DRIVING FORCES THAT HAVE SHAPED TRANSPORTATION DEMAND MANAGEMENT

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ABSTRACT

The practice of transportation demand management is shaped by several driving forces. These include evolving government regulations, economic forces affecting employers, individual behavior, and the combination of demographics and land use. Each contributes to the strategies that have been tested and applied. Each also contributes, to the perception of transportation demand management.

Probably the most significant driving force today is the general topic of government regulations. The principal means of government influence on transportation demand now include federal and state air quality requirements, local congestion management actions, and federal and state tax rules.

Some employers have applied TDM strategies at their own sites in the absense of regulations but have done so for some clear reasons of self-interest. Similarly, most ridesharing and transit occurs because individual riders see self-interest reasons to use those modes.

Demographic and land use change have contributed to the demand management field through the increase of women in the work force, the dispersion of home and work locations, and other trends.

These driving forces are reviewed in this paper and their implications for transportation General Manager are highlighted. Demand management is likened to asset management and comparisons are made with driving forces affecting the transit and highway fields.

INTRODUCTION

With the advent of the Intermodal Surface Transportation Efficiency Act (ISTEA), the Clean Air Act Amendments (CAAA), and a spate of state and local transportation regulations, the field of transportation demand management has moved from being a field with limited, specialized interest to an institutionalized, field of practice that is also legislatively driven.

Although there are examples of transportation demand management going back decades, there was not widespread consideration of the topic until the 1970s. The energy crises of 1973-74 and 1979 plus the first Federal Clean Air Act led to many examples of planning, yet also led to relatively little in the form of actions being taken.

In this review, it is important to distinguish what was seen as conventional in the 1970s and earlier, and what is increasingly being seen as conventional today. For example, pricing of bridge tolls, parking, and transit are not new. What is new in this area is discriminatory pricing that encourages higher vehicle occupancy.

Even marketing campaigns aimed at encouraging people to share rides, conserve energy, and take other behavioral actions were not unheard of prior to the early 1970s. For example, a World War II era movie house "short" encouraged carpooling because "when you drive alone, you ride with the Fuehrer." While the clear message of this campaign was to aid in the war effort by keeping rubber available to the military, such a recurring theme of conserving in the national interest has been seen frequently in the field of transportation demand management.

Today, we consider TDM to encompass all those demand side strategies that can change one's mode of travel, time of travel, frequency of travel, and need for travel. Although some disagree, facility and service actions such as providing

a high occupancy vehicle lane or establishing a new transit route are generally seen as supply side actions and, as such, are more properly transportation systems management or transportation service strategies.

For the purposes of this review, a tight definition of TDM is not necessary. Consider TDM to encompass strategies that are intended to change one's behavior by principally working on the demand side of the supply-demand equation.

REVIEW OF DRIVING FORCES

There are four general driving forces that have shaped transportation demand management. These are regulations, economic forces affecting employers, individual behavior, and demographics plus land use. Clearly there are interactive influences between these various driving forces and one cannot easily separate these into discrete, pure influences. For example, simply trying to determine whether individual behavior drives land use or land use shapes individual behavior is not inherently resolvable. However, to understand the field and where it is headed, it is more important to understand the nature of the influences rather than the precise taxonomy or detailed input/output relationships for predicting behavior (although many have proposed such). Regulations have become the most talked about driving force and are being seen in most areas with severe traffic congestion as well as in areas that are designated as non-attainment areas for federal air quality purposes. Great hopes have been assigned to transportation demand management for addressing these congestion and air quality issues. The regulations such as those of the South Coast Air Quality Management District Regulation XV and the New Jersey Employee Commute Options Program that will induce changes in travel behavior.

ISTEA and the Clean Air Act amendments both put great store in demand management. However, few expect TDM to be "the" solution to congestion, air quality, or mobility problems. Generally, those who advocate the regulatory approach see demand management as an essential part of a broader strategy. An unanswered question is whether a regulatory approach can cause as much usage of carpooling, vanpooling, transit, alternate work hours, and other such strategies as occurred "naturally" in the market place.

This leads to consideration of two other driving forces, namely economic forces affecting employers and individual behavior. The vast majority of people who share rides, use public transportation or use one of the other strategies referred to as TDM do not do so because of some regionally established regulation, a policy that arose in a state or local plan, or due to a catchy colorful advertising campaign. They share rides or use public transportation because it makes sense to them, i.e. because it is in their self-itnerest to do so.

Again, it is difficult to separate the influences of federal housing and highway policies, transit investment practices, and other such items from what individual travelers would have done in the absence of those investments. However, wherever you go in the United States, the distribution of trips by trip purpose for large-scale metropolitan areas shows that transit accounts for between 2 and 6% of all commute trips, carpooling accounts for between 8 and 16% of all commute trips, vanpooling accounts for up to 3% of all commute trips, and driving alone accounts for 70 to 85% of all commute trips.

Whatever we have done as a matter of public policy across the United States at the local, regional, state, and federal areas, we have done fairly consistently. Individual behavior in response to what may appear as a crazy quilt of conditions and practices is remarkably consistent. We might do well to think more about why 15% of people in a given community or metropolitan area are carpooling than to create a catchy campaign on some new basis to get the next 15%.

Similarly, the economic forces affecting employers are fairly similar. Their work sites were designed to a uniform building code (or some slight variation of it), the site was laid out in response to a local zoning ordinance (which is generally similar to those of neighboring communities), and their working conditions and benefit packages are reasonably similar (which is to be expected in a competitive labor market).

A common sense, fundamental law of business is that employers are reluctant (and opposed) to doing anything that will increase the cost of doing business if it does not bring a more-than-offsetting increase in productivity. In this context, ridesharing and related strategies are frequently seen as "do good" programs that do not help the bottom line.

In fact, employers see the employee transportation issue as a factor in employee recruitment and retention and, in some markets, as a government regulatory issue.

There are notable and highly touted exceptions to this. These include the experience of Atlantic Richfield Company on moving to Los Angeles and instituting an extensive employee vanpool program, specialized bus service, and related actions. Many believed Atlantic Richfield did this to be a good community citizen.

Looking deeper, many of the employees Atlantic Richfield brought with them in the move from Philadelphia to Los Angeles were people unaccustomed to driving to work. ARCO also needed to recruit new employees. Fundamentally, they believed that employee recruitment and retention would be substantially better if they had a strong employee transportation program than if they did not. If they also gained respect for being a good community citizen, that was an extra added benefit. However, for each example like an Atlantic Richfield, there are many more who see no reason to change their way of doing business.

Many reviewers have held Atlantic Richfield out as an example of what an enlightened employer can do. What is overlooked is the fact that this was an employee recruitment and retention strategy involved in a large-scale, long distance corporate relocation. And the strategies put in place have continued for many years.

The literature is rich in examples of strong employee transportation programs that have been put in place for corporate relocations. With the exception of responses to regulatory programs, the literature is rather sparse in identifying employer transportation programs that have spontaneously arisen in the absence of a relocation.

For consideration of both employer behavior and individual behavior, it is important to consider the economists model of the rational man. (In light of gender enlightenment, one wonders whether economists may change to a "rational person" theory.) In considering the fundamental argument that people and organizations will do what is in their self interest (i.e. be rational), practitioners in the field have learned over time what the individual and employer are striving to be rational about. As noted for the employer, it is the cost of doing business. For the individual, in its simplest terms, it comes down to matters of time and money.

The fourth driving force concerns demographics and land use. The types, spacing, and distribution of land uses dictate where things occur and many of the needs for travel between one type of site and another. Demographics tied to lifestyles plus employer and other practices all help to shape the requirements for travel and the influences on choice of travel.

When we segregate and isolate land uses we tend to require that one travel greater distances between desired destinations than if we allowed more mixed use activities. However, we cannot necessarily blame our zoning ordinances and similar devices for the segregation of land uses and the isolation of one use from another (e.g. residential being isolated from employment centers).

The comparison between land use patterns and travel patterns in the Houston and Dallas areas is illustrative of this point. Dallas has used zoning to help arrange its land uses for many years. Until recently, Houston did not use zoning. Most of the land use pattern in Houston developed in the absence of zoning. Although the point is arguable, the appearance and distribution of land uses in the two communities are reasonably similar. The distribution of trips by purpose, distance, and frequency are reasonably similar.

Underlying all these driving forces, the potential benefits of TDM and the reasons for consideration of TDM have to do with potential reduction of private and public costs, reduction of traffic congestion, reduction of air pollution, and energy conservation.

These driving forces and underlying desired benefits are reviewed further in later sections of this paper.

TRANSPORTATION SYSTEM ISSUES

As completion of the Interstate highway system nears, there has been a limited ability to expand highway capacity. Not only were highway maintenance and rehabilitation costs increasing (thus generally decreasing the share available for new construction) but also, and more importantly, environmental issues and community disruption issues arose which effectively limited much new highway development.

Many argue that the philosophy of accommodating future travel demands by providing capacity throughout the urbanized areas and beyond was flawed from the outset. This was due to the inducement of sprawled development, the tendency to increase trip lengths, and the effect, in conjunction with zoning that isolates and segregates land uses, to encourage increased vehicle usage plus a general decrease in the effectiveness of public transportation.

With the community and environmental protests against the addition of new highways in most urbanized areas plus the very high cost of such new highways, the highways that do exist are in some metropolitan areas only a portion of the network that was planned. I am not arguing that if only the public would have let the entire network be built, there would be no problem. However, in the 1950s and in particularly in the 1960s, local governments were developing and updating their general plans in good faith reliance that actions being planned by other parties, particularly the state highway departments, would be carried out.

The Century City area is a classic example of this in Southern California. The California Legislature had in its adopted freeways and expressways system many roadways that were to be developed. These included the Beverly Hills Freeway (Route 4 running from downtown Los Angeles to Santa Monica in the area between the present Santa Monica Freeway and the Hollywood Hills) and the Beverly Glen Freeway (running in a north/south direction from the San Fernando Valley to the south paralleling the present San Diego Freeway and to the east of it).

The City of Los Angeles considered this freeway pattern and the anticipated significant freeway-to-freeway interchange, plus the accessibility this would provide throughout the metropolitan area. In good faith reliance upon the State of California, the City of Los Angeles allowed the development of a major urban center now known as Century City.

Both freeways were removed from the plan and neither was built. Century City is now a high-rise development complex housing on the order of 40,000 jobs, and stands as an area with congested streets, high parking prices, and very limited transit service. This example pointedly illustrates how different parties accommodate expected travel demand and development patterns that would shape that demand.

On a larger, more systemic basis, the Century City example has been played out in many communities. It is difficult to argue that every community's general plan development level was sized according to the highway, water, and other infrastructure, that was planned. However, most communities' plans for highway networks were not completed yet the development patterns that have been planned within many metropolitan areas are at least as extensive as were planned during the 1950s and 1960s.

The occupants of those homes and businesses have lived up to or exceeded the expectations of those planning for the communities and their highways. We have wound up with the trips but not the roadway capacity.

It is impossible to prove what would have happened had the more complete roadway networks been developed. However, the fact that vehicle travel volumes are much higher than the roadway capacities in many metropolitan areas stands as testimony to the inability to provide enough roadway capacity to avoid congestion and, in some cases, severe and long-lasting congestion. These congestion levels are among the driving forces today behind the reasons for considering transportation demand management as well as transportation systems management, added transit service, and other related strategies.

In many communities, this has come down to a summary plaintive statement of "You can't build your way out of congestion." Whether this is put in the negative because of lack of localized support for acquiring new rights-of-way

and developing new roadways or due to lack of sufficient funding to build as many new roadways as some may want, the result is the same.

In the 1970s, as one discussed transportation demand management strategies, particularly relative to new roadway alternatives, it was common to hear that one was engaging in "social engineering." By the late 1980s, there was enough general belief that substantial amounts of new roadways could not be built and that consideration of strategies to manage demand were worth considering that TDM was generally not seen as "social engineering."

Some, including the author, have argued that the evaluation of demand management strategies is nothing more than asset management. That is, if one looked at the system as a manufacturing process, one would consider the inputs, the outputs, the influences, and other aspects, and then consider what could be done to gain greater productivity from the system. This may include adding capacity. However, it is more likely that one would first consider adding a second shift (spreading the peak), finding more efficient product delivery means (increasing vehicle occupancy), using just-in-time inventory control (incident management as a close approximation), and apply pricing schemes designed to move the product more cost effectively (discounts for carpoolers, vanpoolers, and transit riders).

Left unclear, unresolved, and perhaps, unresolvable, is the question of whether any strategies can eliminate traffic congestion. One of the arguments for consideration of TDM strategies is that they are necessary in the fight against traffic congestion. There are few examples demonstrating long-term wins in the fight against traffic congestion. The best most organizations are able to conclude is that traffic congestion is "not as bad as it would have been."

There is a clear belief by the drafters of ISTEA and the Clean Air Act Amendments that further emphasis on single occupancy vehicle projects (principally, if not exclusively meaning new roadway construction) is one of the main enemies of more efficient transportation, including increased vehicle occupancies and higher transit usage. As noted before, the purpose of this paper is not to prove or disprove this point. Instead, the purpose is to observe that these are driving forces for the consideration of transportation demand management and to indicate how these driving forces may play out over time.

As pointed out in many metropolitan area plans, vehicle travel volumes have grown much faster than has roadway capacity or transit usage over the past two decades. (The supply of transit has increased over the last two decades and transit ridership has increased in absolute numbers but has declined somewhat relative to total travel.)

The overall result is a general decrease in vehicle occupancy that has been attributed to a wide variety of factors, including continued sprawl development, a relative decrease in the cost of operating a vehicle, the relatively rapid increase in the percentage of women in the work force (particularly women with the primary care responsibilities for small children), and other factors.

GOVERNMENT REQUIREMENTS

Until the early 1970s, there was little (if any) government mandate for consideration of transportation demand management. While there are interesting examples of TDM-like actions that cities and others took in the recent and distant past (e.g. banning chariots in certain parts of downtown Rome), the few instances that are known are more curiosities than a pattern of government policy.

One need only compare the 1956 Interstate Highway Act and the 1991 Intermodal Surface Transportation Efficiency Act. This author is aware of no reference in the 1956 Interstate Highway Act to managing the demand for travel.[1]

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[1]According to Bart Hague, now with the Environmental Protection Agency and a White House staff member during the Eisenhower administration, the only policy level discussion during the development of the Interstate Highway Program that dealt with demand management even remotely concerned the potential effect of the Interstate Highway Program on suburbanization and sprawl.

ISTEA is replete with references to managing demand, transportation control measures, the priority for high-occupancy vehicle treatments over single-occupancy vehicle treatments, and so on.

With the passage of ISTEA, the federal policy emphasis moves from building planty of capacity to accommodate travel demand to one of managing the investments that have been made and deciding on new investments by first considering ways to get more out of the existing system. This is nothing more than asset management and would come as no great shock, or mystery to corporate America.

If most businesses in the United States were asked the question of what they could do to increase their output, most would examine their current operation to see what gains and productivity they could achieve. They may add a second shift, have one of their lesser-used plants produce more product, or take some other action. Few would quickly conclude that they would have to build the second manufacturing plant or something similar. Basically, they would seek more productivity from their existing assets before they would acquire new assets.

In the transportation field (as in other areas of government involvement), the response to the need to handle more trips has generally been to build more capacity rather than wring more capacity or productivity out of what we already have. ISTEA clearly sets asset management as our fundamental priority.

As noted before, what has changed from the mid-1950s to the early 1990s is the pervasive growth of congestion and the mandate to improve air quality. Along the way, however, there have been some notable trends that have shaped federal, state, and local government treatment of transportation management.

The National Environmental Policy Act of 1970 and the Clean Air Act of 1971 both established a course that would lead to greater consideration of demand management and, over time, greater questioning of plans and projects that featured accommodation of vehicle trips, particularly single-occupancy trips.

The first federal Clean Air Act established air quality standards that needed to be met across the country. Non-attainment areas were designated and EPA was mandated to develop transportation control plans for these areas if the local governments and other responsible parties did not do so (or did not do so sufficiently). In fact, the EPA Administrator was personally liable if a non-attainment area failed to put forward an adequate plan and he, the EPA administrator, failed to establish a substitute plan capable of achieving the requisite air quality. This led to some exciting moments in federal and local relations, including one large Los Angeles Times headline that read something to the effect of "EPA to eliminate 90% of Los Angeles driving."

Although EPA did not officially adopt (or, at least, has not adopted) and enact its separate plan, the message was clear. Local areas need to plan appropriately or EPA would be forced to step in and do so. This theme is with us once again with the Clean Air Act amendments of 1991, which have been a long time in the making.

The energy shortages of 1973-74 and 1979 caused more development of specific transportation management strategies and services than did any other single requirement or incident. Many employers established corporate vanpooling programs in response to these petroleum shortages. In addition, the unreliability of the transportation system (in the face of these shortages) spurred on the development of several regional commute management organizations.

This experience helped win the passage of the federal Energy Tax Act of 1978 which, among other actions, established employer tax credits for investing in vanpooling programs and declared employer subsidies of employee vanpool rides to be tax exempt. (When the Act expired in the mid-1980s, employer provided vanpool benefits returned to a hazy tax status.)

As the 1979 energy crisis faded from the front pages, the federal government's emphasis on transportation management declined. The next wave of action was seen at the state level. States including California and Washington passed legislation supporting employer investments in employee transportation programs, establishing tax credits, and taking related actions.

Following the wave of state interests, local government consideration of transportation management strategies became more noticeable. In many cases, the local government actions were being considered because of traffic congestion far more so than because of air quality reasons. From Montgomery County, Maryland negotiated development agreements to the Pleasanton, California trip reduction ordinance, there were many variations and differences in emphasis.

What is particularly significant about ISTEA and the Clean Air Act amendments is not that they emphasize transportation management. Rather, it is that they institutionalize the treatment of transportation demand management. It has been argued that the Federal Clean Air Act and the planning regulations which have been in place for many years led one down an analytical path over the past decade or so that was the functional equivalent of the new requirements of ISTEA and the Clean Air Act amendments. However, Congress elevated this treatment to legislative mandate rather than procedural guidelines. Furthermore, Congress established this treatment in a way that gives interested parties standing in federal court to question whether the planning and decision-making process was adequate and whether it gave appropriate consideration to transportation management.

This treatment, when combined with the funding flexibility embodied in ISTEA, means that the decision of whether to pursue a single-occupant vehicle based project or one that gives preference to high-occupancy vehicles takes on even greater significance. The former sense of security or isolation of working within either a highway or transit pot of funding is no longer present. (The ability to pursue transfers of interstate highway funds to transit projects was an important predecessor of this flexibility but is not nearly as significant as the flexibility to swap funds between the various pots as presented in ISTEA.)

One of the significant issues of institutional arrangements and political science raised by ISTEA is that over the last few decades, the transportation organizations have become quite used to working out their agreements about the role of priorities for projects within the various modal pots. That is, one could argue for the Federal Aid Interstate funds and the relative priorities within a state about where to expend the Interstate funds. Similarly, the Federal Aid To Urban Systems funds presented a more complex situation wherein many local governments (and others) were recipients of FAU funds. The planning and negotiations that yielded the priorities for expenditure of Federal Aid To Urban Systems funds have evaporated. Previous accommodations and internal, local agreements no longer apply. In addition, there are new parties at the table who did not even have standing before. Not only have the rules changed but so have the players. And management of demand, in a very important change, has become one of the required elements of the new game.

Another key change in government regulation has arisen in the tax arena. As noted previously, only a few private sector firms have incorporated transportation management strategies in their employee transportation programs. And those private sector organizations that have incorporated such strategies in the absence of government regulations have generally done so for self-interest reasons (generally employee recruitment and retention and, occasionally, reduction of parking or site development costs.)

In the presence of government regulations, employer actions to apply demand management strategies are increasingly evident. However, these actions are by no means widespread. What appears to be evolving though is an increasingly consistent strategy on the part of federal, state, and local governments to include strategies in their plans and regulations which encourage higher vehicle occupancies. Certainly, ISTEA and the Clean Air Act amendments do this. State requirements for congestion management programs and employee commute options programs work towards this same objective. Local government trip reduction ordinances also work towards this end.

One of the, arguably, significant legislative changes of the past few years is the change in the federal tax rules to allow up to $60/month worth of discounted transit passes or subsidized transit passes to be non-taxable, to allow employer provided vanpool benefits to be non-taxable, and to place a cap on the maximum value of free or discounted employee parking at $155/month. Although the immediate effects may be small, this change adds one more significant message to emphasize that the incentives or opportunities for using one mode of travel or another should be equalized, if not tilted in favor of higher vehicle occupancies.

TOO-ROSY VIEWS OF TDM

There is a school of thought that holds the transportation demand management is a "dumping ground" used when we don't know what else to recommend. While this may appear as a harsh judgment, many who have been in this field for several years have seen numerous instances in which they believe that unrealistic expectations for the results of demand management have been assumed.

Demand management is not unique for this concern. It may be argued that the air quality plans for many metropolitan areas are based upon strategies whose implementability is not clear. Many metropolitan areas' plans call for transit and roadway investments for which funds are not available today.

While it is true that ISTEA now requires metropolitan areas' plans to be financially constrained, the nature of planning itself encourages an organization to determine what they need and then set out to find ways of accomplishing it. If all we ever did was plan for only those actions that we could absolutely and without question accomplish, our list of planned investments and actions would be very narrow. Having said this, the concern with transportation demand management goes beyond considering alternatives that would be desirable and, then, developing specific implementation strategies (including specific financing strategies). The field and the experience base do not presently allow us to reach highly defensible conclusions about, for example, the percentage of future commute trips that can be expected to use carpools, vanpools, transit, etc.

While we have travel forecasting models that include the ability to "predict" shared ride and transit usage, we are basing those "predictions" on a whole range of assumptions about future land use patterns, future behavior, and future employer practices, among other items. These travel predictions are, more appropriately, forecasts of what may happen under a given set of circumstances. They are useful for side-by-side comparisons but may not be highly reliable as forecasts for predictions in their own right.

Decision makers, in some cases, take it "on faith" that managing demands will yield appropriate and positive benefits and that these programs will have an indefinite, continuing beneficial result. At this stage, this argument is inherently unprovable and unresolvable.

This situation is akin to "The Far Side" cartoon by Gary Larson wherein two scientists are standing at a blackboard reviewing the proof of some scientific theory that ends with "and then a miracle occurs." One scientist says to the other, "I think you need to be a little bit more specific." We, in the TDM field, need to be a little more specific here.

The driving force implied here is one of belief that other strategies do not appear to be working that well and that demand management holds promise for doing much more. We need to be critical of this approach and recognize that following a fad is risky, especially in a public policy setting. If decision makers feel they bought into a "too rosy" picture of demand management's potential benefits (for whatever reasons), some may be just as willing to switch fads and, for example, decide that congestion pricing or new technology is the new "flavor of the day."

COMPARISON TO DRIVING FORCES IN OTHER FIELDS

To put the driving forces for demand management in perspective, it is useful to consider some of the driving forces for related transportation strategies. Although a discussion of driving forces is somewhat subjective and is subject to criticism as "simply conventional wisdom," there are some useful parallels.

The driving forces for public transportation are quite similar to those for transportation demand management. Fundamentally, a driving force for public transportation that is different from those for TDM concerns the mobility needs of the traveller for whom a private vehicle is not available or preferable. There is also a clearer sense that becoming dependent on a more compact urban form is a driving force for developing more effective public transportation.

While arguments for public transportation frequently include the need to improve air quality, conserve energy, and accomplish related environmental goals, most analyses of public transit alternatives do not show significant gains in these

areas. This suggests that part of the driving force for public transportation is similar to that for demand management; i.e., a belief that the results of public transportation improvements will help with achieving environmental goals even if the expected results are not forecast to be large.

Driving forces for adding new roadways tend to include the need for capacity to accommodate vehicles in areas where new development is anticipated and no significant roadway capacity presently exists. More fundamentally, the driving force for new roadway capacity tends to be the observation or belief that today's level of congestion is unacceptable and that actions to decrease reliance on private vehicle use either will not or may not eliminate sufficient congestion to make the existing system productive. The reliance on congestion management plans as a device for demonstrating or proving this theory is increasingly popular across the U.S., particularly as required by ISTEA.

WHAT HAPPENS IF DEMAND MANAGEMENT DOES NOT LEAD TO SUFFICIENT AIR QUALITY OR CONGESTION RELIEF RESULTS?

Earlier, it was suggested that TDM actions have not been analytically demonstrated to yield substantial improvements in air quality or, at least, not the level of air quality benefit that has come from changes in automotive technology in the last several years. Similarly, if TDM actions for relieving traffic congestion do not go beyond the current efforts to increase vehicle occupancies for employees of larger employers only, one can question whether the congestion benefits of TDM will be sufficient.

This line of argument begs the question of whether TDM strategies are expected to accomplish the air quality and/or congestion relief goals on their own. The answer certainly is that TDM is only one of several strategies and is not the sole basis for planned improvements. New technology, system management, and new services are each critical components of plans to achieve air quality and congestion benefits.

However, TDM is the perceived underpinning for changes in usage of transit and shared ride arrangements as well as trip avoidance or shifts out of the peak period. The driving forces encouraging each of these changes are not likely to disappear. More realistic assessments of probable results from TDM are likely to be developed. And the perceived high public cost of some solutions is likely to continue as a principal limit on substantial new capital and operations investments.

To the extent that decision-makers see TDM as a way of causing transportation-related results that do not require significant public funds and are credible, the emphasis on TDM will likely continue and, perhaps, increase. To the extent, the predictions or assumptions for TDM are not realized (whether because of resistance, inability to apply the principles broadly enough, or lack of response), other strategies may gain in popularity or reliance.

As you consider your own area's mix of transportation strategies, consider the degree of commitment to the TDM strategies and the basis for those commitments. Ask:

- To what extent is there a clean analytic basis for the expected results of TDM?
- To what extent do the plans, programs, and requirements take it "on faith" that TDM results (or the results from other strategies) will occur?
- If the air quality problem could be principally resolved through technological "fixes," would we apply TDM concepts differently from the way we are applying them now? What would happen to our plans if air quality was not a driving force for TDM strategies?
- Considering the driving forces that have shaped TDM and other strategies, what policies may evolve if TDM results prove satisfactory? What changes may arise if the TDM elements are not satisfactory?

The driving forces of regulations, economic forces, individual behavior, and demographics plus land use are not likely to disappear. Our reliance on TDM strategies will depend on whether TDM is practiced based on realistic, predictable principles and whether the interaction of supply and demand is well understood.