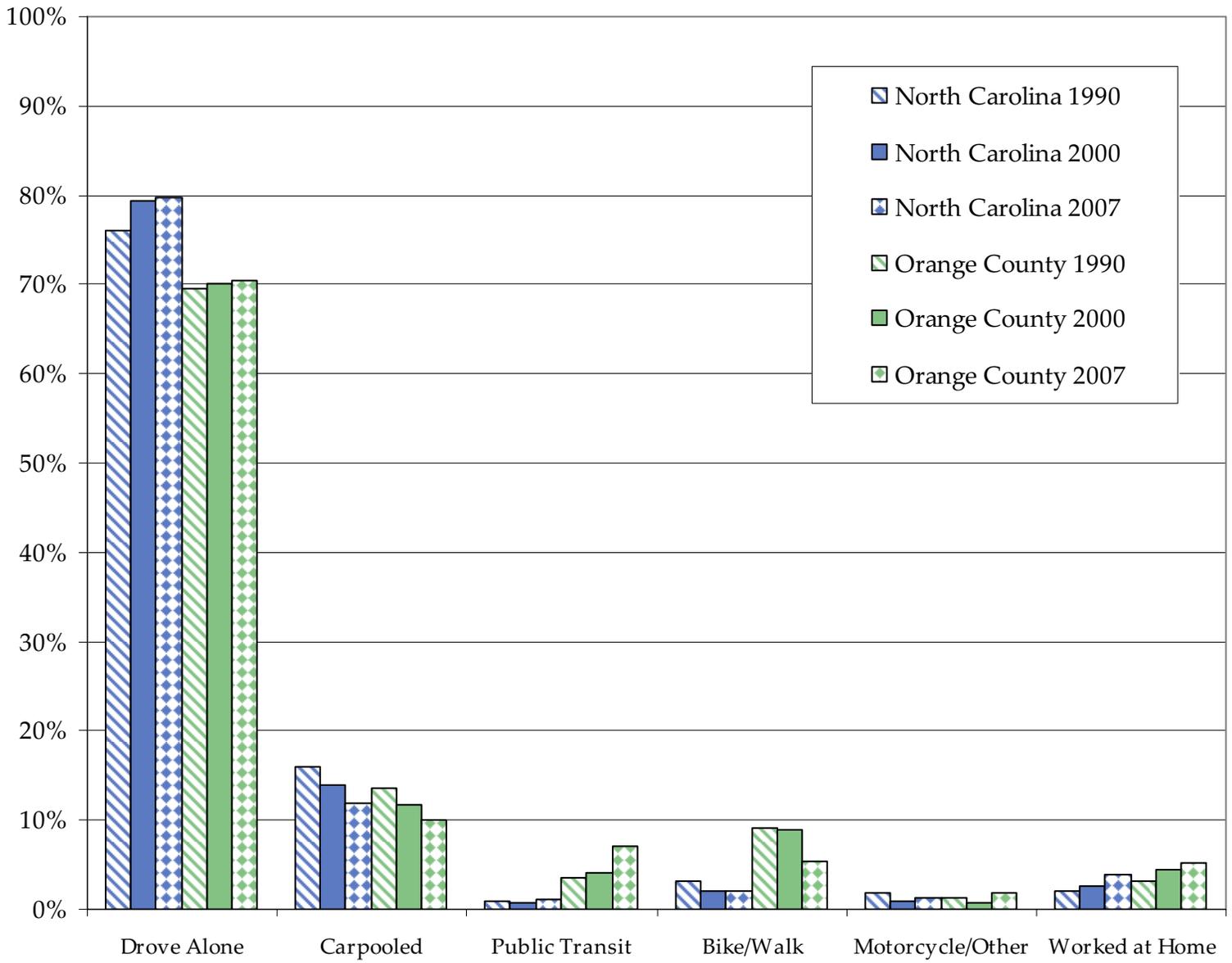
As seen in Figure 7, the single-occupancy automobile is by far the dominant mode of transportation to work for Orange County citizens. However, a comparison of the data for Orange County to North Carolina as a whole reveals unique trends in the county. The percentage of workers driving alone and the number of carpoolers is lower in Orange County than in North Carolina. The number of people using public transit, walking/biking and working at home is significantly higher than the state average (though only a small portion of total commuting trips) and may have increased further since the fuel price escalation of 2008. Further investigation is necessary to determine the reason for the difference between Orange County and the State’s use of alternative modes of transportation and the extent to which this difference may be attributed to Chapel Hill’s fare-free transit system, the relative dominance of the University of North Carolina at Chapel Hill (UNC-CH) as an employer in Orange County and/or other factors.

Recommendations

To support a sustainable future, Orange County should:

- Expand and enhance its public transportation and car-pooling systems and
- Work to reduce vehicle trips altogether by increasing telecommuting, co-locating jobs and residences and developing walkable, bicycle-friendly and mass transit-oriented communities.

**Figure 7: Means of Transportation to Work in Orange County and North Carolina between 1990 and 2007**



Sources: Figure 7 – U.S. Census Bureau and the American Community Survey



# AIR RESOURCES

## Commuting Patterns

Why the indicator was selected

The amount of time that people spend traveling to work correlates directly to air emissions. Because the dominant mode of transportation is the single-occupancy vehicle, statistics on travel time and commuting can indicate how much people contribute to air pollution.

How the indicator was measured

In the 1990 and 2000 censuses and the 2006 American Community Survey, the U.S. Census Bureau obtained data on travel time to work for workers 16 years and older as well as on the number of people commuting out of their county of residence. From these data, calculations were made to determine the number of in- and out-commuters in Orange County.

The trend in Orange County

**WORSENING**

As seen in Table 4, commuting time for Orange County workers continues to increase. Figure 8 confirms that both the number of in-commuters (workers from other counties) and out-commuters (Orange County workers going to other counties) continues to rise as well. Tables 5 and 6 detail the extent of these changes between 1990 and 2006, the most recent period for which data is available.

**Table 4: Change in Average Travel Time to Work**

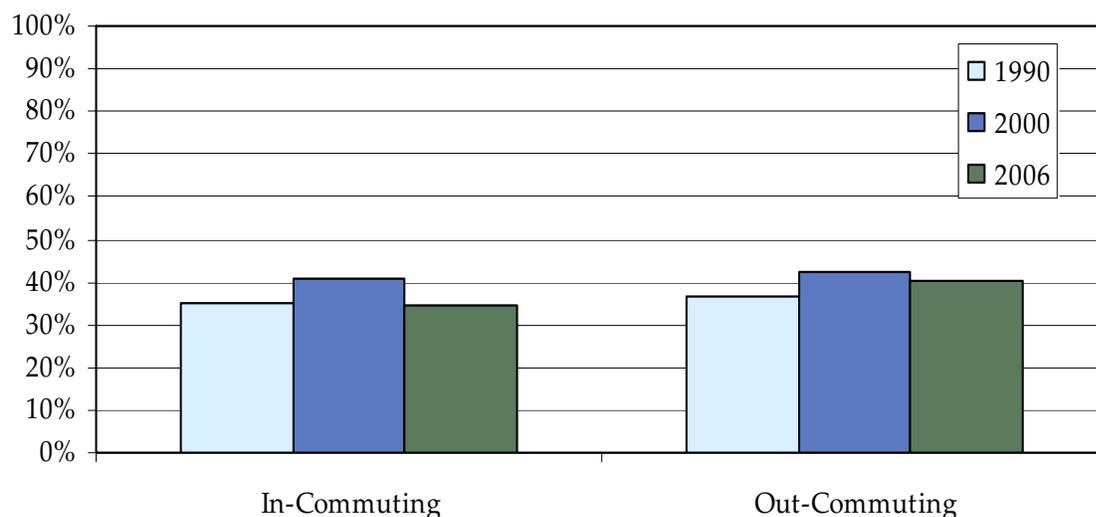
Year	Average Travel Time in Minutes	Percent Change	
1980	18.5	n/a	
1990	18.9	1980-1990	2.16%
2000	22	1990-2000	16.40%
2006	22.5	2000-2006	2.27%

Recommendations

To support a sustainable future, Orange County should:

- Study commuting patterns in Orange County and develop strategies to improve them;
- Encourage and offer incentives for regional employers to promote telecommuting and carpooling to take cars off the road; and
- Improve transportation efficiency: promote more public transportation, ride sharing and alternative transportation such as bicycles and walking.

**Figure 8: Percentage of Employed Persons “In-” or “Out-Commuting” in Orange County between 1990 and 2006**



**Table 5: Change in “Out-Commuting” in Orange County Between 1990 and 2006**

	1990 Census	2000 Census	2006 Estimate	% Change 1990 to 2000	% Change 2000 to 2006	% Change 1990 to 2006
<b>Number of Orange County Residents Who Work</b>	49,915	65,009	65,079	30.2%	0.1%	30.4%
<b>Number of Orange County Residents Working in Other Counties</b>	18,324	27,563	26,105	50.4%	-5.3%	42.5%
<b>Percent of Orange County Residents Working in Other Counties</b>	36.7%	42.4%	40.1%	15.5%	-5.4%	<b>9.3%</b>

**Table 6: Change in “In-Commuting” in Orange County Between 1990 and 2006**

	1990 Census	2000 Census	2006 Estimate	% Change 1990 to 2000	% Change 2000 to 2006	% Change 1990 to 2006
<b>Number of People Working in Orange County</b>	48,621	59,147	59,544	21.6%	0.7%	22.5%
<b>Number of Orange County Workers Living in Other</b>	17,030	24,094	20,570	41.4%	-14.6%	20.8%
<b>Percent of Orange County Workers Living in Other</b>	35.0%	40.7%	34.5%	16.3%	-15.1%	-1.3%

Sources: Tables 4, 5, & 6 and Figure 8 — U.S. Census Bureau and American Community Survey



# AIR RESOURCES

## Public Transit (Bus) Ridership

Why the indicator was selected

Choosing public transportation over single-occupancy vehicles improves the quality of life for people and the environment by reducing traffic congestion, air pollution and fossil fuel usage; saving money; and promoting a more sustainable lifestyle. Public transit ridership tends to increase with rising gas prices and downturns in the economy. However, as public transit has become more socially acceptable and riders realize how convenient, cost-effective and environmentally sound it can be, they tend to continue riding even after fuel prices and the economy return to normal. Buses are the most prolific form of public transportation in the Triangle area. Four agencies Triangle Transit, Chapel Hill Transit, Orange Public Transit and Duke Transit's Robertson Scholar's Express Bus have bus routes that serve Orange County residents.

How the indicator was measured

Bus ridership is measured by the number of trips traveled by bus. A trip is defined as each time a passenger boards a bus. Trip figures are important for forecasting travel demand, determining trends and creating routes, among other reasons. Each of the four transit agencies generates and maintains its own trip numbers. Every time a passenger boards a bus the driver clicks a button adding that rider as one trip. These figures are then used to calculate monthly and annual ridership. Table 7 shows annual ridership since 2003 for each of the transit agencies. Only routes that serve Orange County are incorporated in these numbers.

The trend in Orange County

**IMPROVING**

Overall bus ridership has increased steadily since 2003. CH Transit saw a 40% increase in ridership in 2002 with its move to a fare-free system (not shown in Figure 9) and an increase of 15% between 2007 and 2008. Triangle Transit experienced a 25% jump in ridership between 2007 and 2008, a result of increased service hours for the 500/550 route and greater demand likely due to the spike in gas prices. Demand was significant enough from 2004-2006 for Triangle Transit to add two additional routes in Orange County, the 420 from Hillsborough to Chapel Hill and the 500/550 from Raleigh to Chapel Hill. About 26,000 passengers, or a third of the population that Chapel Hill Transit's routes serve, ride CH Transit buses. It is expected that bus ridership for all four agencies grew further during 2008-2009. There is coordination between the four transit agencies to improve the linkages between Triangle Transit, OPT and CH Transit and to provide service to all of Orange County's communities.

Recommendations

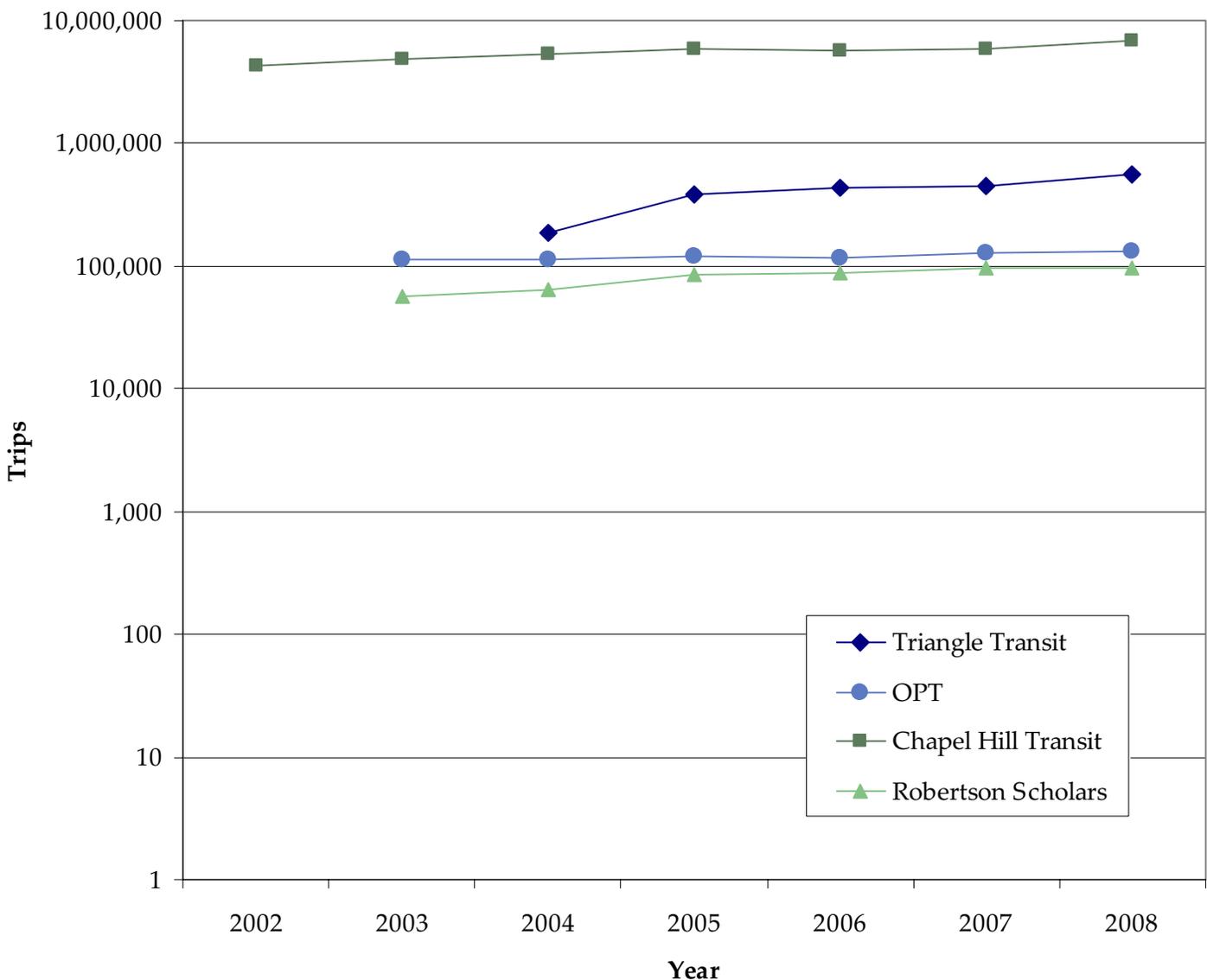
To support a sustainable future, Orange County should:

- Expand the availability and use of public transportation throughout the county to provide better access between employment centers, shopping and service locations and other key points of interest;
- Improve public education and advertising of existing transit services;
- Work with nearby jurisdictions to integrate Orange County plans with regional goals and objectives for an intermodal system to meet projected travel demand that reduces congestion and reliance on single-occupancy vehicles; and
- Improve coordination of all public transit routes and services within Orange County and the Triangle Region.

**Table 7: Bus Ridership, 2002-2008**

Service Provider	2002	2003	2004	2005	2006	2007	2008
Triangle Transit			185,850	382,747	433,654	451,512	491,358
OPT		113,545	113,198	118,991	116,988	128,006	133,892
Chapel Hill Transit	4,287,068	4,833,800	5,364,580	5,923,812	5,692,490	5,918,138	6,817,804
Robertson Scholars		56,969	63,838	86,111	87,710	97,391	97,391
<b>TOTAL</b>		<b>5,004,314</b>	<b>5,727,466</b>	<b>6,511,661</b>	<b>6,330,842</b>	<b>6,595,047</b>	<b>7,540,445</b>

**Figure 9: Annual Bus Ridership, 2002-2008**



Sources: Table 7 & Figure 9 – Public Transit Providers



# AIR RESOURCES

## Daily Vehicle Miles Traveled

Why the indicator was selected

Daily vehicle miles traveled (DVMT) represent vehicle use on public roads by residents and non-residents of Orange County. The analysis of these data over time is a critical factor in estimating the contribution of vehicle emissions to the degradation of air quality within the county. The number of road lane miles represents the overall capacity of the transportation system. Additional lane miles can result in greater DVMT and thus increased vehicle emissions. However, new lane miles that allow freer flow of traffic can potentially reduce emissions and congestion.

How the indicator was measured

The North Carolina Department of Transportation (NCDOT) collects traffic data to estimate statistics such as DVMT shown in Table 8. Vehicle miles are divided into rural and urban. Within these large categories, the mileage is broken down into type of road. Per capita DVMT are calculated by dividing total annual miles driven by the total county population. NCDAQ modeled the DVMT projections for 2010 and 2018. Compiled by NCDOT based on the total mileage of state maintained roads, “lane miles” count a mile of four-lane road as four miles and consider widening of existing roads as new lane miles. “Lane miles” are not distinguished by road type.

The trend in Orange County

**WORSENING**

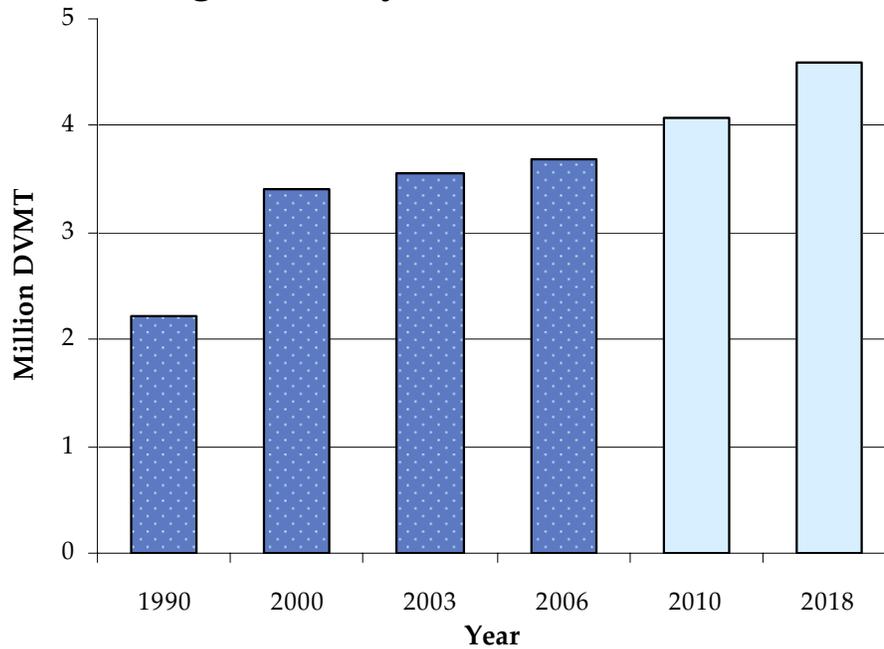
Table 8 shows that both the rural and urban DVMT continue to rise in the county. Urban DVMT correspond to miles traveled primarily by local residents while rural DVMT are associated with travelers passing through the county, non-residents. Figure 10 shows that DVMT projections into the future are predicted to increase at a steady rate. Based on past trends—expected population and job growth and development patterns—there will likely be ongoing increases in DVMT unless comprehensive measures are enacted to reduce single-occupant trips. Orange County should not again experience the dramatic rise in DVMT seen between 1990 and 2000 after the completion of Interstate 40 in 1988 added a large number of interstate miles to Orange County’s road network. Table 9 shows how the overall lane mileage of our local road system grew steadily over the last 22 years. However, while the amount of actual pavement grew only gradually in that period, the DVMT increased at a much greater rate.

Recommendations

To support a sustainable future, Orange County needs to:

- Develop innovative strategies to address the issues involved in rising vehicle miles. Cooperate with others to develop and refine an integrated transportation-impacts model, by combining transportation demand and emissions models, to investigate the possible impacts of trip-reduction measures, road construction and development proposals, transit improvements, increases in employment and other factors that will come into play over the next decades and
- Track DVMT and state maintained road lane miles along with other transportation measures to provide a comprehensive picture of the impact of vehicle use on air quality, land and water resources and the overall environment.

**Figure 10: Change in Daily Vehicle Miles Traveled, 1990-2018**



**Table 8: Daily Vehicle Miles Traveled, 1990-2018**

Road Type	Measured				Projected <sup>3</sup>	
	1990	2000	2003	2006	2010	2018
<b>Rural (non-residents)</b>						
<b>Total</b>	1,501,850	2,410,300	2,452,400	1,878,730	2,050,120	2,313,545
Arterial	75,700	196,100	192,150	115,490	126,026	142,219
Collector	569,300	647,630	678,090	606,830	662,189	747,275
Interstate	745,550	1,417,590	1,414,490	1,042,550	1,137,658	1,283,839
Local	111,300	148,980	167,670	113,860	124,247	140,212
<b>Urban and Small Urban (residents)</b>						
<b>Total</b>	726,280	1,001,400	1,112,570	1,810,410	2,030,205	2,291,071
Arterial	558,040	754,080	445,200	641,770	754,965	851,972
Collector	35,890	41,500	388,590	77,190	84,232	95,055
Freeway	53,660	57,420	61,600	351,460	383,512	432,790
Interstate	21,070	114,320	109,200	618,760	675,207	761,966

**Table 9: Total State Maintained Road Lane Miles, 1985-2007**

Year	Lane Miles	Percent Change	
1985	1,602	n/a	
1990	1,678	1985-1990	4.7%
1995	1,710	1990-1995	1.9%
2000	1,750	1995-2000	2.3%
2003	1,788	2000-2003	2.2%
2007	1,807	2003-2007	1.1%

<sup>3</sup> 2006 Estimate and 2010 and 2018 Projections from North Carolina Office of State Budget and Management  
 Source: Figure 10 and Tables 8 & 9 – NC Department of Transportation



# AIR RESOURCES

## Ongoing Concern: Greenhouse Gas Emissions

Greenhouse gas emissions contribute to climate change. The Earth's temperature is regulated by a natural system known as the "greenhouse effect" whereby a delicate balance of naturally-occurring gases traps some of the sun's radiation near the earth's surface. This radiation heats the atmosphere and creates the conditions which make life on earth possible. The most common naturally-occurring greenhouse gases (GHG) are carbon dioxide, water vapor, methane, nitrous oxide and ozone. Greenhouse gas production is represented by the carbon dioxide equivalent (eCO<sub>2</sub>), a common measure that expresses all GHG production as the number of tons of eCO<sub>2</sub> produced by energy use and waste production in a community.

In 2009, *A GHG Emissions Inventory and Forecast* report was completed for Orange County. In that study, Orange County chose a 2005 baseline year, as the initial measure of its current total GHG and 2030 as the target year for reducing emissions. A baseline emission was determined from all areas of local government operations (i.e. buildings, streetlights, transit systems, vehicle fleets, wastewater treatment facilities and waste generated by government operations) and from energy and waste related community activities (i.e. residential, commercial and institutional buildings, motor vehicles, waste streams and industry within local control). Refer to Table 11 and Figure 11. Then potential reduction target emission scenarios were created, expressed as a percentage of the baseline emission to meet the target year. Growth forecasts are made to allow communities to take into account increases in GHG production when choosing a reduction target. Setting of specific targets are forthcoming by the County's elected boards.

The 2009 GHG report presented Orange County with three scenarios to reduce GHG emissions: a business-as-usual (BAU) option, a mid-level reduction level and an aggressive reduction level. If the business-as-usual (BAU) option were chosen GHG emissions would increase by approximately 53% between 2005-2030. (Measures implemented before 2005 resulted in a reduction of 94,118 tons of GHG or a decline of about three percent from 2005 levels.) Currently planned measures to be in place by 2030 will result in a slight decrease in GHG production (approximately six percent) from the BAU scenario in 2030; however, these measures will be insufficient to offset the 53% percent overall increase (Table 10). To date the county has made many changes in order to reduce future emissions including a large variety of recycling programs, leaf collection, fueling some vehicles with biodiesel, providing bicycle facilities, adopting various ordinances, establishing an Urban Services Boundary, providing daylighting in new schools, purchasing hybrid vehicles over conventional vehicles and supporting Chapel Hill Transit's fare-free system, among others. Establishing a reduction target helps local governments to quantify their commitment to reducing GHG emissions and sets a concrete, measurable goal for the government and community to strive towards. By establishing emission reduction targets and officially adopting these targets through council resolutions, the county will fulfill Milestone #2 of the Cities for Climate Protection (CCP) Five Milestone Framework, adopt an emissions reduction target for the forecast year.

To support a sustainable future, Orange County should:

- Assess and implement the current countywide greenhouse gas (GHG) emissions target reductions and
- Monitor the 2035 Long-Range Transportation Plan from the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, which provides traffic projections for long-range transportation planning.

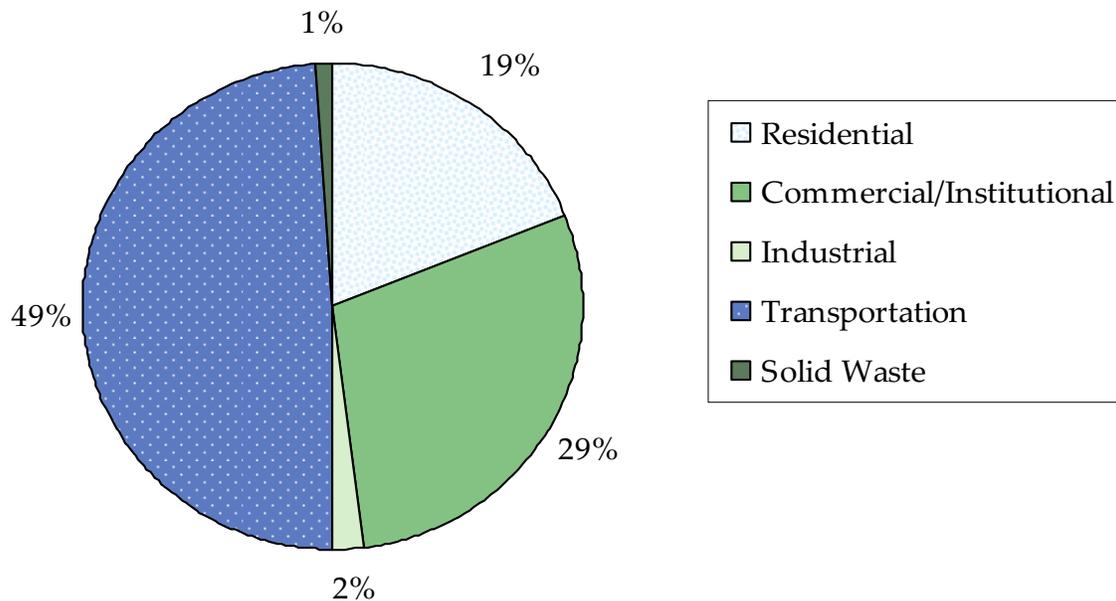
**Table 10: Energy Use  
(based on 2005 Base Year data)**

Year & Scenario	GHGs (Tons)	Difference from Baseline
2005	2,496,505	-
2005 Without Measures	2,871,399	3%
2030: BAU	4,402,043	59%
2030: Currently Planned Measures	4,246,562	53%

**Table 11: Greenhouse Gas Emissions by Sector (tons)**

Sector	Energy (MMbtu)	GHGs (tons)	GHGs (%)
Residential	3,905,632	527,996	19%
Commercial/Institutional	5,637,049	812,943	29%
Industrial	243,009	40,542	2%
Transportation	15,850,531	1,356,984	49%
Solid Waste	-	38,816	1%
<b>Total</b>	<b>25,636,221</b>	<b>2,777,281</b>	<b>100%</b>

**Figure 11: Percent of Greenhouse Gas Emissions by Sector**



Source: Tables 10 & 11 and Figure 11 —Orange County Greenhouse Gas Inventory (2009)