Shrinking the Carbon Footprint of Metropolitan America

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America's carbon footprint is expanding. With a growing population and an expanding economy, America's settlement area is widening, and as it does, Americans are driving more, building more, consuming more energy, and emitting more carbon. Rising energy prices, growing dependence on imported fuels, and accelerating global climate change make the nation's growth patterns unsustainable.

Metropolitan America is poised to play a leadership role in addressing these energy and environmental challenges. However, federal policy actions are needed to achieve the full potential of metropolitan energy and climate solutions.

America's Challenge

The nation's carbon footprint has a distinct geography not well understood or often discussed. This report quantifies transportation and residential carbon emissions for the 100 largest U.S. metropolitan areas, finding that metro area residents have smaller carbon footprints than the average American. However, metro footprints vary widely. Population density and the availability of public transit are important to understanding carbon footprints, as are the carbon intensity of electricity generation, electricity prices, and weather.

Limitations of Existing Federal Policy

Numerous market and policy distortions inhibit metropolitan actors from more aggressively addressing the nation's climate challenge. Economy-wide problems include underpriced energy, underfunded energy research, missing federal standards, distorted utility regulations, and inadequate information. Policy impediments include a bias against public transit, inadequate federal leadership on freight and land-use planning, failure to encourage energy- and location-efficient housing decisions, and the fragmentation of federal transportation, housing, energy, and environmental policies.

A New Federal Approach

Federal policy could play a powerful role in helping metropolitan areas—and so the nation—shrink their carbon footprint. In addition to economy-wide policies to motivate action, five targeted policies are particularly important within metro areas and for the nation as a whole:

- ***Promote more transportation choices*** to expand transit and compact development options
- ***Introduce more energy-efficient freight operations*** with regional freight planning
- ***Require home energy cost disclosure when selling and "on-bill" financing*** to stimulate and scale up energy-efficient retrofitting of residential housing
- ***Use federal housing policy*** to create incentives for energy- and location-efficient decisions
- ***Issue a metropolitan challenge*** to develop innovative solutions that integrate multiple policy areas

America's Challenge

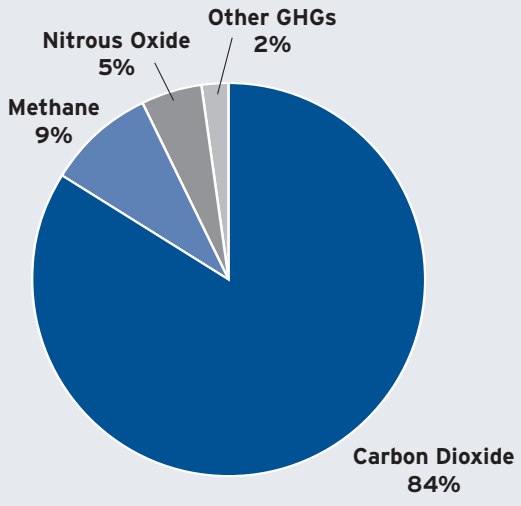
Residential and commercial buildings account for 39 percent of the carbon emissions in the United States. Transportation accounts for one-third of U.S. emissions, and industry is responsible for 28 percent. An effective climate strategy must focus on reducing carbon emissions from all three sectors.

Carbon emissions in the United States have increased by almost 1 percent each year since 1980. Emissions from the residential, commercial, and transportation sectors each increased by more than 25 percent over the past 25 years. Industrial emissions have declined over this same period as the country has moved away from energy-intensive manufacturing and toward a service and knowledge economy.

As a result, consumers are increasingly the driving force of domestic energy consumption and carbon emissions. Residential and commercial buildings and road transportation are expected to dominate energy demand and carbon growth in the future. Total U.S. carbon emissions are projected to grow by 16 percent between 2006 and 2030.

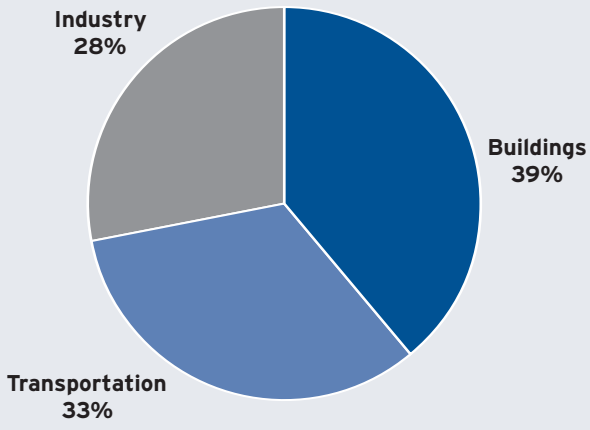
Carbon dioxide is the most prevalent greenhouse gas (GHG) emitted in the United States and it primarily comes from the energy used in buildings and transportation

U.S. GHG Emissions (2005)



Source: Environmental Protection Agency

U.S. CO_2 Emissions by Sector (2005)



Source: Energy Information Administration

Shrinking the nation's carbon footprint while allowing for population and economic growth requires a strategic focus on reducing the* energy intensity *of the U.S. economy and reducing the carbon intensity of the energy we consume. This means reducing either the amount of energy required to power the economy or reducing U.S. reliance on high-carbon-emitting fuels, such as coal.

Reductions will not be easy. Energy intensity is much higher in the United States than in many other developed countries. Despite recent improvements, U.S. energy intensity remains approximately two times higher than in Japan. Although China overtook the United States and Europe in 2006 to become the world's largest carbon emitter, the United States will likely remain one of the most carbon-intensive nations, based on carbon emissions per capita.

Meeting the climate challenge will require adaptation and innovation in metropolitan America. The nation's built environment is concentrated in the largest metropolitan areas, making them central to achieving meaningful carbon reductions.

The Partial Carbon Footprint of Metro America

The nation needs a consistent set of emissions data for multiple periods and at a scale that can be tied to the activities, land uses, and the infrastructure of metropolitan areas before researchers can study the impact of proposed federal policy changes—or the experiences from state and local efforts.

This study begins to fill that need by producing comparable partial carbon footprints for the 100 largest metropolitan areas in 2000 and 2005. The footprints are based on national databases for passenger and freight highway transportation and for energy consumption in residential buildings. The footprints do not include emissions from commercial buildings, industry, or non-highway transportation.

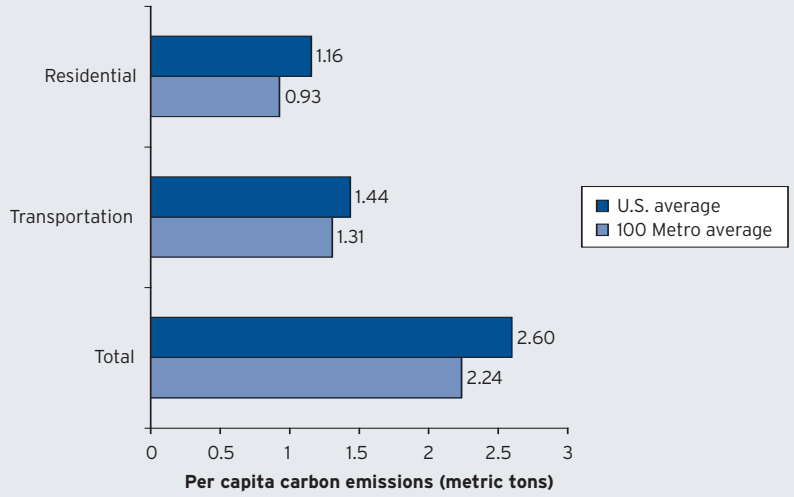
Analysis of the partial carbon footprints reveals five major findings:

1. Large metropolitan areas offer greater energy and carbon efficiency than nonmetropolitan areas

Despite housing two-thirds of the nation's population and three-quarters of its economic activity, the nation's 100 largest metropolitan areas emitted just 56 percent of U.S. carbon emissions from highway transportation and residential buildings in 2005.

Therefore, the average metro resident in 2005 had a smaller carbon footprint (2.24 metric tons) than the average American (2.60 metric tons). The difference stems primarily from less car travel and electricity use.

Residents in the largest metro areas emitted less carbon than the average American in 2005



2. Carbon emissions increased more slowly in metropolitan America than in the rest of the country between 2000 and 2005

Carbon emissions from highway transport and residences in major metro areas increased 7.5 percent from 2000 to 2005, slightly less than the national increase of 9.1 percent. The population of the 100 metro areas, on the other hand, grew by only 6.3 percent. As a result, the average per capita footprint of the 100 metro areas grew by only 1.1 percent during the five-year period, while the U.S. partial carbon footprint increased twice as rapidly (by 2.2 percent) during this same timeframe.

In the 100 metro areas and the nation at large, carbon emissions grew faster for auto transport and residential electricity than for freight travel and residential fuels.

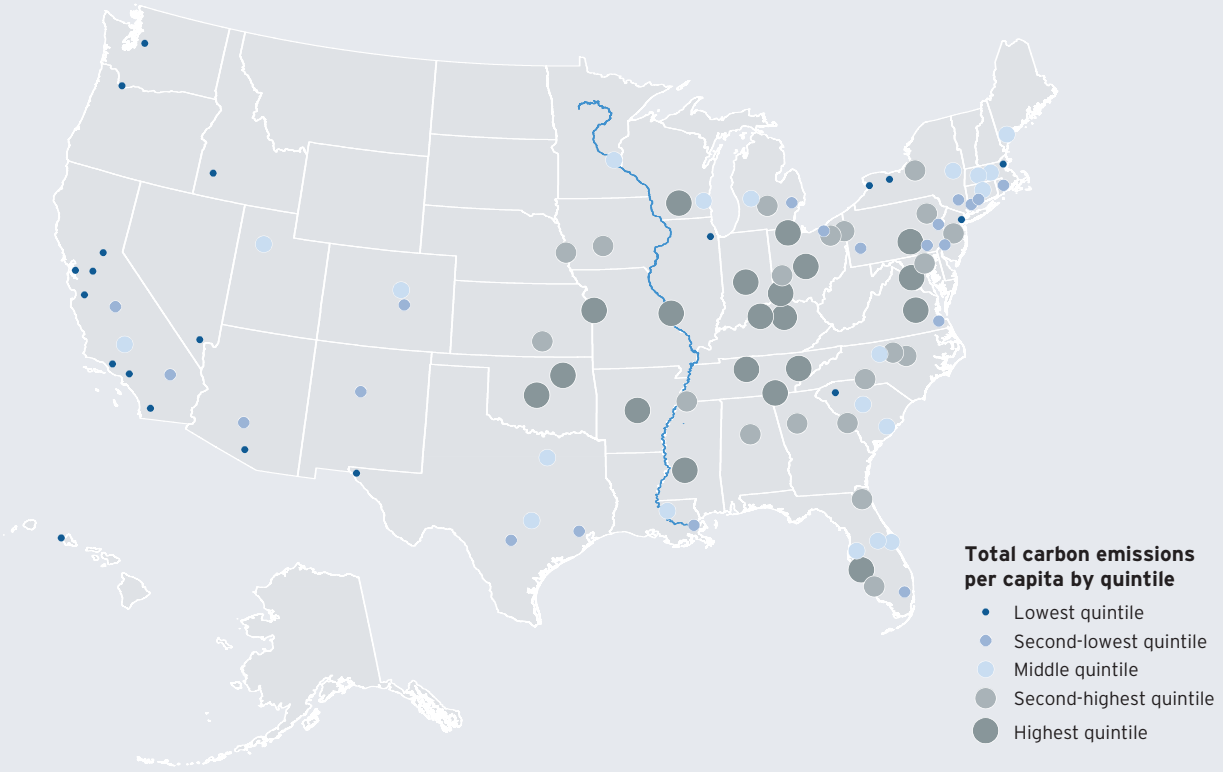
Trenton, NJ, saw the most growth in both total carbon emissions and per capita footprints. In contrast, Youngstown, OH, and Grand Rapids, MI, each saw their carbon footprints decline by 14 percent during the five-year period—the largest declines in the 100 metro areas. Riverside, CA, Bakersfield, CA, and El Paso, TX, also lowered their per capita footprints by more than 10 percent.

3. Per capita emissions vary substantially by metro area

In 2005, per capita carbon emissions were highest in Lexington, KY, and lowest in Honolulu. The average resident in Lexington emitted 2.5 times more carbon from transport and residences than the average resident in Honolulu, at 3.46 metric tons compared with 1.36 metric tons. (Appendix A ranks the full set of 100 metro areas by per capita emissions in 2005.)

This variation is even more striking when adjusting for a metro area's economic output, or gross metropolitan product (GMP)—an indicator of carbon intensity. In this case, the carbon footprints range from a high of 97.6 metric tons of carbon per million dollars of GMP in Youngstown, OH, to a low of 22.5 metric tons per million dollars of GMP in San Jose, CA—more than a four-fold difference.

All of the metro areas with the largest per capita carbon footprints in 2005 were located in the East-Central and Eastern United States, while most of the metro areas with the smallest footprints were located in the West



The Mississippi River roughly divides the country into high emitters and low emitters. In 2005, all but one of the 10 largest per capita emitters was located east of the Mississippi. On the other hand, all but one of the ten lowest emitters—New York being the exception—was located west of the Mississippi. A north-south divide is also apparent. All of the highest per capita emitters were located south of Lake Erie, including two each from Tennessee, Ohio, and Kentucky.

The West is the only region that saw a decline in its partial carbon footprint between 2000 and 2005. The Midwest, Northeast, and South all increased their per capita carbon emissions.

4. Development patterns and rail transit play an important role in determining carbon emissions

Density, concentration of development, and rail transit all tend to be higher in metro areas with small per capita footprints. Much of what appears as regional variation may be attributed to these spatial factors.

Dense metro areas such as New York, Los Angeles, and San Francisco stand out for having the smallest transportation and residential footprints. Alternatively, low-density metro areas such as Nashville and Oklahoma City predominate in the 10 largest per capita metro emitters.

Many metro areas with small per capita carbon footprints also have sizable rail transit ridership. New York, San Francisco, San Diego, and Los Angeles have some of the highest annual rail ridership in the nation. Washington, Baltimore, and Atlanta also have high rail ridership, but they do not follow the same pattern, as they have substantially larger than average carbon footprints

Finally, freight traffic poses a problem for metro areas trying to shrink their carbon footprints. Riverside, CA, Jacksonville, FL, and Sarasota, FL, all include or are near port cities with sizable freight traffic. They also log significant miles of travel by combination trucks, which typically involve low-efficiency trips that either start or end outside the metro area's boundaries.

5. Other factors are important, such as the fuels used to generate electricity, electricity prices, and weather

The fuel mix used to generate electricity matters in residential footprints. A high-carbon fuels mix significantly penalizes the Ohio Valley and Appalachian regions, which rely heavily on coal power. Alternatively, hydro-reliant metro areas such as Seattle have substantially smaller residential footprints.

Pricing influences the electricity component of the residential footprints. Each of the 10 metro areas with the lowest per capita electricity footprints in 2005 hailed from states with higher-than-average electricity prices, including California, New York, and Hawaii. Many Southeastern metro areas, on the other hand, with high electricity consumption per capita have had historically low electricity rates.

Weather unmistakably plays a role in residential footprints. High-emitting metro areas often concentrate in climates that demand both significant cooling and heating, such as in the eastern mid-latitude states. In contrast, the 10 metro areas with the smallest per capita residential footprints are all located along the West Coast, with its milder climate.

To summarize, large metro areas offer greater energy and carbon efficiency than nonmetropolitan areas, and metro areas have development patterns that show promise for reducing carbon emissions.

These results also point to factors that challenge efforts to shrink footprints. First, between 2000 and 2005, carbon footprints grew faster than the population in the 100 largest metro areas, and the nation at large. Second, many of the fastest-growing metro areas are also the least compact, such as Austin, TX, Raleigh, NC, or Nashville, TN. Third, important factors may be largely beyond the grasp of metropolitan America, such as weather.

Fortunately, many of these obstacles can be addressed by policy interventions. More than 800 officials representing 80 million Americans have signed the U.S. Mayors' Climate Protection Agreement, committing to reducing their carbon emissions. In the long run, however, metro America will be hard-pressed to shrink its carbon footprint in the absence of supportive federal policy.

Limitations of Existing Federal Policy

The need for national action to curb carbon emissions is becoming increasingly clear, although the array of federal policies, rules, and available tools for doing so remains incomplete and at times flawed.

Across the entire economy, the federal government has not resolved underpriced energy; underfunded energy research, development, and demonstration (RD&D); a lack of key federal standards; counterproductive utility regulations; and inadequate data on best practices.

In the transportation sector, the federal government favors highway construction over transit and provides inadequate leadership and vision on freight transportation and land-use planning.

In the buildings sector, federal policy does little to create incentives to buy homes in walkable communities or near public transit. Utility policies in traditionally regulated states also thwart energy efficiency improvements and low-carbon options.

Finally, *federal policy is not well integrated,* making it difficult to coordinate transportation, housing, and environmental policy to achieve national goals.

Delay in addressing the flaws in state and federal policy creates lost opportunities. Investments in major new facilities and equipment are often only cost-effective during an upgrade, renovation, or system replacement. If improved technology is not installed at those points, the carbon-intensive status quo can be locked in for decades.

A New Federal Approach

Federal policy can and should play a powerful role in helping metropolitan areas—and so the nation—shrink their carbon footprint. By addressing market and government failures, the federal government has the ability to spur energy efficiency and carbon reduction across all sectors of the nation's economy.

Five economy-wide federal actions are critical to achieving the nation's climate goals:

- **Put a price on carbon** to account for the external costs of fossil fuel combustion
- **Step up investment in energy RD&D** to increase energy-efficiency and low-carbon innovations and more quickly bring innovations to market
- **Establish a national renewable electricity standard** to foster renewable sources and energy efficiency markets in a rational and predictable policy environment
- **Help states reform their electricity regulations** to spur energy efficiency
- **Improve information collection and dissemination** on emissions, energy consumption, and best practices for states and localities

These five policies are critical to achieving the nation's climate goals. As important as they are, however, they do not recognize the role of the built environment in reducing demand for energy and thus in shrinking the nation's carbon footprint.

By addressing market and government failures, the federal government has the ability to spur energy efficiency and carbon reduction across all sectors of the nation's economy.

As the research reported above illustrates, location matters to carbon emissions. Federal climate legislation must address this reality.

Therefore, five targeted policy actions have the potential to transform how consumers, pro-

ducers, and policymakers in metropolitan America make decisions that influence the nation's climate and energy security goals.

Two **transportation and land-use strategies** can promote energy- and location- efficient development.

1. Promote more transportation choices to expand transit and compact development options

The federal government has little direct control over local land-use decisions. Yet, federal transportation decisions greatly influence local and regional development patterns. Federal transportation decisions have historically limited the viability of transit and transit-oriented development, which represents an important tool for shrinking carbon footprints by reducing vehicle travel and associated fuel use.

The federal government could better enable metropolitan areas to address their unique transportation needs and accomplish bold emissions reduction goals.

To remedy these policy flaws, the federal government should adopt a position of "modal neutrality," as Robert Puentes argues in a forthcoming *Blueprint* policy paper. This means that the federal government should not favor one travel mode over another, such as highways over transit. At the very least, the federal Department of Transportation should subject proposals for highway projects to the same level of scrutiny as it does transit project proposals. It should require major investment studies and disclosure of long-term funding for highways and highway improvements, as it does for transit. While economic and fiscal considerations are key criteria for project evaluation, so too should be environmental quality and energy efficiency. By doing so, the federal government could better help metropolitan areas address their unique transportation needs and accomplish bold goals that complement national efforts to reduce emissions.

2. Introduce more energy-efficient freight operations with regional freight planning

The growth in truck traffic is outpacing that of automobile traffic in most metro areas, and truck vehicle miles traveled is expected to grow by more than 2 percent annually through 2020. Given that metro areas handle the vast majority of the nation's freight cargo and traffic, a broader federal role in supporting energy-efficient freight planning is warranted to address regional and national freight transport needs.

To support more energy-efficient truck pickup and drop operations, the federal government should develop and promote well-researched examples of energy-saving freight technologies and logistical systems. Such projects should build on the experience of both the Best Urban Freight Solutions program in Europe and the USEPA's Smartway Transportation Program.

The federal government should also help metropolitan planning agencies collect and analyze information on where to best locate truck-rail, truck-water, and truck-air freight terminals. Here again planners can learn from the European experience of "freight villages," where many different freight handling firms are located along with the consolidation and break-bulk operations associated with very high volumes of metro area truck trips.

The nation should also embrace two **housing policies** to encourage energy- and location-efficient housing decisions.

3. Require home energy cost disclosure when selling and "on-bill" financing to stimulate and scale up energy-efficient retrofitting

The Real Estate Settlement Procedures Act (RESPA) is intended to protect buyers from unforeseen risks and costs when purchasing a home. RESPA should be expanded to include the unseen costs related to energy. Sellers should be required to disclose energy costs for several years before the sale. RESPA should also require the uniform disclosure of energy-efficient investments or energy-efficient certifications previously awarded to the home. There may also be a role for the federal government to develop standards for use by the various multiple listing service systems.

Meeting the climate challenge will require innovation and creativity to link disparate policies beyond anything considered so far.

To encourage energy-efficient retrofits for the existing housing stock, the federal government should collaborate with utility companies, banks, municipalities, housing agencies, and consumer groups to create meter-secured, "on-bill financing" options for home energy efficiency. On-bill financing allows homeowners to pay the upfront costs of efficiency improvements in their monthly utility bills from the savings generated by the investment. By securing the upfront costs to the "meter," multiple dwellers of the same unit benefit from the investment and shared savings. Although versions of this option are emerging, the fragmented nature of the market appears ripe for federal involvement.

4. Use federal housing policy to create incentives for energy- and location-efficient decisions

Currently, real estate prices do not fully reflect the energy- or location-efficiency of buildings. In a responsive market, buyers should be able to borrow higher amounts when purchasing a home that is located near stores and public transit, which can ultimately save energy. Location-efficient mortgages (LEMs) offer such an option. LEMs are currently available in Chicago, Seattle, San Francisco, and Los Angeles, but federal versions are very limited and poorly designed.

While reinvigorating its LEM program, the federal government should expand its range of fiscal incentives to stimulate investments in residential energy efficiency, which are currently quite small and limited primarily to new construction or high-cost solar systems.

Because the federal mortgage interest deduction often leads to the purchase of larger homes and contributes to suburbanization, the federal government should examine whether its signature homeownership policy is undercutting other efforts to reduce energy use and carbon emissions.

Finally, the nation should **encourage innovative and creative policy solutions** from metro areas.

5. Issue a metropolitan challenge to develop innovative solutions that integrate multiple policy areas

Meeting the climate challenge will ultimately require innovation and creativity to link disparate transportation, housing, energy, and environmental policies beyond anything considered so far.

The federal government should issue a new challenge to metro areas—perhaps originating with ongoing congressional climate discussions or in the housing and transportation appropriations—to find new ways to integrate transportation, energy, buildings, workforce, and land-use policies to slow energy consumption and reduce GHG emissions. Two models for this challenge grant are the Department of Transportation's Urban Partnership Program to reduce congestion, and the Department of the Interior's Water 2025 challenge grant program.

* * *

The recommended portfolio of economy-wide and metro-targeted transportation and housing policies addresses the principal market and policy flaws that handicap metropolitan America from contributing more to the nation's energy and carbon reduction goals.

Appendix A. Per capita carbon emissions from transportation and residential energy use, 2005

Metropolitan Area	Rank	Per Capita Carbon Footprint (metric tons)
Honolulu, HI	1	1.36
Los Angeles-Long Beach-Santa Ana, CA	2	1.41
Portland-Vancouver-Beaverton, OR-WA	3	1.45
New York-Northern New Jersey-Long Island, NY-NJ-PA	4	1.50
Boise City-Nampa, ID	5	1.51
Seattle-Tacoma-Bellevue, WA	6	1.56
San Jose-Sunnyvale-Santa Clara, CA	7	1.57
San Francisco-Oakland-Fremont, CA	8	1.59
El Paso, TX	9	1.61
San Diego-Carlsbad-San Marcos, CA	10	1.63
Oxnard-Thousand Oaks-Ventura, CA	11	1.75
Sacramento–Arden-Arcade–Roseville, CA	12	1.77
Greenville, SC	13	1.86
Rochester, NY	14	1.91
Chicago-Naperville-Joliet, IL-IN-WI	15	1.97
Buffalo-Niagara Falls, NY	16	2.00
Tucson, AZ	17	2.00
Las Vegas-Paradise, NV	18	2.01
Stockton, CA	19	2.02
Boston-Cambridge-Quincy, MA-NH	20	2.02
Phoenix-Mesa-Scottsdale, AZ	21	2.07
Fresno, CA	22	2.08
Lancaster, PA	23	2.09
New Haven-Milford, CT	24	2.10
Poughkeepsie-Newburgh-Middletown, NY	25	2.13
Colorado Springs, CO	26	2.13
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	27	2.14
Miami-Fort Lauderdale-Miami Beach, FL	28	2.16
New Orleans-Metairie-Kenner, LA	29	2.16
Bridgeport-Stamford-Norwalk, CT	30	2.18
Cleveland-Elyria-Mentor, OH	31	2.24
Riverside-San Bernardino-Ontario, CA	32	2.26
San Antonio, TX	33	2.27
Pittsburgh, PA	34	2.28
Houston-Baytown-Sugar Land, TX	35	2.29
Virginia Beach-Norfolk-Newport News, VA-NC	36	2.34
Detroit-Warren-Livonia, MI	37	2.35
Albuquerque, NM	38	2.36
Allentown-Bethlehem-Easton, PA-NJ	39	2.36
Providence-New Bedford-Fall River, RI-MA	40	2.37
Hartford-West Hartford-East Hartford, CT	41	2.38
Denver-Aurora, CO	42	2.39
Charleston-North Charleston, SC	43	2.43
Milwaukee-Waukesha-West Allis, WI	44	2.44
Minneapolis-St. Paul-Bloomington, MN-WI	45	2.44
Springfield, MA	46	2.45
Tampa-St. Petersburg-Clearwater, FL	47	2.50
Baton Rouge, LA	48	2.51
Worcester, MA	49	2.52
Salt Lake City, UT	50	2.52
Albany-Schenectady-Troy, NY	51	2.52
Columbia, SC	52	2.53
Bakersfield, CA	53	2.54

Appendix A. (continued)

Metropolitan Area	Rank	Per Capita Carbon Footprint (metric tons)
Orlando, FL	54	2.55
Austin-Round Rock, TX	55	2.57
Greensboro-High Point, NC	56	2.58
Dallas-Fort Worth-Arlington, TX	57	2.58
Portland-South Portland-Biddeford, ME	58	2.60
Palm Bay-Melbourne-Titusville, FL	59	2.60
Grand Rapids-Wyoming, MI	60	2.61
Durham, NC	61	2.61
Akron, OH	62	2.64
Scranton—Wilkes-Barre, PA	63	2.66
Trenton-Ewing, NJ	63	2.66
Omaha-Council Bluffs, NE-IA	65	2.68
Wichita, KS	66	2.68
Syracuse, NY	67	2.68
Atlanta-Sandy Springs-Marietta, GA	67	2.68
Baltimore-Towson, MD	69	2.71
Cape Coral-Fort Myers, FL	70	2.74
Lansing-East Lansing, MI	71	2.75
Charlotte-Gastonia-Concord, NC-SC	72	2.76
Youngstown-Warren-Boardman, OH-PA	73	2.76
Des Moines, IA	74	2.77
Dayton, OH	75	2.77
Raleigh-Cary, NC	76	2.80
Memphis, TN-MS-AR	77	2.87
Augusta-Richmond County, GA-SC	78	2.89
Birmingham-Hoover, AL	79	2.90
Jacksonville, FL	80	2.91
Madison, WI	81	2.91
Sarasota-Bradenton-Venice, FL	81	2.91
Columbus, OH	83	2.95
Kansas City, MO-KS	84	2.97
Little Rock-North Little Rock, AR	85	3.01
Richmond, VA	86	3.04
Jackson, MS	87	3.06
Chattanooga, TN-GA	88	3.11
Washington-Arlington-Alexandria, DC-VA-MD-WV	89	3.12
Tulsa, OK	90	3.12
Knoxville, TN	91	3.13
Harrisburg-Carlisle, PA	92	3.19
Oklahoma City, OK	93	3.20
St. Louis, MO-IL	94	3.22
Nashville-Davidson—Murfreesboro, TN	95	3.22
Louisville, KY-IN	96	3.23
Toledo, OH	97	3.24
Cincinnati-Middletown, OH-KY-IN	98	3.28
Indianapolis, IN	99	3.36
Lexington-Fayette, KY	100	3.46
Average Footprint for 100 Largest Metros		2.24

Source: Author's calculations.

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The Blueprint for American Prosperity is a multi-year initiative to promote an economic agenda for the nation that builds on the assets and centrality of America's metropolitan areas. Grounded in empirical research and analysis, the *Blueprint* offers an integrated policy agenda and specific federal reforms designed to give metropolitan areas the tools they need to generate economically productive growth, to build a strong and diverse middle class, and to grow in environmentally sustainable ways. Learn more at www.blueprintprosperity.org

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The *Blueprint* initiative is supported and informed by a network of leaders who strive every day to create the kind of healthy and vibrant communities that form the foundation of the U.S. economy. The Metropolitan Policy Program Leadership Council—a bipartisan network of individual, corporate, and philanthropic investors—comes from a broad array of metropolitan areas around the nation. Council members provide us financial support but, more importantly, are true intellectual and strategic partners in the *Blueprint*. While many of these leaders act globally, they retain a commitment to the vitality of their local and regional communities, a rare blend that makes their engagement even more valuable. To learn more about the members of our Leadership Council, please visit www.blueprintprosperity.org

For More Information

The full-length paper from which this brief is drawn is available at
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