National Renewable Energy Laboratory
Innovation for Our Energy Future

A national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy

Best Practices in Determining the Impacts of Municipal Programs on Energy Use, Air Quality, and Other Ancillary Costs and Benefits

GOAL

Develop indicators, and measure the energy and environmental benefits of municipal programs that may or may not have energy and environmental goals.

BACKGROUND

Many local and small-scale community programs have the direct intention or the ancillary benefit of increasing energy efficiency, decreasing dependence on foreign oil, promoting clean energy, or improving air quality. Although these programs are locally focused with local goals, the range of benefits includes positive energy and environmental benefits, and the impacts of those can be far reaching. Moreover, the cumulative impacts of these programs have the potential for large impacts on the U.S. dependence on foreign oil and air quality. Understanding the energy and environmental impacts of these programs allows for a full benefits assessment of the program and, in the aggregate, an expression of the full benefit of local programs on energy use and the environment in the United States.

SAMPLE TYPES OF MUNICIPAL PROGRAMS

- Weatherization programs. The stated goal is to save the consumer money by increasing the efficiency of the home, but the overall impact not only includes increased consumer comfort, but also the reduction of energy use and pollutant emissions.
- Traffic reduction programs. The primary goal is reducing congestion or alleviating traffic, but the ancillary benefits of reducing mobile source pollution, increasing worker productivity, avoiding emissions and gasoline use, and saving money spent on gasoline can be significant.

IMPACTS OF MEASURING ENERGY AND ENVIRONMENTAL ANCILLARY BENEFITS

Measuring the ancillary energy and environmental benefits of programs is important because of the following local benefits:

- Offers a fuller look at the benefits/financial savings related to small programs,
- Argues for continued program support, and
- Addresses the energy and environmental needs of the community

On the national scale, municipal and local programs may have a large impact on national energy use patterns, energy security, and air quality.

SAMPLE LOCALIZED BENEFITS ANALYSIS

This set of sample graphs illustrates the development and measurement of indicators for a municipal congestion-reduction program. The traffic-congestion program collects data on the number of trips the program reduces annually (**Figure 1**).

Using this limited data, NREL developed methodologies to determine energy and environmental program benefits, including:

Gasoline savings (gallons avoided). Reductions in gasoline use are the result of reduced trip frequency and length. Assuming that the primary fuel for vehicles is gasoline, there is a decreased demand for gasoline.

Sample Emissions Results Table 2 . Annual average and cumulative program attributable pollutant reductions (1992-2005)

Pollutant	Annual Average Reduction (tons)	Cumulative reduction (tons)
CO	664	9,300
VOC	79	1,100
Nox	60	843

Pollution-reduction impacts (CO, VOC, NOx, and CO2 equivalents avoided). Pollution reductions are the direct result of vehicles not running on the roads. Reductions contribute to the improvement of local air quality and decreased greenhouse gas emissions in the immediate and surrounding areas (**Figures 2 and 3**).

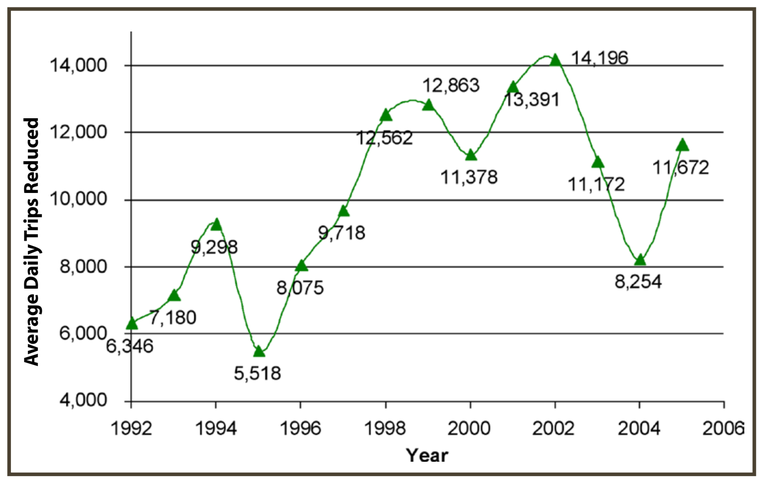

Figure 1: Sample Starting Point Data. This program was able to provide average daily trips reduced attributable to the program. From this data, NREL developed methodologies for quantifying economic and air quality benefits

Pollution reductions can also be represented in tabular form, as in **Table 2**.

Productivity benefits (commute time savings) and **Limited Economic Benefits.** Time spent sitting in traffic is time one cannot spend elsewhere. The time gained by not sitting in traffic is a benefit. This benefit, depending on the use of the time saved by choosing an alternative to driving alone, is considered a quality-of-life benefit to either the commuter or the employer company. Reduced gasoline purchases and increased productivity have measurable economic benefits illustrating the impact of the program (**Table 3**).

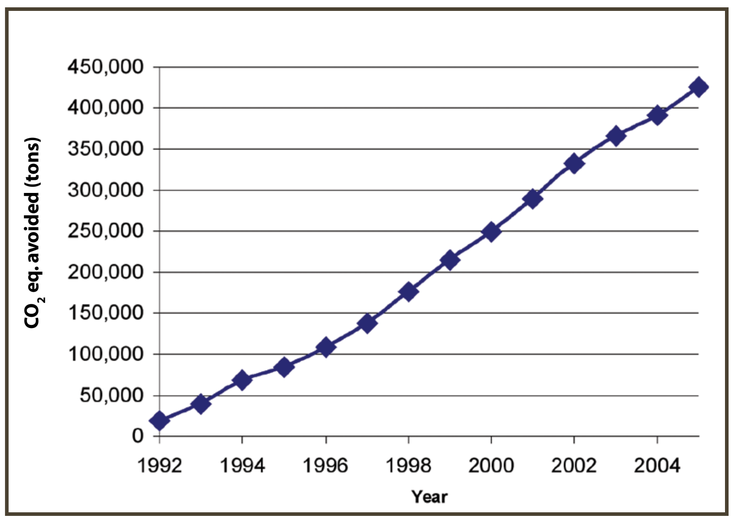

Figure 2: Cumulative CO2 equivalent savings resulting from program.

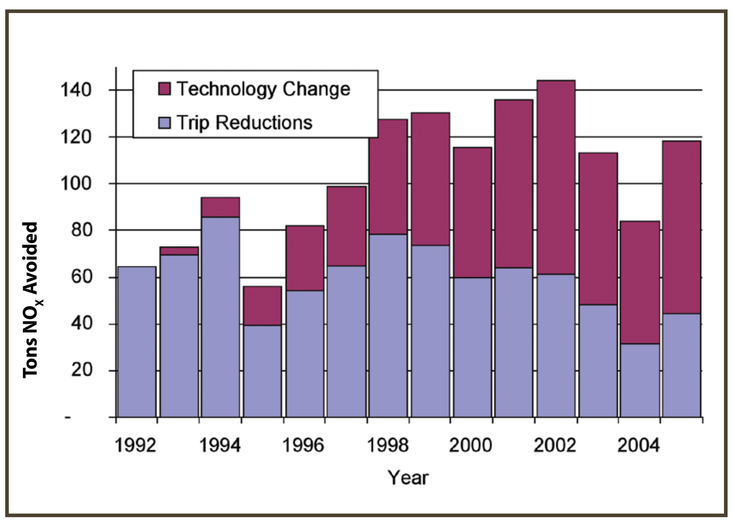

Figure 3: Estimated NOx avoided resulting from combined average vehicle technology change and the sample program.

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SEAC Strategic Energy Analysis Center

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THIS TYPE OF ANALYSIS CAN ANSWER THE FOLLOWING TYPES OF QUESTIONS

- What is the overall energy and environmental benefit of municipal energy related programs?
- Where is the largest potential impact for these municipal programs?
- Can a best practices guide for developing municipal program metrics be created and implemented for better understanding of program development and impacts?

Table 3: Productivity benefits and Limited Economic Benefits

Indicator	2005	Cumulative Total (1992-2005)
Gasoline Savings (gal.)	3,000,000	44,000,000
Employee Productivity (hours)	3,000,000	42,000,000
Economic Benefits* ($)	47,000,000	658,000,000

*Includes both gasoline savings and productivity savings (estimated time saved).