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How Smart Growth and Livability Intensify Air Pollution

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The Environmental Protection Agency (EPA) wants to implement stronger air pollution restrictions on ozone (smog) for the stated purpose of improving public health.[1] These regulations are misguided because they would impose significant costs for little or no benefit.[2] At the same time, policies being implemented at the state and local levels and proposed at the federal level are working to undermine any improvement of air quality.

Population Density and Air Pollution. For years, regional transportation plans, public officials, and urban planners have been seeking to densify urban areas, using strategies referred to as "smart growth" or "livability." They have claimed that densifying urban areas would lead to lower levels of air pollution, principally because it is believed to reduce travel by car. In fact, however, EPA data show that higher population densities are strongly associated with higher levels of automobile travel and more concentrated air pollution.[3]

This is illustrated by county-level data for nitrogen oxides (NOx) emissions, which is an important contributor to ozone formation. This analysis includes the more than 425 counties in the nation's major metropolitan areas (those with more than 1 million in population).[4]

Seven of the 10 counties with the highest NOx emissions concentration (annual tons per square mile)[5] in major metropolitan areas are also among the top 10 in population density (2008). New York County (Manhattan) has by far the most intense NOx emissions and is also by far the most dense. Manhattan also has the highest concentration of emissions for the other criteria air pollutants, such as carbon monoxide, particulates, and volatile organic compounds (2002 data).[6] New York City's other three most urban counties (Bronx, Kings, and Queens) are more dense than any county in the nation outside Manhattan, and all are among the top 10 in NOx emission density. (See Table 1.)

Traffic and Air Pollution. More concentrated traffic also leads to greater traffic congestion and more intense air pollution. The data for traffic concentration is similar to population density.[7] Manhattan has by far the greatest miles of road travel per square mile of any county. Again, seven of the 10 counties with the greatest density of traffic are also among the 10 with the highest population densities. As in the case of NOx emissions, the other three highly urbanized New York City counties are also among the top 10 in the density of motor vehicle travel. (See Table 1.)

The overall relationship between higher population densities and both NOx concentration and motor vehicle traffic intensity is illustrated

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Intensity of Nitrogen Oxides and Motor Vehicle Travel

Calculations Are per Square Mile

Nitrogen Oxide Emissions

Rank	County Equivalent	Times Major Metropolitan County Average
1	New York County, NY	23.8
2	San Francisco County, CA	14.7
3	Bronx County, NY	13.7
4	Washington, DC	13.1
5	St. Louis, Mo.	12.4
6	Arlington County, VA	11.3
7	Cook County, IL	10.0
8	Suffolk County, MA	9.5
9	Kings County, NY	8.7
10	Queens County, NY	8.7

Motor Vehicle Travel Miles

Rank	County Equivalent	Times Major Metropolitan County Average
1	New York County, NY	37.8
2	Bronx County, NY	22.3
3	Fredericksburg, VA	19.9
4	Alexandria, VA	15.8
5	San Francisco County, CA	15.6
6	Arlington County, VA	15.1
7	Suffolk County, MA	14.4
8	Queens County, NY	14.3
9	Kings County, NY	13.8
10	Washington, DC	13.1

Note: Figures for nitrogen oxide emissions are for 2008. Figures for motor vehicle travel are for 2005.

Sources: U.S. Environmental Protection Agency, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, 2008 National Emissions Inventory Data, at *http://www.epa.gov/ttn/chief/net/2008inventory.html* (September 6, 2011); U.S. Environmental Protection Agency, 2005 County-Level Vehicle Miles Traveled, at *http://www.epa.gov/ttnnaaqs/pm/docs/2005_vmt_county_level.xls* (September 6, 2011).

Table 1 • WM 3364 heritage.org

in Table 2. There is a significant increase in the concentration of both NOx emissions and motor vehicle travel in each higher category of population density. For example, the counties with more than 20,000 people per square mile have NOx emission concentrations 14 times those of the average county in these metropolitan areas, and motor vehicle travel is 22 times the average.[8] A smaller sample

1. Imposition of these regulations has been suspended, with a further review in 2013.
2. Andrew M. Grossman, "High on Ozone: The EPA's Latest Assault on Jobs and the Economy," Heritage Foundation *Webmemo* No. 3330, August 1, 2011, at *http://www.heritage.org/research/reports/2011/08/high-on-ozone-the-epas-latest-assault-on-jobs-and-the-economy.*
3. Wendell Cox, "Population Density, Traffic Density and Nitrogen Oxides (NOx) Emission Air Pollution Density in Major Metropolitan Areas of the United States," *Demographia.com,* September 6, 2011, at *http://www.demographia.com/db-countynox.pdf* (September 14, 2011).
4. These data do not provide air quality rankings. Higher air pollution emissions are associated with lower air quality; however, other factors also contribute, such as climate, topography, etc. The concentrations of NOx emissions and motor vehicle traffic can vary significantly within single counties. Moreover, there are strong statistical associations between motor vehicle travel and NOx emission densities among the major metropolitan counties.
5. U.S. Environmental Protection Agency, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, 2008 National Emissions Inventory Data, at *http://www.epa.gov/ttn/chief/net/2008inventory.html* (September 14, 2011).
6. Calculated from data downloaded from U.S. Environmental Protection Agency, AirData, at *http://www.epa.gov/oar/data/geosel.html* (September 14, 2011).
7. U.S. Environmental Protection Agency, 2005 County-Level Vehicle Miles Traveled, at *http://www.epa.gov/ttnnaaqs/pm/docs/2005_vmt_county_level.xls* (September 14, 2011).
8. The city (county-level jurisdiction) of Fredericksburg, Virginia, surprisingly ranks third in its concentration of motor vehicle travel, yet ranks eighth in population density. This reflects the high volumes of traffic through the city on two of the East's busiest roadways, Interstate 95 and US-1.

Nitrogen Oxide Emissions and Motor Vehicle Travel Intensities

By Population Density for Major Metropolitan Areas with More Than 1 Million Population

Population Density (People per Square Mile)	Nitrogen Oxide Emissions per Square Mile	Times Major Metropolitan County Average	Motor Vehicle Travel Miles per Square Mile	Times Major Metropolitan County Average
20,000 or more	108.1	13.7	304,064	22.1
10,000–20,000	79.8	10.1	173,450	12.6
5,000–10,000	65.1	8.3	146,149	10.6
2,500–5,000	40.3	5.1	84,695	6.1
1,000–2,500	23.1	2.9	45,064	3.3
Less than 1,000	4.6	0.6	7,057	0.5
Average of Major Metropolitan Counties	**7.9**		**13,779**	

Note: Figures for nitrogen oxide emissions are for 2008. Figures for road travel are for 2005.

Sources: U.S. Environmental Protection Agency, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, 2008 National Emissions Inventory Data, at *http://www.epa.gov/ttn/chief/net/2008inventory.html* (September 6, 2011); U.S. Environmental Protection Agency, 2005 County-Level Vehicle Miles Traveled, at *http://www.epa.gov/ttnnaaqs/pm/docs/2005_vmt_county_level.xls* (September 6, 2011).

Table 2 • WM 3364 heritage.org

of the most urbanized counties (those with 90 percent or more of the land urbanized) showed a stronger association.[9] Even research by the Sierra Club and a model derived from that research by ICLEI–Local Governments for Sustainability, both strong supporters of densification, show that traffic volumes increase with density.[10]

The Goal: Improving Public Health. These data strongly indicate that the densification strategies associated with smart growth and livability are likely to worsen the concentration of both NOx emissions and motor vehicle travel.

But there is a more important impact. A principal reason for regulating air pollution from highway vehicles is to minimize public health risks. Any public policy that tends to increase air pollution intensities will work against the very purpose of air pollution regulation—public health. The American Heart Association[11] fotund that air pollution levels vary significantly in urban areas and that people who live close to highly congested roadways are exposed to greater health risks. The EPA also notes that NOx emissions are higher near busy roadways.[12] The bottom line is that—all things being

9. Cox, "Population Density, Traffic Density and Nitrogen Oxides (NOx) Emission Air Pollution Density in Major Metropolitan Areas of the United States," p. 4.
10. As described in Wendell Cox, "New Traffic Scorecard Reinforces Density-Traffic Congestion Nexus," *newgeography*, March 3, 2010, at *http://www.newgeography.com/content/001444-new-traffic-scorecard-reinforces-density-traffic-congestion-nexus* (September 14, 2011), an increase of neighborhood densities from four to 15 housing units per acre is associated with a 150 percent increase in traffic density. This is calculated from the ICLEI-Local Governments for Sustainability Density-VMT Calculator, at *http://www.icleiusa.org/library/documents/8-Density-VMT%20Calculator%20%282%29.xls/view* (September 14, 2011), which is based on Sierra Club research by John W. Holtzclaw, "Smart Growth—As Seen From the Air: Convenient Neighborhood, Skip the Car," presented at the Air & Waste Management Association's 93rd Annual Meeting & Exhibition, June 23, 2000, at *http://www.sierraclub.org/sprawl/transportation/holtzclaw-awma.pdf* (September 14, 2011).
11. Robert D. Brook, Barry Franklin, Wayne Cascio, *et al.*, "Air Pollution and Cardiovascular Disease: A Statement of the Health Care Professionals from the Expert Panel on Population and Prevention Science of the American Heart Association," *Circulation*, Vol. 109, 2004, pp. 2655–2671, at *http://circ.ahajournals.org/content/109/21/2655.long* (September 14, 2011.)
12. U.S. Environmental Protection Agency, Nitrogen Dioxide, at *http://www.epa.gov/air/nitrogenoxides/health.html* (September 14, 2011).

equal—higher population density, more intense traffic congestion, and higher concentrations of air pollution go together.

All of this could have serious consequences as the EPA expands the strength of its misguided regulations. For example, officials in the Tampa–St. Petersburg area have expressed concern that the metropolitan area will not meet the new standards, and they have proposed densification as a solution, consistent with the misleading conventional wisdom. The reality is that this is likely to make things worse, not better. Officials there and elsewhere need to be aware of how densification worsens air pollution intensity and health risks and actually defeats efforts to meet federal standards.

Growth That Makes Areas Less Livable. There are myriad difficulties with smart growth and livability policies, including their association with higher housing prices, a higher cost of living, muted economic growth, and decreased mobility and access to jobs in metropolitan areas. As the EPA data show, the densification policies of smart growth and livability also make air pollution worse for people at risk, while increasing traffic congestion.[13]

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13. Additional analysis and information is available in Cox, "Population Density, Traffic Density and Nitrogen Oxides (NOx) Emission Air Pollution Density in Major Metropolitan Areas of the United States."