ENERGY CONSUMPTION AND THE COMMUTE TO WORK

VTC Working Paper

Prepared by: Alan M. Voorhees Transportation Center
Edward J. Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey

in association with:

Jeffrey Zupan, Transportation Consultant

Prepared for: Center for Energy, Economic, and Environmental Policy
Edward J. Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey

INTRODUCTION

Observers have long believed that commuting to and from urban places well served by transit is more energy efficient than commuting to more auto-oriented suburban work sites. However, little empirical investigation has been conducted to substantiate this hypothesis. An analysis of commutation patterns for two locations in New Jersey – one urban and one suburban -- provides strong evidence that, in the aggregate, workers commuting to urban places consume significantly less energy than those commuting to suburban locations.

In December 2005, the Alan M. Voorhees Transportation Center (VTC) in association with Jeffrey Zupan, Transportation Consultant, completed a study comparing work commute and energy consumption patterns for downtown Newark, NJ, an urban, transit-rich location, and Parsippany-Troy Hills, NJ, a prototypical auto-accessible, suburban office campus location. Both downtown Newark and Parsippany-Troy Hills have nearly 50,000 jobs. However, with 48,000 jobs per square mile, the downtown Newark study area, consisting of three census tracts, has a job density nearly fourteen times the job density of Parsippany-Troy Hills, which has only 3,500 jobs per square mile in six census tracts defined for this study as office-oriented.

RESEARCH APPROACH

The study examined how commuters destined for Newark and Parsippany-Troy Hills traveled to work and quantified the energy used during their work commute. Specifically, it looked at what form of transportation commuters chose (whether they traveled by auto, by transit or walked) and their length of commuter trips (how far did commuters travel to get to their places of employment). Using 2000 U.S. Bureau of the Census journey-to-work data, computerized auto, bus and rail trip length data, and energy consumption per mile by travel mode, the study determined the energy requirements of commuters to these two locations.

KEY FINDINGS

- **It takes 57% more energy to transport commuters to Parsippany-Troy Hills than to Downtown Newark.** This translates into the equivalent of 229 gallons less per year for each commuter to Newark than for each commuter to Parsippany-Troy Hills; at a cost of gasoline of $2.50 the savings would amount to 11 gallons per week, or $27.50. . The three primary reasons why this is true are:

    1. Auto trips use more energy than transit trips;
    2. Newark has larger share of workers commuting by transit than Parsippany-Troy Hills; and
    3. Trips to Newark are shorter, on average, than to Parsippany-Troy Hills.

- **Auto trips consume 8,500 BTUs per passenger mile** when a driver travels alone. Though rarely utilized, carpooling is much more efficient than single occupant auto trips – averaging only 3,900 BTUS per passenger mile. In contrast, in New Jersey, **transit consumes only about 3,200 BTUs per passenger mile**.

- **Commuters are more likely to use transit when traveling to Newark than to Parsippany-Troy Hills**. Twenty-seven percent of commuters to Newark traveled by transit, while only 1.4 percent traveled by transit to Parsippany-Troy Hills. Conversely, ninety-seven percent of commuter trips to Parsippany Troy Hills were made by auto, while 70 percent of commuters traveling to Newark used autos.

Travel Mode	Newark	Parsippany-Troy Hills
Auto	70%	97%
Transit	27%	1.4%

- **Commuters traveling to Parsippany-Troy Hills are more likely to travel farther than those destined for downtown Newark**. The average auto commuter to Parsippany-Troy Hills travels twenty miles from home to workplace; the median commuter travels seventeen miles. The average auto commuter to Newark travels only sixteen miles; the median auto commuter travels only eleven. This pattern holds true for transit commuters as well.

Trip Length	Newark	Parsippany-Troy Hills
Average	16 miles	20 miles
Median	11 miles	17 miles

POLICY IMPLICATIONS

These findings have a number of policy implications. First, the State of New Jersey is expected to add close to one million jobs over the next twenty years. Most of this growth is expected to occur outside of central cities. If only a fraction of that growth, 50,000 jobs, were to be located in downtown Newark instead of suburban locations similar to Parsippany-Troy Hills; then Newark's employees would be far more energy efficient than their office park counterpart.

Secondly, the energy savings could be considerably greater if a greater percent of Newark's workers commuted other than by auto. Although the share of Newark workers choosing to commute by transit is significantly higher than workers traveling to work sites in Parsippany-Troy Hills, today, Newark's transit share is about half of what it was 25 years ago. If the transit share to Newark were fifty percent, as it was in 1980, then commuter travel to downtown Newark would consume twenty-one percent less energy than it does today. This finding lends support to potential policy interventions designed to increase transit ridership to Downtown Newark employment.

Given an assumption that Downtown Newark could return to a 50 percent level of transit use, those trips would require fifty percent less energy. This cumulative energy saving would amount to about 11.5 million gallons of gasoline per year, saving the average commuter about $600 annually in energy costs for commuting.

FUTURE RESEARCH

Given these potential policy implications and the limited scope of this preliminary analysis, the findings of the study suggest further research is warranted in a number of areas.

1. **More and varied locations** – This study looked only at two locations. By examining a wider range of work locations, insight would be gained as to how locational differences and varying levels of transit service affect mode choice and energy consumption. For example, how do urban downtowns, such as Jersey City, New Brunswick and Trenton compare in energy consumed in commuting with other campus locations, such as in the Meadowlands?
2. **Supportive policies and micro-location factors** – As this research shows, the transit usage of Newark commuters today is far lower than in 1980. What supportive policies and projects could best assist Newark's employees to regain a 50 percent transit mode split in future years? Some of the policy and micro-location issues that could be explored in that context are as follows:
    - What are the effects of free, subsidized or paid parking on mode choice?
    - How might incentives designed to increase transit use (e.g., commuter benefits programs such as transit check) change travel behavior?
    - How do micro-location factors such as worksite proximity to transit and land use mix affect commute choice?

- How does the availability of housing proximate to employment locations affect commuter behavior and energy use?

3. **Non-work travel** – This study examined energy consumed as part of the work commute only; however, the majority of travel is not work related. Do individuals working in compact, mixed-use environments such as downtown Newark make more mid-day trips by walking or by transit, while those in office campuses use their autos for such trips, adding to the energy disparity between the two?

4. **Industry sector and job characteristics** – This study examined jobs and workers without regard to industry and occupation. Industry sector and job characteristics may influence mode choice. For example, jobs in Parsippany-Troy Hills are primarily office while Newark's employment is more mixed. More detailed analysis could isolate the potential effect of industry sector and job characteristics on commute choice and energy usage.