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The Twin Cities *Real* Transportation Problem

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Introduction

Suburban Congestion. What is it and why is it the Twin Cities' *real* transportation problem?

Webster's dictionary defines the word "congestion" as a condition of overcrowding, overburdening, or an excessive accumulation to the point of obstruction. Though the term "suburban congestion" does not have a precise definition, most persons living in urban areas today have a clear perception of what suburban congestion entails. Images of overcrowded freeway lanes, snarled intersections, endless queues of cars and bumper-to-bumper, stop and go traffic jump quickly to mind.

The Twin Cities and metropolitan areas all across the nation are reaching a "suburban congestion crisis" brought on by an ever increasing demand for travel and the limited capacity of our highway systems to serve this demand. This article points out some of the demographic trends and lifestyle factors which have brought us to this suburban congestion crisis and identifies several realistic options or a "family of solutions" capable of relieving the crisis.

Roots of the Suburban Congestion Problem

During the 1950s, 60s, and 70s, congestion problems were primarily confined to radial routes leading into and out of the central business districts. Ken Orski, president of Urban Mobility Corporation points out that during the recent decade the entire nature of traffic congestion has changed. "In the past, traffic congestion was associated primarily with the downtown commute and occurred primarily on radial routes leading into the city. Today some of the worst traffic snarls occur far from the urban core (1)." More precisely, these traffic jams are all too often found on circumferential suburban routes—routes originally designed to detour commuters around the congested core areas.

A prime example of this in the Twin Cities metropolitan area is Interstate I-494 as it runs through the suburbs of Richfield, Bloomington, Edina, and Eden Prairie. I 494 was originally designed as one half of the I 494/I 694 ring route, a structure planned to carry metropolitan "through" trips around the Minneapolis and St. Paul downtown cores. Today, however, much of the traffic on I-494 is from local, short trips that are generated by the many office, retail, and service establishments which now flourish along the "I-494 strip."

What factors have contributed to the changing focus of travel patterns and travel demand in our metropolitan area? According to Allan Pisarski, author of *Commuting in America*, three primary trends have combined to cause a "boom" in commuting; the worker boom, the suburban population and employment boom and a boom in the use of the private automobile (2). These three trends are also primary factors in Twin Cities suburban congestion (3).

Work Force Increases

A greater percentage of the Twin Cities population is employed today than ever before (Table 1).

- The Metropolitan Council estimates that in 1986 approximately 56 percent of the region's total population was employed as compared to 45 percent in 1970.
- This figure translates into a total employment in 1986 of over 1.18 million persons, an increase of 29 percent over 1970 levels. During this same time period, the metropolitan region's population base increased by only 13 percent.

A large portion of this workforce increase can be attributed to the aging of the "baby boomer" population, who began to reach labor force age during the 1960s and 70s. The dominance of the baby boomer population in the workforce and in our region's travel patterns is expected to continue well into the next century.

- It is estimated that in 1980, baby boomers accounted for over 42 percent of the nation's workforce (2).
- In the Twin Cities area, the working age population group (ages 18 65) grew by over 34 percent between 1970 and 1986.

In addition to the baby boomers, the number of women entering the workforce also has experienced extraordinary increases.

- The number of women workers in the Twin Cities grew by over 89 percent from a little over 310,000 in 1970, to over 588,000 in 1986.
- Women now account for almost 48 percent of the region's total workforce.

An important aspect to keep in mind when considering this growth in the workforce and, in turn, the number of work trip commuters, is that the increases are well in excess of the

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Table 1. Twin Cities metropolitan area population and employment figures for 1970, 1986, and 2000 (projected).

	1970	1986	Percent Increase (1970 to 1986)	2000 (Projected)	Percent Increase (1986 to 2000)
Population	1,874,612	2,118,445	13%	2,310,000	9
Pop. Ages 18-65	1,025,400	1,375,000	34	1,500,000	9
Ages 18-65 as a Percentage of Total Pop.	55%	64%	—	65%	—
Employment	853,139	1,185,000	39	1,405,000	19
Employed as Percentage of Total Population	45%	56%	—	61%	—
Females Employed	310,605	588,289	89	674,000	19
Females Employed as % of Total Emp.	38%	48%	—	48%	—

Source: Metropolitan Council, Minneapolis-St. Paul

metro area's population growth. Transportation planners and highway engineers have traditionally relied heavily upon population forecasts to guide them in developing future transportation plans. What this means is that, while workforce increases did not go totally unforeseen, planners underestimated the tremendous impact these increases have had on our highway system today.

Suburban Population and Employment Increases

Since the 1950s, population increases have primarily taken place in the suburbs. While central cities and non-metropolitan areas have been stabilizing or experiencing population declines, the suburban area populations have continued to grow.

- In 1970, the central cities accounted for 40 percent of the region's total population. By 1986, this figure had dropped to 30 percent and by the year 2000 only 26 percent of the metropolitan area population will reside within the city limits of Minneapolis and St. Paul combined.
- The majority of the suburban population growth has taken place in what is known as the "developing ring of suburbs." Developing suburbs now account for over 34 percent of the region's population.
- The developing ring suburbs often lie on the edge, if not outside the existing regional highway infrastructure.

Population increases, however, are not the only demographic changes which have impacted the character of suburban commuting. Ken Orski suggests that, "We are witnessing today a second suburban migration. This time it is a migration of employment . . . (1)." Not only has the total number of jobs and workers in the Twin Cities dramatically increased but more often these jobs are located in the suburban rings and more precisely, often in strips along the regional highway infrastructure rather than in the traditional urban core.

- Employment in the metropolitan area's suburban communities has increased by over 92 percent, from just over 376,000 in 1970 to over 722,000 in 1986. Suburban employment is expected to continue to grow, accounting for over 90 percent of the region's expected employment growth.
- By the year 2000, 64 percent of the region's work force will be traveling from suburb to suburb rather than into the downtowns during the work trip commute (4).

A problem with both suburban residential and employment growth is that in large part, the two have occurred independently of one another. Individuals do not necessarily live in the same suburb in which they work, and with the predominance today of the two-worker family, it is virtually impossible to live in a location which is convenient for both workers.

Automobile Usage and Daily Travel Increases

As our region's population and employment have increased, so too have the number and length of trips that all of these people are making on an average day (Table 2).

- In 1970, the average number of daily trips per person was around 2.7, by 1986 this number had climbed to 3.4, and by 2000 is expected to reach 3.6 trips per person per day.
- In 1970, the average work trip distance was approximately 6.6 miles, today it is 8.1 miles, and by the year 2000 will be 9.7 miles long.

The worker and suburban job booms have also had a significant impact on the type of trip being made today. Often the traditional work trip is no longer a straight shot from home to work, but rather is a trip meant to fulfill a variety of functions, as it now encompasses the trip to the day-care center, shopping and errand running.

This multiple purpose work trip and the dispersed location of origins and destinations in suburban areas serves to reinforce our dependence on the private automobile as the primary means of transportation. More people are choosing or finding it necessary to own a private automobile and in many instances two-worker families are finding it necessary to own not only one car, but two.

- Vehicle ownership in the Twin Cities area has increased by over 52 percent, from 851,000 cars on the region's highways in 1970 to over 1.3 million vehicles today.
- The number of households owning two or more cars has

increased from 33 percent to 54 percent between 1970 and 1986. Twin City households now own an average of 1.7 cars.

- Simultaneously, average vehicle occupancy has fallen from 1.5 persons per vehicle in 1970 to 1.3 persons per vehicle in 1986.

This increase in automobile ownership and travel is occurring in the face of predictions that the "age of telecommunications and high technology" would substantially reduce the amount of travel by allowing people to work and conduct business at home or without having to leave the office. On a national level, the number of persons working at home has actually been on the decline and in 1980 accounted for only 2.3 percent of the total number of workers (2). Telecommunications is most likely affecting travel patterns, but it is certainly not an immediate solution to reducing congestion.

Transportation System Deficiencies

The tremendous increases in workers, suburban population and employment, daily travel and automobile usage have had a significant impact on the region's transportation system for two primary reasons. First, the vast increases in travel demand are being imposed on an older, mature metropolitan highway system and secondly, the metropolitan area's transit system is incapable of meeting the needs of suburban commuters.

Aging, Inefficient Highways

The existing metropolitan highway infrastructure is a system designed for a different era. The suburb to central city commute is no longer the dominant travel pattern and the region's radial and ring routes were not designed with adequate capacity to serve today's suburb to suburb travel demand.

With the completion of I-394 west of Minneapolis, about 90 percent of the region's planned highway system will be in place. No major expansions to this system can be expected in the foreseeable future, particularly with the ending of the federally funded Interstate highway program in 1991. Federal and state emphasis in the near future will be on the reconstruction and upgrading of existing facilities to provide needed additional capacity.

Many people question why much of the existing system was not originally designed and built to provide capacity for suburb-to-suburb travel. A primary reason is that highways are not designed in isolation, but are part of an overall system plan. Many of the elements originally included in the metropolitan area system plan, such as the 28th Street crossstown, Southwest diagonal, and Hiawatha Avenue expressway have not been, nor will ever be built. Regardless of the various reasons behind these occurrences, the result has been that the facilities which were built, such as I 494, I 35W and County Road 62, have been forced to carry traffic volumes far in excess of the levels for which they were designed.

Falling Transit Ridership

Transit ridership in the metropolitan area reached its peak in 1979 at around 93.8 million passengers annually. Since this time, ridership has been in continual decline and today the bus system serves fewer than 73 million passengers a year, representing a 22 percent reduction from 1979 levels.

Forecasts do not indicate the current level of ridership is going to increase significantly in the near future. Even assuming the construction of a regional light rail transit system, transit is not expected to account for more than 3 to 5 percent of the region's total trips through the year 2000.

In 1970 there were 45 miles of "congested" urban highways in the Twin Cities. By 1986 this number had grown to 132 miles of congested highway facilities and by 2000 will reach 206 miles.

The traditional form of regional, central business district-oriented transit service does not fit in suburban areas because of diverse patterns of origins and destinations, low population densities and suburban land use configurations which are not conducive to transit service. Suburban communities need transit services, such as circulator and paratransit systems, which can be tailored to meet their needs.

Result—Congestion

So what does all of this mean for the average Twin City resident? First of all it means that we can all expect the congestion problem to get worse before it gets any better, if it ever gets better at all. The Minnesota Department of Transportation (MnDOT) estimates that in 1970 there were 45 miles of "congested" urban highways in the Twin Cities.

Table 2. Twin Cities metropolitan area travel statistics for 1970, 1986, and 2000 (projected).

	1970	1986	2000 (projected)
Avg. Daily Trips per Person	2.7	3.4	3.6
Daily Number of Auto Drivers	3,350,000	5,300,000	6,100,000
Daily Number of Auto Passengers	1,600,000	1,400,000	1,800,000
Daily Number of Transit Riders	162,000	230,000	275,000
Daily Vehicle Miles	24,000,000	38,000,000	48,000,000
Annual per Person Miles of Travel	7,700	9,200	10,500
Avg. Work Trip Distance, miles	6.6	8.1	9.7
Avg. Vehicle Occupancy	1.5	1.3	1.3
Total Vehicles Owned	851,530	1,306,840	1,490,000
% Households with No Cars	15%	10%	8%
% Households with 2 or More Cars	33%	54%	55%

Source: Metropolitan Council, Minneapolis-St. Paul

By 1986 this number had grown to 132 miles of congested highway facilities and by 2000 will reach 206 miles!

Congestion, however, is relative. As a recent visitor from Los Angeles commented, "Your cities do not have a peak period or peak hour of travel. You have a peak 15 minutes!" Obviously this is an exaggeration, but is an indication that when compared to Los Angeles, where many of the highways are severely congested for 8 to 10 hours a day, many perceive that the Twin Cities area does not have a problem.

The difficulty in this is discovering what the public's overall "acceptable level of service" really is. To be sure, we probably have not reached the limits yet in very many locations. Yet as funds and capacity additions become increasingly scarce, and travel demand continues to grow, the breaking point on many highways is going to be reached.

What are the Solutions to Suburban Congestion?

Finding solutions to the suburban congestion problem is one of the priority issues facing many state, regional, and local elected officials today. The various agencies charged with transportation planning are also struggling to reorient their agencies to deal with the congestion problem.

Even if adequate funds were available, there simply is not enough space, nor would it likely be politically and aesthetically acceptable to try and provide the amount of freeway and roadway capacity needed.

MnDOT is reaching a crossroads where it can no longer afford to be primarily a builder and maintainer of highways. In a recent strategic planning process, congestion was identified as one of eight critical issues facing the department. MnDOT is now learning how to promote and implement a variety of alternative solutions to congestion.

The Metropolitan Council, in its recently published Transportation Policy Plan, recognizes that the growth in personal travel expected over the next twenty years is going to have a serious detrimental effect on the levels of accessibility provided by the Twin Cities' regional transportation systems. The 19 goals set out in its policy plan seek to identify a means for dealing with this travel growth and encouraging coordinated transportation planning efforts at all levels of government (5).

Finding solutions to the suburban congestion problem is no longer an activity dealt with exclusively by the public sector. Congestion costs are borne in large part by the private sector, through reduced office and plant accessibility, wasted employee travel time and decreased morale, and increased vehicle maintenance and operating costs. Private sector employers and developers are beginning to realize that they too must play a role in reducing the congestion levels on our transportation facilities if these costs are to be reduced. Private sector initiatives which have in the past centered around small, inexpensive options are today running the whole spectrum of alternatives from providing employees with staggered work hour options, assisting in car and vanpool organization with preferential parking treatment, plus financial participation in the design and construction of required transportation improvements.

The key to the solution of suburban congestion is to realize that this spectrum of alternatives and participation by a variety of actors is what will be required to solve congestion problems. The challenge today is to strengthen our region's cooperative planning practices and involve more people in the development of a well-rounded "family of solutions."

Potential Solutions

Solutions to suburban congestion can generally be placed in one of four categories:

- Transportation System Improvements—solutions which reduce congestion by providing additional system capacity.
- Transportation Systems Management (TSM)—solutions which improve traffic flow through better management of the existing system capacity.
- Travel Demand Management (TDM)—solutions which reduce congestion by controlling the demands on existing capacity.
- Improved Transit Services

Transportation System Improvements

It is often said that we are not going to be able build our way out of the congestion problem. Even if adequate funds were available, there simply is not enough space, nor would it likely be politically and aesthetically acceptable to try and provide the amount of freeway and roadway capacity needed to meet the region's growing travel demands.

While the above statements are true, it does not mean that we should not expect to undertake some major highway improvement projects over the next few decades. Some of the major construction projects planned for the metropolitan area include the new Northtown highway, which will extend west of the Mississippi River Bridge into Brooklyn Park; proposed Highway 169 in Eden Prairie; the proposed Shakopee by-pass; and the south extension of State Highway 3 in Inver Grove Heights. However, barring any significant change in the outlook for additional highway funding, it is not likely that many additional projects will be undertaken.

A large part of the region's future highway work is going to be concentrated on major reconstruction and upgrading of existing facilities. Many of the region's highways are aging and often lack the proper design and capacity for both existing and future demand. These problems will have to be remedied and additional capacity must be incorporated as a vital part of many of these projects.

Additional capacity can often be provided simply by correcting an obsolete design on the existing facility (i.e. adding shoulders or turn lanes, removing sharp curves, or lengthening merge lanes). Other times, however, full lanes will need to be added to gain the required capacity, such as is now being done on I-694 in Fridley and on the recently completed section of I-94 east of St. Paul.

Reconstruction efforts can sometimes occur within the existing highway right-of-way, but may require the acquisition of additional land, particularly when a full lane is being added. Along fully developed highway corridors, this often creates controversy with neighborhood groups.

One way to minimize the amount of right-of-way required is to include high occupancy vehicle (HOV) lanes as an integral component in freeway construction and reconstruction projects. HOV lanes can provide a "people" carrying capacity much greater than normal freeway lanes. The "Sane Lane," an interim HOV lane now in use along Highway 12, is

currently estimated to be carrying 50 percent more persons during the AM rush hour than either of the other lanes.

Transportation Systems Management

In many instances, the solutions to suburban congestion simply revolve around making better and more efficient use of our existing systems. The objective of Transportation Systems Management (TSM) is to maximize existing highway capacity through better management of the system as a whole. TSM strategies revolve around providing traffic surveillance, priority treatment of buses and HOVs, incident detection and management, and motorist aid and information systems. Specific measures which may be used include monitoring roadways using closed circuit television cameras, ramp metering, bus and HOV by-pass ramps, changeable message signs, lane control signals, highway advisory radio, and highway assistance vehicles. Many TSM strategies have been in use for years and may seem like pretty mundane solutions, yet each element has a significant role to play in developing the "family of solutions" needed for solving congestion.

One promising TSM strategy is to reduce congestion by reducing the number of incidents which occur on the region's freeway corridors. It is estimated that approximately 60 percent of highway congestion is incident (i.e. accident, stalled car, weather, construction, and maintenance) related. Learning how to control and minimize these incidents can go a long way towards solving the congestion problem. MnDOT has recently implemented a fleet of "Highway Helper" trucks to assist stranded motorists and help control incidents.

MnDOT's Traffic Management Center (TMC) in Minneapolis is currently one of the leading facilities in the nation for the utilization of TSM measures. The TMC is the central control center for system wide coordination of a traffic management system which covers over 37 miles of freeway in the Twin Cities metropolitan area. The system uses closed-circuit television cameras to continuously monitor freeway conditions and provides central control of ramp metering. TMC personnel are also in close communication with the Highway Patrol to provide quick response to accidents and other freeway incidents. Current plans are to add an additional 25 miles to the traffic management system by the year 2000.

Transportation Demand Management

Travel demand management (TDM) aims at getting drivers to change their commuting patterns in order to reduce the demand for freeway capacity. Demand management options include such strategies as staggered work hours to spread demand across a greater time period, car and vanpool programs, preferential parking, and promotion of transit and other alternative modes. Transportation demand management aims not only at reducing overall travel demand, but particularly at reducing vehicle demand for roadway capacity.

The private sector can make substantial contributions in the area of travel demand management by taking responsibility for implementing TDM measures. An excellent example of private sector involvement in TDM is currently occurring along the I 494 corridor, where a number of developers and employers have teamed up to form a Transportation Management Organization (TMO) known as Improve-494.

TMOs are voluntary organizations formed to assist their members in improving traffic conditions along the adjacent highway corridor. TMOs generally engage in a number of TDM activities ranging from sponsoring van and carpool programs, providing transit subsidies, and operating circulator or local transit services, to lobbying for needed transportation system improvements. The goal of Improve-494 is to reduce traffic congestion by 10 to 15 percent over the next five years.

Of much greater long-range impact is the implementation of local land-use control measures. Local communities are also beginning to realize that land use and transportation planning can no longer take place independently. Development must be coordinated with transportation decision-making. Strengthened land use control and zoning ordinances can encourage the type of development that supports the use of alternative transportation modes and spreads trip generation more evenly throughout the day.

One way of doing this is to instigate local ordinances which require developers to submit TDM plans for approval. Developers are then granted reductions in the number of required parking spaces or are given other financial incentives based on their ability to demonstrate a commitment to TDM. Developments found in non-compliance with the plan are fined or refused additional development rights.

In the Twin Cities area, the western suburbs of Golden Valley, Minnetonka, and St. Louis Park are actively involved in developing TDM strategies for the rapidly developing Highway 12/I-394 corridor. Minnetonka has recently adopted a plan which relates the intensity of development to the available capacity of the I-394 interchanges and the local roadway system. The plan requires a traffic impact analysis when a development is proposed. If a roadway improvement is needed because of the development, the developer will be required to pay for it through impact fees. The plan also requires developers to show how transit would be used and for existing and new employers to implement techniques that reduce traffic congestion (6).

Improved Transit Services

As mentioned before, traditional transit services often do not work well in the suburban areas. However, transit service can be a viable solution to congestion when directed at the appropriate markets and needs. Local transit services may be the best option for addressing suburban congestion. Local community services are seen to provide better responsiveness to community needs, allow for service flexibility and often provide more service for about the same cost as regional transit services.

In the Twin Cities area, suburban communities can choose to "opt out" of the regional system. Cities which opt out are given their share of the regional transit tax to run locally based transit operations. The city of Plymouth opted out of the Metropolitan Transit Commission several years ago to contract with a private bus company to provide both local circulator service and line haul service to the central business district. Other services which can easily be provided on a local level include car and vanpool programs, private subscription bus and vanpool services, and specialized para-transit services.

Transportation Funding

Obtaining sufficient funding to cover the costs of transportation improvements is difficult today. For example, highway expenditures in terms of constant dollars per vehicle mile of travel have decreased by 56 percent between 1960 and 1982 (7). During this same time, the need for highway construction as well as reconstruction and maintenance has grown considerably. MnDOT estimates that at the current rate of highway funding, our state highways, which should be totally

rebuilt every 50 years, will be rebuilt only once every 125 years. This does not include providing any new facilities for increased demand. Public transit systems also face many challenges in obtaining adequate funding.

A way to supplement current funding, is to turn to non-traditional sources of funding and financing methods. Ken Orski notes that the burden of financing our highway system improvements need no longer fall entirely into the lap of the public sector, "There has been a growing acceptance of the principle of 'cooperative financing,' a notion that private developers must bear a fair share of the cost of public transportation infrastructure (8)."

Cooperative financing includes alternatives such as special taxing or benefit assessment districts, corridor development fees, or direct public/private negotiations. Benefit assessment districts require each developer to pay for a portion of the required infrastructure, while corridor development fees assess each development in proportion to its expected traffic generation. The emphasis of these programs is to shift the cost of the infrastructure onto the direct beneficiaries.

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Solutions of Tomorrow

Support of research and innovation is becoming critical to helping us address transportation challenges today. Change comes through innovation, and innovation usually is the result of some type of research and development effort.

Role of Research

High technology applications are moving into the transportation field, though often at a rate much slower than that of other economic sectors. This is due in large part to the lack of commitment and funding to transportation research from both the public and private sectors.

Keeping publicly supported research strong in a time of a large federal deficit is a challenge. As overall funds are cut, the questionable nature of research makes it especially vulnerable to instability and lack of support. Privately supported research efforts meanwhile are often difficult to measure. They tend to concentrate primarily on vehicle related technology, with little attention being given to the transportation system itself.

In the United States, two-thirds of all federal research and development effort is in the area of defense. Looking at total federal research expenditures, including defense, less then 1 percent is spent on transportation. On non-defense measures, only about 3 percent of expenditures are devoted to transportation. Ten times this much is spent on health and over four times this amount is expended on space related research and development (9).

All this is not to say that the outlook for innovation in transportation is entirely grim. A number of recent efforts, such as the instigation of a $150 million, five year Strategic Highway Research Program (SHRP) by the state departments of transportation and the Federal Highway Administration, indicate that the role of transportation research is gaining greater recognition. It is estimated that the payback from this special highway research could exceed $600 million a year in reduced highway expenditures.

Transportation research can offer a wealth of benefits, from low technology options such as improved materials in pavement design, reflectorization, and ice and snow control, to high technology efforts in automating our nation's freeway system. The return on investment realized from research innovations can be substantial by lowering the costs of design and construction, extending the useful lives of transportation facilities, and reducing personal delay and vehicle costs.

High Technology Solutions

As mentioned earlier in this article, a key element in the solution to suburban congestion will be the upgrading and, in many cases, complete rebuilding of the Interstate highway system to provide additional capacity. However, an important point to remember is that the funding for this rebuilding is not going to occur, unless the new system has something more to promise to the public.

Advanced technologies, capable of decreasing headways and increasing speeds and safety, must become integral components of our new highway systems. The development of some of these new technologies will require major technological breakthroughs in the next few decades, but in large part many so-called "futuristic" solutions are already possible today. These solutions include such innovations as automated guided vehicles, automated highway systems, mobile traffic information systems, automatic vehicle identification and location, and electronic route guidance systems.

Though each of these systems differs somewhat in its level of advancement and technological requirements, they are similar in that each tries to "marry" the vehicle with the roadway. The private automobile and highway infrastructure must be viewed as two components of a single "transportation system." Improvements to the system must take into account how the two interact.

In November of 1987, a fourteen member steering committee including University researchers, private motor vehicle manufacturers, and federal and state transportation officials, was formed to guide national efforts in the area of new technologies for the highway. The overall effort, known as Mobility 2000, is directed at identifying substantive technology, legal and institutional issues which must be addressed before automated and semi-automated technologies can become a reality on our highway systems. This group has made great strides in a short period of time.

Conclusions

Suburban congestion is not a problem with immediate or easy solutions. Congestion is caused by a number of factors which are closely related with society's current values and lifestyle. Radically changing how and when individuals choose to travel will be a long and slow process, and may never become a reality.

Congestion, however, is everyone's problem and everyone has a role to play in finding its solution. We must learn how to implement a whole variety of solutions, including improving existing highway and transit systems, implementing transportation system and travel demand management measures, and supporting research and development in new transportation technologies. In effect we must build a complete program for congestion relief, a "family of solutions" which can incrementally move us towards solving the congestion problem.

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