Miles to Go Before They're Green

Reducing Surface Transportation Greenhouse Gas Emissions Through a Regional Performance-Based Framework

by

Gary Rahl
Rahl_Gary@bah.com

David Erne
Erne_David@bah.com

Victoria Adams
Adams_Victoria@bah.com

Stephanie Sand
Sand_Stephanie@bah.com

Booz | Allen | Hamilton

delivering results that endure

Miles to Go Before They're Green

Reducing Surface Transportation Greenhouse Gas Emissions Through a Regional Performance-Based Framework

Any program created to minimize greenhouse gas (GHG) emissions in the US will be difficult to implement without an aggressive effort to sharply curtail emissions from surface transportation—cars, buses, trucks, and the like—in the largest metropolitan areas (also referred to as metropolitan statistical areas, or MSAs).

Consider the scope of the problem: Transportation generates approximately one-third of all US GHG emissions. Surface transportation in the 100 largest US metropolitan areas is responsible for more than half of these emissions, by far the largest single contributor. Moreover, between 2000 and 2005, carbon emissions in those same MSAs increased by nearly 10 percent. Even factoring in the recent economic downturn and its downward effect on carbon emissions, the long-term trend in transportation emissions still appears to be moving upwards. To meet the goal of 80 percent emissions reductions by 2050, which the scientific community has put forward as necessary to avoid the most significant impacts of climate change, new thinking and action is needed in the surface transportation sector.

By modeling the effectiveness of emissions reduction policies in MSAs, Booz Allen Hamilton has identified portfolios of strategies that would curtail greenhouse gases in a wide range of metropolitan areas. These models allowed us to generate a series of recommendations for a new approach to funding transportation projects based on a region's success in meeting specific GHG reduction goals. Such a performance-based approach would represent real public sector innovation, and would tackle a fundamental challenge that has limited progress in reducing emissions to date. With a total program cost estimated at a fraction of projected annual cap-and-trade revenue, or the federal government's traditional annual investment in transportation, such an approach would put the scientific community's 2050 goal within reach.

Scope of the Problem

Jurisdictional and policy barriers, as well as lack of funding, inhibit metropolitan areas from taking more effective action to reduce GHG emissions from surface transportation. MSAs are generally highly dispersed entities, often spread over a number of neighboring communities or even across different states, each with their own political priorities and budgetary concerns. Typically, the transportation systems serving MSAs are managed by a variety of local rail, bus, highway, and port agencies. Such fragmented local leadership is unable to drive sufficient consensus for land use planning and housing development oriented around: efficient transportation nodes; coordinated transportation expansion; means and methods of project financing; and regional transportation innovation. Making matters worse, federal transportation funding approaches have not traditionally considered GHG emissions an important issue, and provide few incentives for meaningful regional transportation planning to reduce them. As a result, the transportation networks of most MSAs are regional in scale and impact, but local in management and planning.

Unless they take coordinated steps to mitigate the impact of transportation on GHG emissions, metropolitan areas will continue to be an outsized carbon contributor. According to a Booz Allen Hamilton analysis, without any meaningful carbon reduction strategies (CRS), annual GHG output from the 100 largest MSAs will increase from about 1 billion metric tons in 2010 to 1.35 billion metric tons in 2030. The same study found, however, that by implementing a wide range of green transportation strategies—increased public transit, incentives for commuting

by mass transportation, congestion pricing, low emission fleets, traffic signal improvements, and others—these regions could build on changes that are occurring at the national level (increased corporate average fuel economy (CAFE) standards, renewable fuels mandates, and the like) and, in a best case scenario, could reduce their transportation emissions by up to 80 percent in that 20-year period (see Exhibit 1).

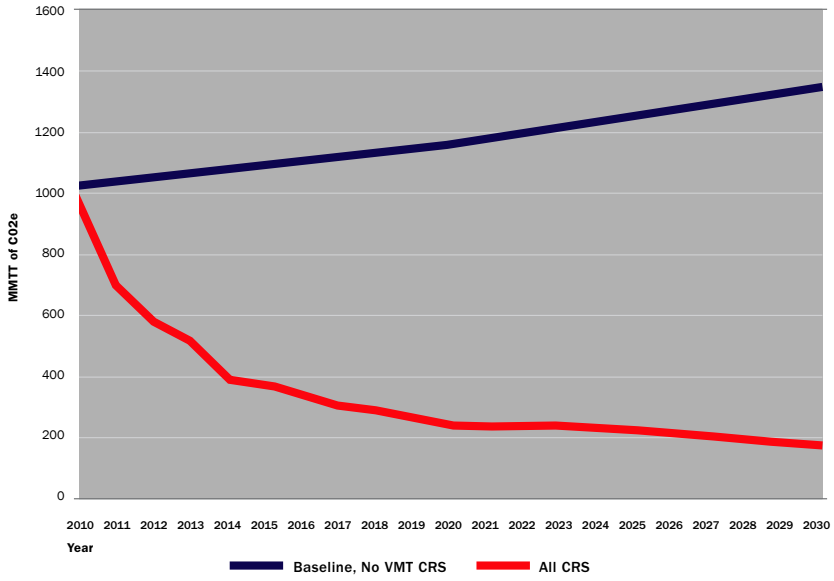
For MSAs, however, getting from here to there will require much more than good intentions.

To achieve these gains, a national-scale program that provides incentives (in the form of significant funding streams) based on a metropolitan area's performance in actually achieving GHG emissions reduction is needed. Administered by an appropriate federal agency, perhaps the US Department of Transportation (DOT) or US Environmental Protection Agency (EPA), this program could be funded by a portion of the revenue generated from auctioned allowances under a federal cap-and-trade GHG framework, or as part of a transportation reauthorization bill.

Under the program designed by Booz Allen, MSAs would receive a mixture of performance and investment grants that would reward them for investing in GHG-reducing transportation policies. We envision that the grants would initially focus on helping MSAs develop their emissions reduction strategies, and put in place the organizational infrastructure needed to strengthen the regionally focused planning and reporting capabilities they ultimately would need. The program would soon shift from these grants to a more performance-based orientation as a region's projects and policies begin to take hold and achieve measurable GHG reductions—the greater the real reductions, the larger the funding stream.

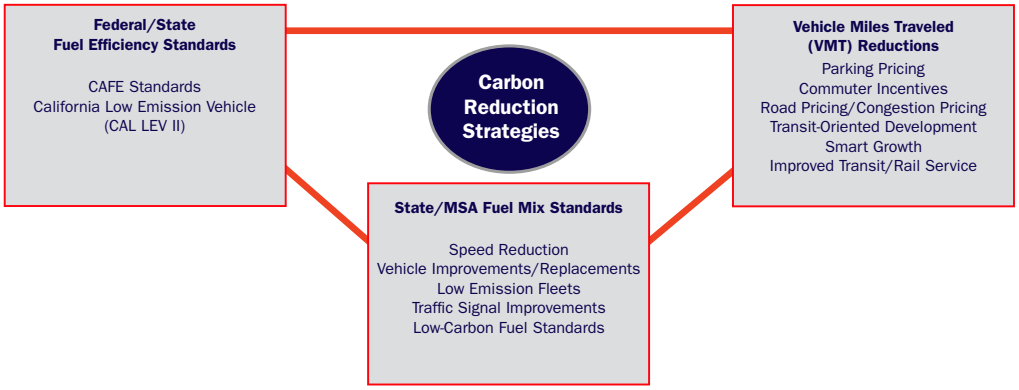
Unlike other proposals, this program would not mandate any particular approach to GHG reductions but would require that funding be applied to reducing the level of GHG emissions from surface transportation regionally. MSAs would be free to adopt the most efficient method of GHG reductions for their region. One region might decide to invest in mass transit while another might opt to reach its GHG goals through implementation of new policies, such as congestion

Exhibit 1 | Potential GHG Impact of Transportation Carbon Reduction Strategies on Top 100 Metropolitan Regions



Source: Booz Allen Hamilton

Exhibit 2 | CRS Categories to Reduce GHG Emissions



Source: Booz Allen Hamilton

charging or anti-idling ordinances. The advantage of this approach is that it would encourage innovation and give regional decision makers and local communities the freedom to select (and create) those policies that are most effective for them, and best align with their aspirations for regional development.

Most importantly, a performance-based system such as the one described here would encourage metropolitan regions to go beyond simply planning for emissions reduction. By designing a program such that the performance-based rewards are of sufficient magnitude, metropolitan regions would have incentives to act in a unified way and actually implement their approach to transportation GHG reduction.
A performance-based program would go straight to the heart of the challenge that regional transportation planners have faced for decades—the difficult part of the problem is not creating a regional plan, but rather creating a plan that all involved jurisdictions actually have incentive (and means) to implement.

Modeling Reduction Strategies

To determine how well GHG reduction strategies could work in distinctly different metropolitan areas, Booz Allen turned to an advanced modeling technique, known as the Monte Carlo method. Simply put, the Monte Carlo method uses repeated, random sampling to simulate, in this case, the likely range of impacts that GHG reduction strategies could have on MSAs that adopt these policies. We did not try to predict the carbon minimization policies that individual MSAs would adopt, but instead explored the outcome of organic policymaking in which MSAs adopted approaches best suited to their situations.

Furthermore, we did not assume that emissions reduction strategies had only one possible impact no matter how or where they were deployed. Instead, we reviewed data on the wide range of effectiveness of each strategy from MSAs all over the country and incorporated ranges of performance to the Monte Carlo model. Consequently, by using our model, policy makers in a given MSA or at a national level can explore alternative GHG strategy combinations within a flexible framework.

In all, Booz Allen modeled the unpredictability and uncertainty of more than 100 MSAs choosing varied carbon reduction strategies over a 20-year period. We were able to address such critical questions as:

- What would happen to GHG emissions if MSAs invested more heavily in mass transit?
- What would happen if MSAs invested in lower cost options, such as traffic calming or congestion fees?
- How would gas or carbon taxes impact GHG emissions?
- How would enhanced CAFE standards or new technology impact GHG emissions?

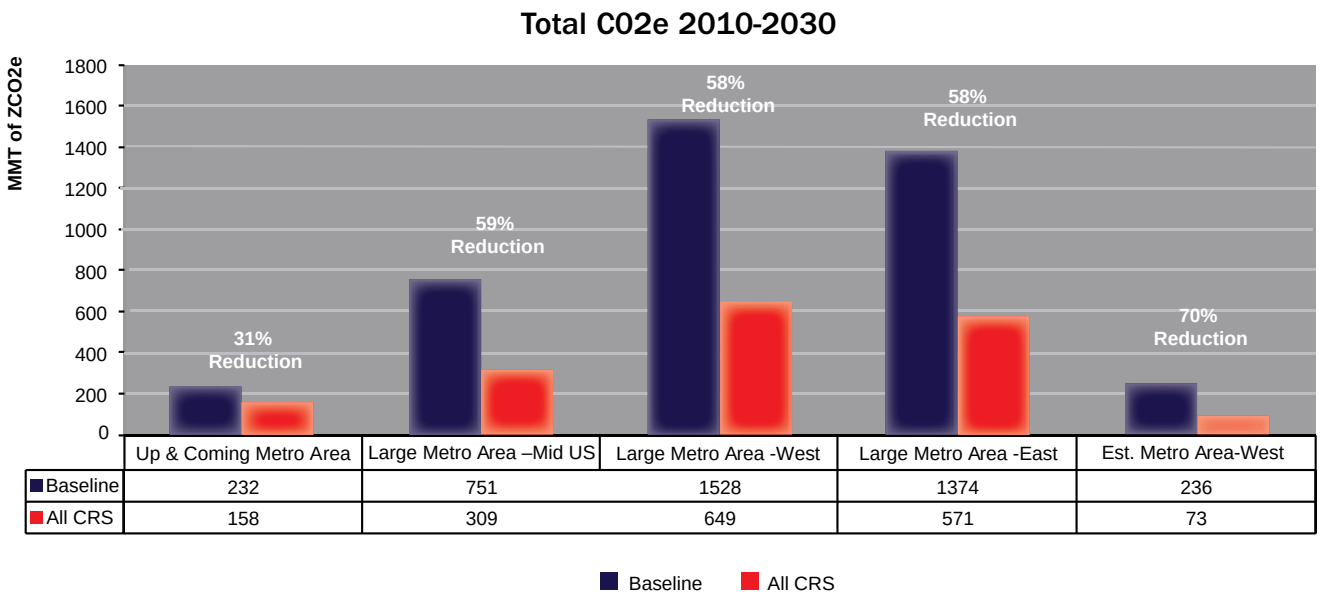
For the purposes of our analysis, emissions reduction strategies were broken down into three categories traditionally considered by policy makers: Federal/State Fuel Efficiency Standards; State/MSA Fuel Mix Standards; and Vehicle Miles Traveled (VMT) Reductions (see Exhibit 2 on previous page).

What Works Best

Not surprisingly, because of their unique characteristics, different MSAs enjoyed different outcomes in our model, depending on the particular GHG reduction strategies applied. No single strategy or group of strategies on their own is a solution to the problem. Instead, a portfolio of strategies across the three categories delivered the best GHG emissions reductions. Results also varied based on the general size of the MSA and whether they had existing policies and/or infrastructure in place. For example, by adopting a GHG program, the biggest metropolitan areas would realize nearly 60 percent improvements in their carbon emissions between 2010 and 2030. By contrast, up-and-coming cities—particularly wide open regions with significant vehicle traffic and substantial growth yet to come—could expect GHG reductions closer to about 30 percent (see Exhibit 3). Improvements in these representative MSAs (using more realistic assumptions for the representative MSAs) combined with those in other MSAs could result in the overall nationwide reduction of 80 percent, as previously mentioned.

Perhaps as importantly, from a policy perspective, Booz Allen's models showed how critical it was to adopt the appropriate GHG strategies for a given region. For example, while low emission fleets would be equally valuable in most representative MSAs—providing GHG reduction of nearly 60 percent over 20 years—parking pricing, commuter incentives, and transit-oriented development would have little impact in the near-term on emerging cities (because jobs and shopping tend to be more spread out and not as concentrated around a central business district) but would generate more than 10 percent improvements in established cities. In contrast, the high Vehicle Miles

Exhibit 3 | Scenario Analysis of Representative Cities



	Up & Coming Metro Area	Large Metro Area –Mid US	Large Metro Area -West	Large Metro Area -East	Est. Metro Area-West
Baseline	232	751	1528	1374	236
All CRS	158	309	649	571	73

Source: Booz Allen Hamilton

Traveled (VMT) in emerging areas would make low carbon fuel standards a higher-impact option than in metropolitan areas that were already more compact.

Designing a Program

While our modeling highlights the great potential, strategies for reducing GHG emissions from surface transportation often imply significant investments. With the budget constraints, MSAs will have a difficult time implementing these strategies without federal assistance. In providing such assistance, though, any federal effort should recognize that MSAs are not starting with a blank slate, and should consider how best to incentivize MSAs of all sizes. For example, offering incentives on the basis of total GHG emission reductions favors large metropolitan areas such as New York and Los Angeles. Providing incentives on the basis of per capita reduction in GHG emissions is more desirable to smaller metropolitan areas, which are currently less efficient than larger regions by that measurement. Therefore, we developed a number of different approaches to incentivize MSAs that focus on each city's particular needs.

Under one possible approach, MSAs would apply for participation in the federal program by submitting a 20-Year Surface Transportation Emissions Reduction Plan. To support development of this plan, the federal implementing agency would need to establish a "planning basis characterization" of each emissions reduction strategy that would include the presumed performance of the strategy and the expected time period over which each strategy is likely to provide GHG reduction. Upon acceptance of the 20-Year Plan, an MSA would receive initial grant funding over a three-year implementation period. This should provide funding to the MSA for its first set of activities, and with the promise of future funding, retain sufficient incentive to implement strategies that suited them best and reduce GHG emissions as quickly as possible. In ensuing years, they would receive performance grants as they achieved GHG reductions. Incentive grants would diminish over time while performance grants would increase. The combination of incentives and performance grants could be capped on a yearly basis.

Based on our analysis, approximately $4 billion per year in combined grants could be paid out if carbon reduction were valued at approximately $30 per ton. While that would be a significant investment in emissions reduction, it would be just a small percentage of projected annual cap-and-trade revenue, or of the federal government's traditional annual investment in transportation, an indication that reducing surface transportation's contribution to greenhouse gases significantly is not only possible but less daunting than perhaps it would first seem. To do this, however, a much greater degree of cooperation than we have seen to date among the federal government, municipal jurisdictions, and local agencies is required. But that, too, can be readily accomplished with the appropriate admixture of federal performance and investment grants and more deftly coordinated local transportation policy leadership. Considering the deleterious impact of greenhouse gases—a condition that promises to worsen if only little is done, creating an innovative policy approach to diminishing carbon emissions from surface transportation is a logical step.

Ready for What's Next

At Booz Allen Hamilton, we take pride in helping the federal government prepare fully for upcoming challenges. With deep expertise in the complexities of today's fast-changing energy markets and decades of experience helping governments optimize their use of facilities, installations, and other infrastructure, we're uniquely positioned to look ahead and collaborate with our clients on energy efficiency, renewable energy, sustainability, and opportunities and challenges related to climate change.

About Booz Allen

Booz Allen Hamilton has been at the forefront of strategy and technology consulting for 95 years. Every day, government agencies, institutions, corporations, and infrastructure organizations rely on the firm's expertise and objectivity, and on the combined capabilities and dedication of our exceptional people to find solutions and seize opportunities. We combine a consultant's unique problem-solving orientation with deep technical knowledge and strong execution to help clients achieve success in their most critical missions. Providing a broad range of services in strategy, operations, organization and change, information technology, systems engineering, and program management, Booz Allen is committed to delivering results that endure.

With 20,000 people and $4 billion in annual revenue, Booz Allen is continually recognized for its quality work and corporate culture. In 2009, for the fifth consecutive year, *Fortune* magazine named Booz Allen one of "The 100 Best Companies to Work For," and *Working Mother* magazine has ranked the firm among its "100 Best Companies for Working Mothers" annually since 1999.

To learn more about the firm and to download digital versions of this article and other Booz Allen Hamilton publications, visit www.boozallen.com.

Contact Information:

Gary Rahl
Rahl_Gary@bah.com

David Erne
Erne_David@bah.com

Victoria Adams
Adams_Victoria@bah.com

Stephanie Sand
Sand_Stephanie@bah.com

Emily Wasley (Wasley_Emily@bah.com) also contributed to this article.

Booz | Allen | Hamilton

Principal Offices

ALABAMA
Huntsville

CALIFORNIA
Los Angeles
San Diego
San Francisco

COLORADO
Colorado Springs
Denver

FLORIDA
Pensacola
Sarasota
Tampa

GEORGIA
Atlanta

HAWAII
Honolulu

ILLINOIS
O'Fallon

KANSAS
Leavenworth

MARYLAND
Aberdeen
Annapolis Junction
Lexington Park
Linthicum
Rockville

MICHIGAN
Troy

NEBRASKA
Omaha

NEW JERSEY
Eatontown

NEW YORK
Rome

OHIO
Dayton

PENNSYLVANIA
Philadelphia

SOUTH CAROLINA
Charleston

TEXAS
Houston
San Antonio

VIRGINIA
Arlington
Chantilly
Falls Church
Herndon
McLean
Norfolk
Stafford

WASHINGTON, DC

The most complete, recent list of offices and their addresses and telephone numbers can be found on www.boozallen.com by clicking the "Offices" link under "About Booz Allen."