Connect2050 Appendix 7. Air Quality

Background

The National Ambient Air Quality Standards (NAAQS) defines the allowable concentration for six different pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide). In the past, portions of the Triangle area were designated as "non-attainment" for oxides of nitrogen and volatile organic compounds (VOC) that are precursors to ozone, and for carbon monoxide because the area did not meet the NAAQS standard. As a result, North Carolina Department of Environment and Natural Resources (NCDENR), which is responsible for creating the State Implementation Plan (SIP) to address the non-attainment issues, included the Triangle area in the SIP. Basically, the MPOs complied with the SIP by demonstrating that certain emissions from the future transportation sector would not exceed a specified threshold, called the SIP budget. The compliance requirements and emission calculation methodology were presented in a detailed report called the *Research Triangle Regional Conformity Determination Report*. The 20-year CO maintenance requirements for the Triangle expired in 2015.

On December 26, 2007, the Triangle Area was redesignated as attainment with a maintenance plan for ozone under the eight-hour standard. The U.S. Court of Appeals for the DC Circuit in the South Coast Air Quality Management District v EPA, No. 15-1115, issued a decision on February 16, 2018. In that decision, the Court struck down portions of the 2008 Ozone National Ambient Air Quality Standards (NAAQS) State Implementation Plan Requirements Rule which vacated the revocation of transportation conformity requirements for the 1997 8-hour Ozone NAAQS.

In November 2018, U. S. EPA issued Guidance for the South Coast v EPA Court Decision. U. S. EPA's guidance states that transportation conformity for MTPs and TIPs for the 1997 ozone NAAQS can be demonstrated without a regional emissions analysis pursuant to 40 CFR 93.109(c). Transportation conformity for the 1997 ozone NAAQS would be required on MTP and TIP actions as of February 16, 2019.

As a result, the Triangle is still required to demonstrate transportation-air quality conformity, but is not required to calculate future emissions and compare them to an emissions limit, termed a "budget." However, the MPOs believe that monitoring and lowering pollutant emissions is a prudent practice given the positive health, environmental and economic benefits of doing so. Thus, to ensure that the 2050 MTP continues to support these positive benefits, this appendix compares the emissions set forth in the SIP that was used for the last long-range plan that required a quantitative analysis (2040 MTP) with those estimated to result from implementation of the 2050 MTP.

The 2050 MTP Conformity Determination Report can be viewed on each MPO's web site and on the Triangle J COG web site.

2050 MTP Air Quality

Connect2050 has a significant focus on air quality:

Goal -- Protect the Human and Natural Environment and Minimize Climate Change
Objective – Reduce transportation sector emissions
Objective – Achieve net zero carbon emissions

The tables that follow compare the SIP budget used in the 2040 MTP, with the projected emissions from the current plan, i.e., 2050 MTP. The values are for the daily kilograms of emissions of oxides of nitrogen (NOx) and carbon monoxide (CO) for the counties that are in the respective air quality areas. In every case, the projected 2050 MTP emissions are only a fraction of the SIP budget, being as low as 10% in Granville County for NOx and only reaching the highest fraction among the group at 27% in Wake County for NOx and for CO. These future lower emissions are not surprising. It is expected that the Corporate Average Fuel Economy (CAFE) standards will continue to improve the average fuel economy of cars and light trucks. In addition, vehicle emission standards continue to reduce tailpipe pollutants and improve fuel quality.

NOx *(kg/day)*

County (1)	2040 MTP SIP Budget	2050 MTP	MTP/ SIP Budget
Durham	4,960	1,173	24%
Wake	16,532	4,397	27%
Granville	1,714	163	10%
Franklin	1,139	202	18%
Johnston	5,958	838	14%
Orange	3,742	650	17%

(1) Chatham not included because only partial county data is available for the prior budget

CO *(kg/day)*

County (2)	2040 MTP SIP Budget	2050 MTP	MTP/ SIP Budget
Durham	160,771	24,827	15%
Wake	348,604	94,545	27%

(2) Only Durham and Wake counties had a prior CO budget.

The three tables on the next page show daily pollutant emissions from the transportation sector for the Triangle Region, CAMPO and DCHC MPO. The tables feature the different pollutants by the base year (year 2016), Existing + Committed (E+C), and adopted 2050 MTP scenarios. The E+C is essentially a no-build scenario. It is the population and employment in the year 2050 on the current and underway

network of roadways and transit service. The MOVES3 emissions model uses vehicle-miles-traveled (VMT) and speed data from the Triangle Regional Model (i.e., transportation model) to produce this data.

Although the VMT will increase nearly 80% over this time period (2016 to 2050), most of the pollutants are forecasted to decrease. This reduction comes because tailpipe emissions standards continue to improve, the efficiency of the motor vehicle fleet (average miles per gallon) is expected to improve), the age of the motor fleet is getting newer, and the proportion of electric vehicles is expected to increase.

Unfortunately, carbon dioxide emissions from the transportation sector will continue to increase despite a reduction in the per capita consumption of gasoline and wider use of electric vehicles.

Emissions - Triangle Region	**Year ==>**	**2016**	**2050**	**2050**	**% change**
Pollutant	**Scenario ==> Unit of Measure**	**Existing**	**Existing + Committed**	**Adopted**	**2016 to 2050 Adopted**
Carbon Monoxide (CO)	1,000 kilograms	321	166	170	-47%
Nitrous Oxides (NOx)	1,000 kilograms	26	8	8	-70%
Volatile Organic Compounds (VOC)	1,000 kilograms	19	11	12	-39%
Particulate Matter (PM2.5)	kilograms	561	297	304	-46%
Greenhouse Gases (CO_2 equivalent)	1 million kilograms	27	33	34	22%
Daily Energy Consumption per capita	gallon of gasoline	1.6	1.1	1.1	-29%

Emissions - CAMPO	**Year ==>**	**2016**	**2050**	**2050**	**% change**
Pollutant	**Scenario ==> Unit of Measure**	**Existing**	**Existing + Committed**	**Adopted**	**2016 to 2050 Adopted**
Carbon Monoxide (CO)	1,000 kilograms	195	106	111	-43%
Nitrous Oxides (NOx)	1,000 kilograms	16	5	5	-67%
Volatile Organic Compounds (VOC)	1,000 kilograms	12	7	8	-35%
Particulate Matter (PM2.5)	kilograms	340	190	198	-42%
Greenhouse Gases (CO_2 equivalent)	1 million kilograms	17	21	22	31%
Daily Energy Consumption per capita	gallon of gasoline	1.4	1.0	1.1	-27%

Emissions - DCHC MPO	**Year ==>**	**2016**	**2050**	**2050**	**% change**
Pollutant	**Scenario ==> Unit of Measure**	**Existing**	**Existing + Committed**	**Adopted**	**2016 to 2050 Adopted**
Carbon Monoxide (CO)	1,000 kilograms	83	37	38	-54%
Nitrous Oxides (NOx)	1,000 kilograms	7	2	2	-74%
Volatile Organic Compounds (VOC)	1,000 kilograms	5	3	3	-48%
Particulate Matter (PM2.5)	kilograms	145	67	68	-53%
Greenhouse Gases (CO_2 equivalent)	1 million kilograms	7	7	7	6%
Daily Energy Consumption per capita	gallon of gasoline	1.7	1.1	1.2	-30%

Note: CO_2 typically represents about 80% of Greenhouse Gas (GHG) emissions.

Listed below are more detailed calculations from the emissions analysis output across a range of parameters.

DAQ updated Data run using Wake County emission coefficients and Region VMT

TRM Region, Weekday Emissions, 2050 MTP

pollutant		2050 FCvFinal
CO	kg	170,034
NOx	kg	7,908
VOC	kg	11,653
PM2.5	kg	304
Daily CO2 Equivalent	kg	33,591,523
Daily CO2 Equivalent Weekday per capita	kg	10.62
Annual CO2 Equivalent per capita	kg	3,692
Total Daily Energy Consumption	kj	464,001,662,976
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	3,521,567
Daily Energy Consumption per capita	gallon [U.S.] of auto gasoline	1.11
Annual Energy Consumption per capita	gallon [U.S.] of auto gasoline	387
Population		3,163,933

Durham

pollutant		2050 FCvFinal
CO	kg	24,827
NOx	kg	1,173
VOC	kg	1,729
PM2.5	kg	45
CO2	kg	4,984,911
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	522,593
VMT Factor Durham		14.6%

Orange

pollutant		2050 FCvFinal
CO	kg	13,969
NOx	kg	650
VOC	kg	957
PM2.5	kg	25
CO2	kg	2,759,622
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	289,305
VMT Factor Orange		8.2%

Chatham

pollutant		2050 FCvFinal
CO	kg	6,597
NOx	kg	307
VOC	kg	452
PM2.5	kg	12
CO2	kg	1,303,341
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	136,636
VMT Factor Chatham		3.9%

DCHC (based on DCHC VMT in TRM Summary Report)

pollutant		2050 FCvFinal
CO	kg	37,939
NOx	kg	1,764
VOC	kg	2,600
PM2.5	kg	68
CO2	kg	7,495,190
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	785,758
VMT Factor DCHC		22.3%

DCHC (based on TRM Summary Report Population) per capita

pollutant		2050 FCvFinal
CO	kg	0.056
NOx	kg	0.003
VOC	kg	0.004
PM2.5	kg	0.000
CO2	kg	11.075
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	1.161
Population DCHC		676,776

Wake

pollutant		2050 FCvFinal
CO	kg	94,545
NOx	kg	4,397
VOC	kg	6,480
PM2.5	kg	169
CO2	kg	18,678,119
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	1,958,120
VMT Factor - Wake		55.6%

Franklin

pollutant		2050 FCvFinal
CO	kg	4,354
NOx	kg	202
VOC	kg	298
PM2.5	kg	8
CO2	kg	860,115
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	90,170
VMT Factor - Franklin		2.6%

Granville

pollutant		2050 FCvFinal
CO	kg	3,499
NOx	kg	163
VOC	kg	240
PM2.5	kg	6
CO2	kg	691,212
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	72,463
VMT Factor - Granville		2.1%

Harnett

pollutant		2050 FCvFinal
CO	kg	2,843
NOx	kg	132
VOC	kg	195
PM2.5	kg	5
CO2	kg	561,618
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	58,877
VMT Factor - Harnett		1.7%

Johnston

pollutant		2050 FCvFinal
CO	kg	18,029
NOx	kg	838
VOC	kg	1,236
PM2.5	kg	32
CO2	kg	3,561,717
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	373,393
VMT Factor - Johnston		10.6%

Person

pollutant		2050 FCvFinal
CO	kg	1,372
NOx	kg	64
VOC	kg	94
PM2.5	kg	2
CO2	kg	271,013
Total Daily Energy Consumption	gallon [U.S.] of auto gasoline	28,412
VMT Factor - Person		0.8%

CAMPO total based on TRM Summary Report VMT

CAMPO (Total)

pollutant		2050 FCvFinal
CO	kg	110,533
NOx	kg	5,140
VOC	kg	7,575
PM2.5	kg	198
CO2	kg	21,836,727
Total Daily Energy Consumption	US gals	2,289,253
CAMPO VMT Factor		65.0%

CAMPO total based on TRM Summary Report Population (per capita)

CAMPO (per capita)

pollutant		2050 FCvFinal
CO	kg	0.051
NOx	kg	0.002
VOC	kg	0.003
PM2.5	kg	0.000
CO2	kg	10.039
Total Daily Energy Consumption	US gals	1.052
CAMPO Population from TRM Summary Report		2,175,144