CHAPTER 8

Reducing Growth in Vehicle Miles Traveled: Can We Really Pull It Off?

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For many years, international efforts to reduce greenhouse gas (GHG) emissions have focused on supply side fuel and vehicle technology strategies. This approach has reflected a belief that travel and land use strategies, the key alternatives to fuel and technology approaches, would be largely ineffective due to an intractable desire for ever increasing automobile use, particularly in the United States.

Work at the New Jersey Department of Transportation (NJDOT) suggests that this is not true and that there is strong public support for programs designed to reduce vehicle miles traveled (VMT). Moreover, the problem of excessive driving, fuel consumption, and GHG emissions is spreading around the world, particularly in the rapidly developing Asian nations. With 500 million new people moving into developing Asian cities over the next 20 years and rapid growth projected for parts of South America and Africa, it is questionable whether fuel supply and vehicle technology will be enough to reduce GHG emissions. Drawn on real-world experiences in New Jersey, this chapter examines the potential for restraining growth in VMT, and thus GHG emissions, by influencing the land use patterns which have characterized suburban development in the United States since World War II.

Evolving Transportation Approach to Solving Congestion

Transportation agencies in the United States have historically been reluctant to address transportation planning using strategies that influence land

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use. Most shared the belief that the love affair that exists in the United States between drivers and their automobiles would undermine any attempt to limit VMT. The result has been programs oriented almost exclusively to building more roads in the belief that road construction could keep ahead of traffic congestion.

Recent data suggests that outrunning traffic congestion is a Sisyphean task. For example, the 2005 Urban Mobility Report, completed by the Texas Transportation Institute (TTI), reveals that in spite of one of the biggest road building campaigns in the history of the world, congestion around the United States is worsening (Lomax and Shrank, 2005). In the 83 metropolitan areas studied by TTI:

- The time lost due to congestion annually jumped from 16 hours in 1982 to 62 hours per peak period traveler in 2000.
- The percentage of the major roadway system that is congested rose from 34 percent in 1982 to 59 percent in 2003.
- The number of hours when congestion occurs increased from 4.5 hours in 1982 to 7.1 hours in 2003.
- Sixty-seven percent of the peak period travel was congested in 2003, compared to 32 percent in 1982.
- Traffic congestion cost $63 billion in the United States in 2003 and 3.7 billion wasted hours each year.

Not only are drivers spending more time in congestion, but the ability to avoid it has virtually disappeared. When the post–World War II development and highway boom began, some commuters faced congestion on a few big highways during a relatively few peak hours. Today, in spite of major efforts at building the interstate highway system and many state and local highways, the number of congested major highways has increased, and congestion has spread to the back roads—once used to bypass the congestion—and the congestion has spread to off-peak hours. Over the last two decades, the average length of commute, miles driven, and time spent in traffic has increased at rates well above population growth. Walking is down dramatically.

The deterioration of public health has accompanied the rise in VMT and traffic congestion. Figure 8-1 shows the alarming increase in obesity rates in just 12 years from 1989 to 2001, as measured by the National Centers for Disease Control (CDC) (Jackson and Kochtitsky, 2001). The CDC has classified this rapid deterioration of public health as an inactivity epidemic and is warning that the health impacts of this inactivity include obesity, diabetes, cardiovascular disease, colon cancer, increased symptoms of depression and anxiety, and poorer development and maintenance of bones and muscles.

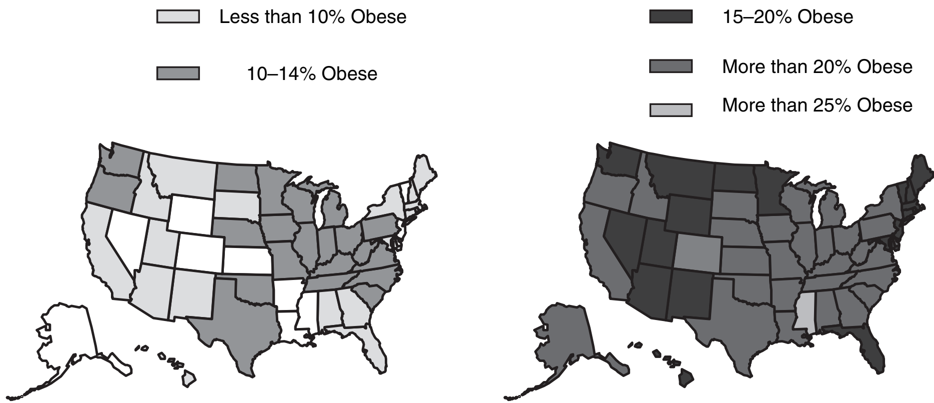

FIGURE 8-1. Obesity rates in the United States in 1989 compared to 2001. *Source:* From *Creating a Healthy Enviroment, The Impact of the Built Environment on Health*, Richard J. Jackson, MD, MPH; and Chris Kochtitsky, MSP; 2001.

Reasons for the Growing Traffic Congestion in the United States

These trends are the inevitable result of allowing transportation and land use systems to evolve separately over the last four to five decades. While interaction between transportation and land use is extremely complex, most state agencies are looking at a few basic reasons to explain the surge in VMT and the decline of walking:

- Induced demand
- The suburban sprawl factor
- Separated and spreading land use patterns
- The disappearance of the connected network
- Context-insensitive street designs

Figure 8-2 describes the induced demand phenomena. When paved road construction first started early in the twentieth century, it made land further out from the urban core more accessible. Cheap farmland in rural areas was more attractive to development, and people moved further out to take advantage of the newfound affordability and quiet rural lifestyle, initiating suburban sprawl. As more and more people moved out, the rural atmosphere changed to suburban, and ease of travel gave way to return of congestion. More roads were built, more cheap land was made accessible, more people moved; soon jobs and commercial uses followed. This led to more congestion, more loss of quiet atmosphere, more development, and more roads.

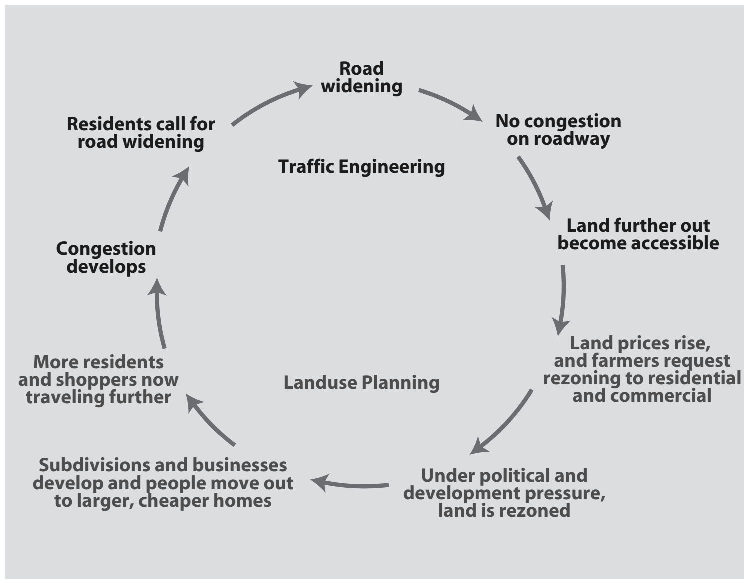

FIGURE 8-2. The endless cycle of capacity and sprawl. *Source:* Courtesy of Ian Lockwood of Glatting Jackson.

Compounding the sprawl factor is the post–World War II trend of separated and spread land uses. Prior to the rise of the automobile as the common form of transportation, land uses were, out of necessity, mixed and compact. Although many land use planners warned of the toll that this outward migration was beginning to take, few decision makers listened.

Ignoring the advice of planners and reacting to the desire to escape unattractive land uses, community planning shifted to separating land uses into specific and separate categories. This was a radical change from the traditional development scenario typical of communities created prior to World War II, which promoted land uses close to each other and connected by local streets. Convenience stores, compatible commercial uses, and neighborhood schools were located in the midst of residential areas. Not only could trips be made without using the big highway, some could actually be made on foot or bike, eliminating the demand for motor vehicles for these uses altogether.

Modern planning now, with limited exceptions, rejects the traditional integrated approach and intentionally separates and spreads different uses. Subdivisions are devoid of convenience uses and community schools, and these everyday uses are intentionally distanced from residential areas. Generally, these conveniences are placed on state and county roads, forcing these roads to bear not only through traffic but driving to local destinations as well. Road networks are intentionally disconnected and curvilinear. The

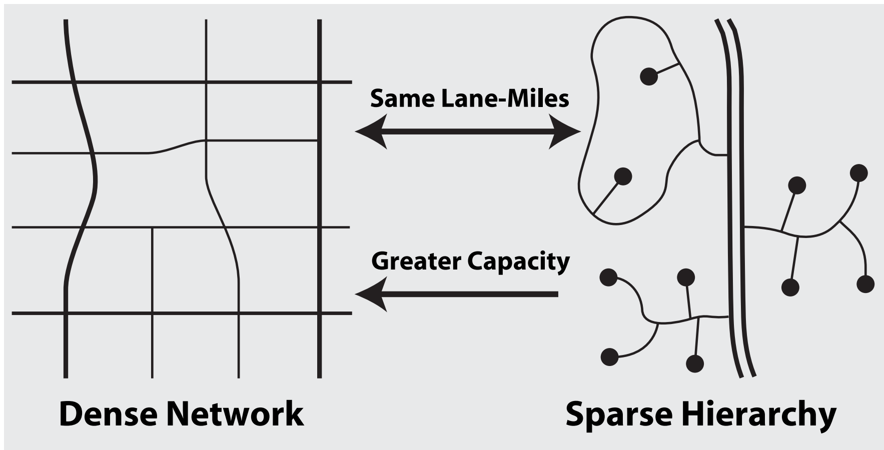

FIGURE 8-3. Capacity of a dense and connected network versus the modern sparse hierarchal roadway system. *Source:* Courtesy of Ian Lockwood of Glatting Jackson.

desired result of lightly traveled residential areas is accomplished with the unintended consequence of runaway congestion on county and state highways.

Modern planning and circulation plans have another and perhaps more pervasive role in congestion. Traffic from isolated residential points of origin, called pods, in modern development designs can access big highways only at a few points. As residential communities grow, traffic engineers are forced to add traffic signals to more and more of these intersections, adding to the access time from the side roads. Moreover, once stopped, cars on the main roads do not instantly return to highway operating speeds when the light turns green. As a result, adding new signals to intersections, and later more access time to the side streets, cripples the capacity of the major highways.

Figure 8-3 shows that a dense and connected network, mile for mile, has more through carrying capacity than a sparse one. The latter forces out all traffic to the big highway as soon as possible and concentrates left turns at a few spots. Also, the main roads are almost always the taxpayers' responsibility, while the lesser, unconnected streets are generally built by private developers. In an era where government funds are shrinking, this failure to recapture private sector investment through sound infrastructure development is crippling efforts to reduce traffic congestion.

History of Traffic Development Patterns in the United States

Early development in America occurred around water bodies and rail lines. Without cars, the emerging urban centers needed to be compact and

pedestrian oriented. The commercial, social, and recreational exchanges needed for prosperity could not occur otherwise.

In urban areas, street designs sought to improve channels of communication, drainage, sanitation, commercial success, and aesthetics. The connected network was of huge importance because it afforded good communication between various parts of the city. Drainage requirements for disposal and sanitation forced street networks to respect the contours of the land. Street frontage, block size, and the ratio of street frontage to buildable area were all important to commercial development. Because streets were front yards of properties and pathways for pedestrians, street trees and streetscaping were important for beauty and shade. Trees were encouraged between the back of the curb and the sidewalk to shield pedestrians from traffic.

When the freeways were introduced into the landscape, the automobile freed people from the need to locate near water or rail and it undercut the ability of cities to maintain connected networks. The grid pattern began to break down. Homes, which used to be located in close proximity to schools, jobs, and stores, were increasingly being built miles away.

The paradigm for street design and planning also became oriented toward the automobile. A new philosophy of road design shifted the focus toward the car, and design standards were based on streets classified according to functionality for the automobile. This new system treated the effect of roads on adjacent land uses as secondary, whether those uses were communities, open space, or ecosystems. New street design philosophy totally ignored the value of the adjacent community, with predictable results. Two examples of the incompatibility of modern land use planning, with its emphasis on the car, and pedestrian access to urban services are shown in Figure 8-4.

Can you spot the pedestrian?

Could you cross here?

FIGURE 8-4. Modern pedestrian unfriendly streets. *Source:* Sharon Roerty, Voorhees Transportation Center.

Changing the Paradigm

The adverse consequences of car-oriented growth on public health, the environment, traffic congestion, and social isolation are becoming clearer. The original public support for car-oriented land use decisions was motivated by a desire for freedom of travel, escape from congestion, and affordable housing. Although it worked well for a while after World War II, the policies to achieve these goals are now causing, not solving, problems.

The body of work that supports the connection between poor land use decisions and traffic congestion is growing. Studies done by Reid Ewing of the National Center for Smart Growth at the University of Maryland, for example, demonstrate that the per capita VMT in the least sprawling communities is 25 percent less than in the most sprawling (Ewing et al., 2003; Ewing, 2005).

Similarly, the body of work that supports the connection between modern land use and health is growing. A 2003 article in the *American Journal of Health Promotion* revealed that people who live in sprawling communities have higher body mass indexes, are more likely to be obese, and are more likely to have high blood pressure (Ewing et al., 2003). The *American Journal of Preventative Medicine* reported in 2004 that people who live in neighborhoods with a mix of shops and businesses within easy walking distance have a 35 percent lower risk of obesity (Frank, 2004). The *Annals of Behavioral Medicine* reported in 2003 that walkable neighborhoods encourage 15 to 30 extra minutes of walking per week, enough to lose a pound a year (Saelens, 2003).

Surveys conducted for Brooke Warrick's American Lives, a consumer market research firm, reveal that respondents expressed a greater desire for the conveniences of neighborhood life than for the amenities of middle class suburbia. Nearly four times as many respondents expressed a desire for a small cluster of convenience stores nearby or a neighborhood library than for clubhouses or dramatic entrances to their housing developments (Warrick, 1995).

A New Approach to Congestion Relief and VMT Reduction in New Jersey

A conservative estimate of the investment that it would take to relieve congestion on New Jersey's state highways indicates that it would cost over $20 billion to address congestion by the traditional method of adding lanes or building bypasses. Since the NJDOT can invest no more than $100 million per year on congestion relief, it would take 200 years to eliminate congestion by building new capacity, even if no new congestion emerges in the meantime.

With no other way to turn, the NJDOT has accepted the challenge of changing land use patterns. NJDOT's Smart Corridors Program, now called

the New Jersey Future in Transportation (NJFIT) program, seeks to form partnerships with other New Jersey state agencies and local governments. The goal of the program is to build alternatives, increase transportation choices, lower design speeds, and provide more pedestrian friendly streetscapes. It also works with local jurisdictions to identify improvements to existing county and municipal roads to improve mobility. NJFIT partners with communities and developers to help revise internal circulation plans to provide connectivity between adjacent developments to facilitate movement without entering the state highway system. Finally, the program will provide planning assistance and consultant resources to local jurisdictions to help them develop land use planning alternatives that shift trips to nonautomobile modes and make better use of the local road infrastructure. This approach achieves coordination of all levels of planning activities to leverage the full value of infrastructure investments made in New Jersey transportation corridors.

The NJFIT program is based on four key principles:

- Downsizing new investment in new capacity for state highways
- Working with communities to create a connected network of local streets
- Helping communities with land use design
- Implementing context sensitive street designs (CSDs) on highways

Downsizing, or "right sizing," as Secretary Allen Biehler of Pennsylvania DOT calls it, is necessary because the huge costs of eliminating congestion at dozens of locations in New Jersey will allow only a few congestion hot spots to be fixed each decade. Causing most communities to wait decades if not a century for a solution is unacceptable, if not absurd. So in each Smart Corridor where a study is underway, NJDOT engineers are working to identify key locations where choke points are responsible for disproportionate amounts of congestion. Sometimes segments of new state highway may have to be added to support or complete the travel network, but these segments will be smaller in size and less ambitious in design approach.

Connectivity is best described in a 1990 paper entitled *Hierarchical and Connected Road Systems*. The paper indicates that a well-connected road or path network has many short links, numerous intersections, and cul-de-sacs. As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, creating a more accessible and resilient system (Kulash, Anglin, and Marks, 1990).

From the 1960s through the 1990s, roadway design practices favored a poorly connected, hierarchical network, with numerous cul-de-sacs. This increases the amount of travel required to reach destinations, concentrates traffic onto fewer roads, and creates barriers to nonmotorized travel. A connected road network emphasizes accessibility by accommodating more direct travel with traffic dispersed over more roads, while a hierarchical road

network emphasizes mobility by accommodating higher traffic volumes and speeds on fewer roads.

NJFIT land use policies support improved connectivity as a way to increase land use accessibility. For a particular development or neighborhood, connectivity applies both internally for streets within that area and externally for connections with arterials and other neighborhoods. Increased street connectivity can reduce vehicle travel by reducing travel distances between destinations and by supporting alternative modes. Increased connectivity tends to improve walking and cycling conditions, particularly where paths provide shortcuts, so walking and cycling are relatively faster than driving. This also supports transit use.

Traffic modeling by Kulash, Anglin, and Marks predicts that a connected road network reduces VMT within a neighborhood by 57 percent compared with conventional designs. A U.S. Environmental Protection Agency study found that increased street connectivity, a more pedestrian-friendly environment, and shorter route options have a positive impact on per-capita vehicle travel, congestion delays, traffic accidents, and pollution emissions (EPA, 2004).

Providing a well-connected street network and a backbone of strategic investment in the state highway system can go a long way to addressing congestion in a study area. However, to fully reap the benefits of that work, the land use must be arrayed in an intelligent manner to minimize unnecessary trips or trips that are unnecessarily lengthy. As part of the NJFIT program, the NJDOT, in collaboration with the New Jersey Office of Smart Growth, will provide planning assistance and consultant resources to local jurisdictions. The assistance is to help them develop land use planning alternatives that shift trips to nonautomobile modes and make better use of the local road infrastructure. Assistance will be provided in the form of in-house expertise and consultant services provided at state expense.

CSD is an important part of the NJFIT program, due to the increased reliance that the program places on local and county roads. On these roads, street design should lead drivers to adopt driving behavior appropriate to local conditions. Since vehicular speeds affect local context as surely as the physical dimensions of the street, roadway designers should carefully consider the appropriate target speed for a roadway section. This consideration must be based on land use conditions, building densities, the environment, and the disparate needs of the residents and the users of the facility. Streets not only serve transportation-related functions but are also places of commercial and social encounter. Therefore, designers should also consider the nonvehicular uses of a roadway and seek consistency between all aspects of the roadway, its environment, and the chosen design speed.

There is a wide range of options available to the designer to do so, including some that fall under the umbrella "traffic calming." These include neckdowns, rotaries, and speed humps; however, these could also include narrow lanes and shoulders, and curvilinear alignments.

The tendency to develop streets that are wide, flat, and straight in search of safety will sometimes lead to inappropriate vehicle operating speeds, particularly in downtown or "Main Street" environments. In these locations, where the true intent may have been for a slower pace of traffic, street design needs to support pedestrian safety and acknowledge the importance of pedestrian quality of life, and related socioeconomic factors. Additionally, there is evidence emerging that wider roadways and faster speeds during traffic yielding are not always safer, even when viewed strictly from a motorist's perspective.

Therefore, when working with local road networks, designers need to consider the adjacent land use and desired function of the road. The streets need to be designed to be sensitive to these contexts and encourage the intended operating speeds. Modern roadway design, particularly as it relates to secondary and tertiary streets, needs to carefully weigh whether the use of these elements creates a desirable balance between the competing interests of adjacent land use, nonmotorized transportation, and motor vehicles.

The NJDOT expected a poor reception to its new direction for congestion relief and VMT reduction. It assumed that the public would balk at the deemphasis of roadway expansion as the prime solution to congestion. It also expected local jurisdictions to oppose the efforts of any state agency attempting to influence their local land use planning. Instead, the NJFIT received an unexpected welcome, and officials in most cities have embraced the effort. It appears that local communities are being overwhelmed with development applications and are working under tight budgets that in most cases do not allow them to plan effectively.

Project Examples from New Jersey

Some examples of local programs growing out of the NJFIT statewide initiative include the following success stories.

For Route 31 in Flemington and Raritan, an extensive and connected local road network has been planned, and a slower-moving, two-lane rural parkway has been proposed to replace the abandoned freeway bypass concept. This network is not only less costly, but it also spreads its investment in congestion relief over 10 to 15 years. The original bypass solution would have not only cost the New Jersey taxpayers almost double, $150 million as opposed to $70 million for the network, it would have concentrated the investment over two fiscal years. Furthermore, the bypass solution would have squandered the opportunity to recapture the developer infrastructure for public use.

Similarly, in Trenton, a new network has been proposed for the Trenton Waterfront Redevelopment area. The existing land use is a series of huge parking lots and state offices that, combined with the Route 29 Freeway, currently severs Trenton from its waterfront. Conversion of Route

29 into a boulevard and the addition of a local street network will diffuse traffic.

For the 12 communities in the Route 9, Ocean County, corridor, some jurisdictions were skeptical at first and held back on cooperation and participation for several months. In other places, NJDOT and OSG support was immediately welcomed. One local planner told the NJDOT, "It's about time someone from the state came here to help us." After a few months, the NJDOT lead engineer was getting so many invitations to attend local planning board meetings that his other projects had to be reassigned.

On Route 31 in Hopewell, local officials were initially incensed at the suggestion that the solution to their traffic problems might lie in their land use planning. Six months later, local officials were working side by side with NJDOT engineers and OSG planners to resketch the future of their community.

In the Route 33 Smart Corridor project, local officials in Hamilton agreed to work with the NJDOT from the beginning and the lead engineer now gets calls from the Hamilton mayor almost weekly, asking for help with another land use development somewhere in the town.

In Manalapan, the NJDOT and OSG have helped local officials and developers reshape new development adjacent to the Monmouth Battlefield. The original plan for the area called for almost 2,000 new homes to be built in four unconnected pods. All travel to and from each pod would have to be made on the adjacent county roads and highways. No street connections would have been made to a new "lifestyle shopping center" planned to be located adjacent to the new residential areas. Although the two land uses would literally be within shouting distance of each other, the street plan would force everyone into their cars. The new plan for the Monmouth Battlefield area provides for multiple and walkable connections between all residential areas and the new commercial development. Furthermore, the commercial area has been replanned to create a town center for Manalapan, a feature that is currently missing from and desired by the community.

Other State Initiatives

Other progressive transportation agencies have embarked on programs similar to the NJFIT program. For example, over the past few years, the Pennsylvania DOT has collaborated with the Delaware Valley Regional Planning Commission to undertake several cutting edge integrated transportation and land use strategies studies. They have collaborated in support of new street connections, sought context sensitive solutions to reinforce historical main streets, and provided land use planning expertise to communities. Their work has sought to change densities, mix uses, and foster development that inspires nonautomotive modes of transportation.

The New Hampshire DOT (NHDOT) has also stepped out of traditional roles and helped prepare a manual on smart growth in New Hampshire. It also began to make the transportation and land use connections on projects such as Interstate 93 (I-93) and State Route 16. On I-93, NHDOT provided communities with $2 million for integrated transportation and land use planning.

More recently, the Portland Area Comprehensive Transportation Study (PACTS) enacted bold policy and priorities regarding transportation investments. PACTS, which is the Metropolitan Planning Organization for the Portland, Maine, region, now requires any arterial corridor roadway project that will reduce commuter travel times between an urbanized and a nonurbanized area be accompanied by a land use plan that preserves the arterial's capacity, protects its mobility function and the public investment, and minimizes sprawl.

The Vermont Agency of Transportation recently had a major circumferential highway project stopped by the courts after several decades of study. The Chittenden County Circumferential Highway was remanded back to the state for a reexamination, due to the failure of the proponents to adequately assess the induced and cumulative growth impacts of the highway. This is the first instance that a state agency was found to violate federal environmental laws primarily based on land use and secondary impact assessment considerations.

Conclusion

The NJDOT followed the traditional approach of trying to widen existing roads or build new roads in response to congestion for many years. It has recently faced the reality that this solution has not been working. Congestion continues to increase on the state highway system and has spread to secondary and tertiary roads. This is not unique to New Jersey but is manifesting itself all around the country.

With most transportation agencies facing the need to focus on aging infrastructure programs, the option of building more roads faster is not only unlikely but impossible. This is borne out by the 2005 Urban Mobility Report, which indicates that from 1982 to 2001, states have been able to provide only 41 percent of the new capacity needed to abate congestion (Lomax and Shrank, 2005).

The NJDOT turned to a new approach for dealing with congestion and reducing vehicle miles traveled, an approach based on proactive integration of transportation and land use planning. Attempts to influence the demand for automobile usage are not being met by the public resistance many predicted. Public willingness to accept the new paradigm supports the conclusions that sound planning and integration of transportation and land use can in fact reduce VMT.

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