

Quantifying the Emissions Benefits of Transportation Efficiency and SOV Travel Reduction Programs

Catherine E. Preston and John V. Thomas¹

Abstract:

Many sensible and cost effective initiatives face a common challenge: the benefits which they generate are either difficult to quantify or long term in nature. In fact, many of the most cost effective public policies in arenas such as health care, human services, and education are effective because they address long term structural problems. The same is true of many investments and programs to reduce pollution from the transportation sector. Some of the most effective initiatives, such as land use planning, improved urban design and alternative transit infrastructure investment, have the greatest potential to achieve emissions reductions because they address structural aspects of urban sprawl and the dependence on individual passenger car travel. Many travel reduction policies and programs, such as telecommuting, carpool/vanpool/paratransit and other innovative transit initiatives, do show immediate results. However, the near term benefits from other initiatives with significant long term potential to reduce emissions often prove difficult to quantify.

The support for transportation efficiency initiatives, particularly those that involve federal funding, increasingly depends upon justification of the investments and programs in terms of short term, quantifiable results. Therefore, there is a need to develop better means of measuring and accounting for their benefits. The needs are both practical and theoretical. From the practical side, there is a need to further develop an annual reporting infrastructure to provide a more comprehensive accounting of local projects that are part of a national program, such as EPA's Transportation Partners. From the theoretical side, there is still a need to further develop the tools of measurement and quantification for many types of transportation efficiency initiatives.

¹ Program Analysts, Energy and Transportation Sectors Division, Office of Policy Development, Office of Policy, Planning and Evaluation, US Environmental Protection Agency, 401 M Street SW (2126), Washington, DC 20460.

Developing a reporting infrastructure is particularly challenging in the case of transportation efficiency measures, as many of the initiatives are undertaken either by local governments or local non-profit organizations, both of which are likely to be short on staff and financial resources to implement a major quantification effort. Traditional methods for capturing the results of short term measures, such as travel diaries and polls, must be replaced by estimates. Methods for quantifying the effects of long term, structural changes must be developed with this limitation in mind.

Over the past year, EPA's Transportation Partners program, in cooperation with nine national non-profit organizations and over 300 local governments, non-profits and businesses, has attempted to address the challenges presented by attempting to quantify the emissions reductions achieved by such programs. As such travel reductions programs increasingly depend on their ability to show "tons reduced per dollar," the lessons from the Transportation Partners quantification project should prove useful, especially to those implementing land use planning, urban design or alternative transportation infrastructure construction strategies.

Introduction:

Transportation Partners is a voluntary program of the US Environmental Protection Agency (EPA) which focuses on the reduction of greenhouse gases from the transportation sector. Transportation Partners focuses its attention on emissions reductions that can be achieved through the reduction of single-occupant vehicle miles traveled (SOVMT), rather than through changes in fuels or engine technologies. Broadly, such programs can be categorized as either community design and redevelopment; economic incentives and market-based approaches; and technology-based projects that improve alternatives to single-occupant vehicle travel. Transportation Partners is funded through the Climate Change Action Plan and is housed under EPA's Office of Policy, Planning and Evaluation. Currently, there are approximately 3.5 full-time equivalent (FTE) employees working on the program.

Program Structure:

Structurally, Transportation Partners breaks down into three primary groups. At the federal level, "TP Central" is comprised of the EPA headquarters staff who manage, coordinate and support the Transportation Partners program. The "Principal Partners" are a group of nine non-governmental organizations which receive funding from EPA to develop strategies, projects and provide technical expertise to a broad group of constituents working in the field of SOVMT reduction strategies.

The Principal Partners' research, publications and workshops in turn support the SOVMT reduction activities of over 300 local "Project Partners." Project Partners work at the local level to implement these strategies. They include local activist organizations, local and regional governments, metropolitan planning organizations (MPOs), transit agencies, and employers. They range in size from one or two volunteers working as a newly formed activist organization to governmental offices with professional staffs larger than that of TP Central.

Activity Types:

The Project Partners work within a wide range of strategic approaches that cut across many modes of transportation. These strategies include: improvements to bicycle and pedestrian environments, improved transit service, carpool/vanpool programs, and telecommuting initiatives. Each of these categories has the potential to reduce SOVMT in the short term. Additionally, however, many Project Partners are focused on long term strategies, working on policy development, land use and transportation planning activities, education and advocacy.

The 1996 Evaluation Process:

The development of the 1997 evaluation of Transportation Partners really began with our first attempt at such an evaluation in 1996. The form we drew up for the 1996 Partner Profile resembled a "short answer" question exam with one line questions followed by white space to write-in narrative responses. The format was designed to give a maximum amount of flexibility to a wide range of partners. When asking questions such as "How will your project increase transportation choices?" or "Can you quantify/estimate the emissions reductions likely to result from your project?" we did not want to impose a particular format, or even units, on respondents. We were aware that many organizations would not have the information which we sought available in precisely the format we wanted, let alone the same format as each other. By leaving the space for them to respond as they felt appropriate, we hoped we would increase the number of completed forms.

Another challenge faced during the 1996 evaluation was how to obtain the information necessary without directly asking any of the Project Partners. Under the Federal Paperwork Reduction Act, any agency asking the same questions of more than nine people or organizations must first obtain permission from the Office of Management and Budget. OMB must approve an Information Collection Request (ICR). Time was scarce for the 1996 evaluation and we were not able to process an ICR for the data collection. This meant we were restricted to asking the Principal Partners for the information on their Project Partners. This

middleman approach was extremely time-consuming for those Principal Partners who attempted to complete the information for each of their Project Partners and not entirely effective. As a result, we obtained information on approximately 10% of the Project Partners.

The 1997 Evaluation Development:

Due to both a significant growth in our Project Partner base and our need to collect better information the effectiveness of the programs, the 1997 evaluation process took a different form. Simply asking our Principal Partners to repeat the same evaluation from the previous year seemed fruitless. Thus we began preparing an Information Collection Request in March 1997 that would enable us to conduct a survey of the Project Partners. Despite the bureaucratic difficulties such a process creates, it can be a helpful exercise for anyone preparing to survey the public. The ICR process requires prospective surveyors to estimate the burden to the requester and to the prospective respondents in terms of hours and dollars. Understanding these costs, and how to minimize them, may help increase responsiveness.

Reducing the burden on respondents was our primary focus in retooling the Partner Profile. We made a strategic decision to ask for the minimum information necessary for us to estimate the SOVMT reductions that resulted from each project. Instead of asking for details like average commute length or average travel speeds (surrogates for which can be obtained from US Department of Transportation publications), we asked for project-unique data. Wherever standard surrogates were possible, we did not ask Project Partners for such detailed information.

Asking for the most basic information also helps to standardize calculations for all respondents. Using a uniform procedure for all projects minimizes the variability in the data. While this does not ensure that we are comparing apples to apples, we will know more precisely what information was and was not factored into each calculation.

On occasion, Project Partners do have more complete information available than that for which we have asked. We have endeavored to make it clear that we would be happy to accept more detail information or analysis in lieu of completed surveys. Where transit agencies or transportation departments have their own annual reports, we have encouraged them to submit those either in lieu, or, ideally, in addition to a completed Partner Profile.

The Role of an Evaluation in Voluntary Programs:

The most basic motivation for evaluating federal voluntary programs is generated by the need to demonstrate the program's effectiveness. The continued viability of programs is based, with good reason, on their ability to achieve measurable results, in this case, tons of carbon dioxide reduced per dollar spent. The mission of voluntary programs, however, is not only to encourage actions that benefit the environment without imposing requirements or regulations on participants, but to encourage experimentation and innovative approaches.

Therefore, we tried to design the evaluation mechanism to not only quantify the impact of various programs elements but contribute to information sharing and institution building. A key aspect of such an evaluation is a concern for how it will evolve over time. For this reason, we attempted to reduce the partner profile to its most essential and basic elements. From there we hope to incrementally build up the scope and rigor of the evaluation. We felt that a process that placed significant burdens on the participants would result in little more than a paper implosion that benefited neither the program or the project partners.

How the Evaluation Fits with Transportation Partners Specific Objectives and Structure:

The central focus of Transportation Partners also affects the way in which the evaluation process was designed. Although the program reaches across a broad range of the transportation sector and seeks to reduce the transportation's impact on many aspects of the environment, its primary purpose is reducing greenhouse gas emissions, (primarily carbon dioxide). The program's role within the U.S. Climate Change Action Plan is to improve transportation efficiency, or more specifically, increase access to and use of transportation modes other than travel in single occupant vehicles thereby reducing the amount of carbon dioxide emissions per passenger mile.

Other voluntary emission reduction programs in the transportation sector focus on technologies that improve fuel efficiency or reduce tailpipe emissions. The evaluation of such programs is more straightforward and can rely on easily quantifiable measures. However, a transportation efficiency program that includes projects as diverse as: bicycle and pedestrian promotion, services to improve access to rail transit, corporate commuter programs, innovative land-use planning and travel demand management studies, etc. must also be innovative in its approach to evaluation. The first step is to collect information that contributes to an assessment of the impact different classes of projects can have.

Transportation Partners broad range of participants also shapes the manner in which the evaluation is designed and carried out. Among the 300 project partners, the level of information gathering and analysis capabilities varies greatly. Some local government participants are able to assign members of their planning staffs to evaluate the effectiveness of their projects on an continuing basis. At the other end of the spectrum, a neighborhood organization may be extremely limited in their ability to gather even the most basic information. Therefore, the ambition of the partner profile scope was limited in part by this concern.

Long v. Short Term: How to measure future SOVMT reductions?

One of the major challenges faced by the Transportation Partners program evaluation was the question of how to measure the contributions made by organizations and projects engaged in activities which were long term in nature. These included land use planning and zoning activities, transit-oriented development projects, parking policy advocates, and highway-alternatives studies. While it is our belief that these strategies will be instrumental in achieving lasting and significant reductions in SOVMT, it is not likely that they would generate emissions reductions in such an initial stage of implementation.

Nonetheless, we felt it was important to acknowledge the potential of these activities and to increase our ability to quantify that potential. In general, planning, policy and advocacy actions do not reduce SOVMT in and of themselves. Rather, they increase the ability for non-automobile options to compete for trips and/or reduce the distance between destinations such that trips are shorter. Some studies have been done on the impact of increased density or parking fees on vehicle travel, which would help us make estimates. Much of the information we requested, however, was more designed to give us a starting point for future assessment of SOVMT in these areas, rather than with any specific idea as to how to use the information to make an estimate.

The Relationship to Other Policies, Programs, and Regulations:

It is also important to carefully design the program evaluation with federal, state and local policies affecting transportation in mind. The all encompassing nature of transportation means that a wide range of federal and state responsibilities such as the Clean Air Act, ISTEA, National Environmental Protection Act, etc., all interact with Transportation Partner projects. The expectations created by collecting information to evaluate a voluntary program can open the door for expectations that such projects should receive “credit” or some form of relief from regulations. Engaging in an evaluation does raise concerns and reservations among officials who manage regulatory programs. However, so long

as the emphasis remains on gathering and reporting information that is solely for program evaluation, these concerns should be adequately addressed.

The Evaluation Process and Transportation Research:

A further goal of our evaluation is to contribute to the understanding of how the transportation system and the individuals who use it respond to new and innovative policies. In spite of the limited scope of our information gathering effort, the products will serve as the basis for preliminary findings on the relative effectiveness of experimental approaches to improving transportation efficiency. Additionally, the information gathered can serve to highlight key areas for future research. Projects that show significant results would be natural candidates for focused research to better understand the dynamics within the transportation system.

Conclusion:

The Transportation Partner evaluation process should be seen in the context of an evolution. Its intent is part program evaluation, part information dissemination, and part institution building. Additionally, given the difficulties and limitations of such an endeavor, experimentation with different techniques for information collection and analysis will be the force that drives the development of the process. In the future, electronic formats such as spreadsheets with built-in calculators, or an evaluation software with a more comprehensive scope could be developed. However, the development of evaluation tools is, above all, a process that must try to learn what tools will be most effective for its users as well as providing the most effective information for program managers.



Partner Profile

General Information

- Please feel free to attach the following information in a separate sheet.

(A) Organization Name _____

(B) Contact Name _____

(C) Contact Address _____

(D) Contact Phone Number _____ (E) Fax Number _____

(F) Contact Email Address _____

(G) Organization web site _____

(H) Please describe project in terms of:

(1) Primary Activity _____

(2) Target Audience _____

(3) Desired Outcome _____

(4) Other relevant information _____

(I) Date of Project Implementation: _____

(J) Location of Project: _____

(K) No, I would not like a US DOE 1605b form completed from this information.

(L) This information may not be released except as required by the Freedom of Information Act.

II. Transit

(A) Fuel Type: ___% Gas ___% Diesel ___% Natural Gas
 ___% Electric ___% Other

(B) Vehicle Type: Bus or Train (Vanpools should be reported in section 3)

(C) 1996 Ridership: _____

(D) Date of 1997 data collection: _____/____/____

(E) 1997 Ridership: _____

(F) Transit Fleet Capacity: _____

(G) Cost of Project (Total) _____

(H) Cost this Fiscal Year _____

(I) Source of Funding _____

(J) Volunteer Hours used _____

(K) In kind resources donated _____

III. Carpool/Vanpool/Paratransit

(A) Number of people participating: _____

(B) Total number of employees in company : _____

(C) Number of Drivers: _____

(D) Percent of Vehicles that are: ___% Cars
 ___% Minivans ___% Vans

(E) Fuel Type: ___% Gas ___% Diesel ___% Natural Gas
 ___% Electric ___% Other

(F) Cost of Project (Total) _____

(G) Cost this Fiscal Year _____

(H) Source of Funding _____

(I) Volunteer Hours used _____

(J) In kind resources donated _____

IV. Telecommuting

(A) Total number of employees telecommuting _____

(B) Employees telecommuting 1 day per week _____
 2 days per week _____
 3 days per week _____
 4 days per week _____
 5 days per week _____

(C) Total number of employees _____

(D) Cost of Project (Total) _____

(E) Cost this Fiscal Year _____

(F) Source of Funding _____

(G) Volunteer Hours used _____

(H) In kind resources donated _____

V. Bicycle and/or Pedestrian Facilities

(A) Facility type: _____

(B) Estimated number of users (annual): _____

(C) Estimated average trip length (in miles) _____

(D) Estimated percentage of users who are
 (1) Pedestrians: ___% (2) Bicyclists: ___%

(E) Estimated percentage of uses which are:
 (1) Commuting trips: ___% (2) Recreational: ___%
 (3) Shopping: ___% (4) Other: ___%

(F) Cost of Project (Total) _____

(G) Cost this Fiscal Year _____

(H) Source of Funding _____

(I) Volunteer Hours used _____

(J) In kind resources donated _____

VI. Planning and Policy Activities

Infrastructure

- (A) Planned change in highway or arterial capacity: _____
- (B) Planned increase in transit capacity (in terms of riders): _____
 - (1) Increase in bus capacity _____ (2) rail capacity _____
- (C) Planned change in miles of sidewalks: _____
- (D) Planned change in miles of bike lanes _____
- (E) Planned change in miles of trails _____

Land Use

- (F) Planned acreage of mixed use development: _____ +/-
- (G) Planned change in residential density: _____ +/--units/acre
- (H) Planned change in commercial/industrial density: _____ +/-sq ft/acre
- (I) Planned change in acres of green space: _____ +/-

Parking Management

- (J) Parking Cash-Out or Transit Subsidy implemented? yes no
 - (1) Potential number of affected employees _____
- (K) Parking Freeze implemented? yes no
 - (1) At what level? _____
- (L) Parking maximums implemented? yes no
 - (1) At what level? _____
- (M) Parking fees changed? yes no
 - (1) At what level? _____

VII. Advocacy

- (A) Type of measure which you are advocating (check all that apply):
 - (1) Transit: (2) Carpool/Vanpool: (3) Telecommuting:
 - (4) Bicycling: (5) Walking: (6) Infrastructure:
 - (7) Land Use: (8) Parking Management:
- (B) Type of advocacy:
 - (1) Technical: (2) Legal: (3) Policy: (4) Education:
- (C) Number of members: _____
- (D) Other organizations with whom you are working: _____