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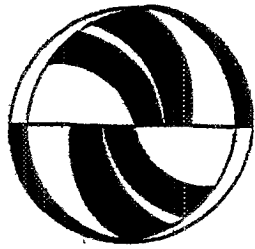
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**The Motorization of North America:  
Causes, Consequences, and Speculations on  
Possible Futures**

Martin Wachs

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The University of California  
Transportation Center  
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**The Motorization of North America: Causes, Consequences and  
Speculations on Possible Futures**

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The University of California Transportation Center  
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# The motorization of North America : causes, consequences, and speculations on possible futures

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## Introduction: North American Motorization in Relation to the Rest of the World

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North America is the most motorized or automobile-oriented part of the world. This is shown in Table 1 using data for vehicle registrations in several parts of the world. While Africa has a population of 46 people per registered vehicle (including trucks and buses) or 70 persons per passenger automobile, and Asia has 26 people per vehicle or 41 per passenger car, North America has reached the point of having only 1.92 people per vehicle and 2.8 people per passenger car. These figures for North America include Mexico, a country that can still be said to be in the process of developing rapidly, and which has relatively low numbers of vehicles in relation to its population. In the United States there is one vehicle per 1.32 people, including commercial vehicles or one passenger car per 1.96 people, and Canada is similar with 2.18 persons per vehicle of every type or 1.92 people per passenger car (American Automobile Manufacturers Association, 1997).

North America is substantially more motorized than France. The United States has 4.5 times the population of France and 6.66 times as many vehicles; while Canada has 49.5% the population of France and 55.5% the number of vehicles. These differences are substantial, yet they are much smaller than the differences between these advanced economies and newly developing nations.

When contemplating the lessons to be learned by studying motorization, it is critical to recognize that there are, broadly, three different patterns of motorization in the world. First, in Europe, great cities like Paris and London were quite large and well developed prior to the advent of motorized public transit and automobile transportation. The cores of these cities still reflect their development over several centuries during which walking and horse-drawn transportation dominated. These cities have changed dramatically during the twentieth century, throughout which adaptation to public transport and the automobile has been a constant, ongoing process. Still, in such cities the cores or center cities continue to contain large concentrations of employment and public transport remains a major contributor to urban travel, especially peak-hour weekday work travel. Because North America developed much later than Europe, there are fewer cities in North America that have cores of substantial size that predate transit and automobile technology.

North America, with the exception of those few old centrally-oriented cities like New York, Toronto, or Boston, represents a second pattern, fundamentally different from European cities. By and large the urban areas of North America grew to prominence after the invention of motorized transit and the automobile. To a far greater extent than European cities, Los Angeles, Tucson, and Vancouver reflect continuous, gradual and conscious adaptation and adjustment of urban design to the automobile and vice versa. Automobile ownership rates in relation to population were already greater in North America in 1920 than they are today in Africa or many parts of Asia, and as the level of motorization has approached saturation, there actually has been a steadily declining rate of increase in motorization for five or six decades. The location of the majority of work sites is today suburban and most peak-hour work journeys are made between suburban residences and suburban employment sites. Public transport is viable in many metropolitan areas, but its use is declining steadily because both residences and jobs are continually shifting to areas that are unserved by transit. In the United States, public transport provides important service to peak hour commuters who use automobiles for virtually all of their non-work trips. Public transport also provides critical service for all trip purposes to recent immigrants, the disabled, and people who are too poor, too old, or too young to use automobiles. There are small but important differences between the United States and Canada. Although public transport use is declining over time in most North American markets, and the largest, oldest cities having transit friendly conditions capture the largest shares of transit travel in both countries (New York, Boston, Montreal, Toronto) a somewhat larger share of the urban travel market continues to be served by public transport in Canada than in the United States. Not surprisingly, Canadian cities are to a greater extent than cities in the USA characterized by conscious attempts to

encourage higher densities of residential and commercial activities in the vicinity of transit services.

A third pattern of motorization exists in those parts of the world that have large metropolises in which motorization has accelerated relatively recently, and in which rates of increase in motorization are soaring in the late twentieth century while levels of motorization remain well below those of North America. In such cities the vast majority of personal travel continues to be done on foot or using public transportation, and economic activity remains highly centralized.

Table 1 : motorization Rates in Selected Areas of the World in Year 1995.

	Population (000)	Passenger Cars (000)	Total Vehicles (000)	People per Car	People per Vehicle
North & Central America	446,855	159,040	232,608	2.80	1.92
USA	265,563	134,981	200,446	1.96	1.32
Canada	28,821	13,183	16,668	2.18	1.73
Mexico	95,772	8,400	12,150	7.88	11.40
Africa	722,809	10,344	15,731	45.95	69.88
Asia	3,217,930	77,585	122,412	26.29	41.48
Europe	860,499	197,314	233,811	4.36	3.68
France	58,040	25,100	30,295	2.31	1.91

Source: American Automobile Manufacturers Association, Motor Vehicle Facts and Figures, 1997 Edition, Pages 44-47.

We can contemplate a continuation of automobile oriented trends in North America, and that would mean a gradual, steady increase in the number of automobiles and in the amount of automobile travel as population increases. It does not, however, imply dramatic growth in the rates of motorization there. It is an entirely different problem to imagine motorization rates in Europe that could approach those of North America. This would mean a substantial increase in the number of vehicles per household and would have complex and undoubtedly serious effects on the older cores of Europe's great cities.

In addition, it is very difficult to comprehend what it would be like in that third group of cities - rapidly motorizing ones in Asia and Africa in which levels of motorization remain low - should those cities ever attain motorization levels similar to those of North America. For example, the United States and Canada are relatively car rich, having a total of 217 million motor vehicles, approximately one-

third of the world's total of about 647 million vehicles. If Asia and Africa were to quickly reach the current rate of motorization of Canada and the USA, they would add to their current stock of vehicles nearly three billion additional vehicles, or five times the number that presently exist throughout the entire world!

## Deconstructing North American motorization

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The motorization of North America is a complex phenomenon that is often grossly oversimplified. Many Europeans, for example, believe that North Americans have a «love affair» with the automobile, and this characterization suggests a general belief that Americans' and Canadians' attachment to their cars is in some sense irrational, costly, wasteful of energy, and damaging to the environment. Careful analysis, however, reveals highly varied patterns of automobile ownership and use, and very different levels of reliance on public transportation in North American cities.

### 1. Motorization in rural versus urban communities

It is important that Europeans understand that North America covers an extremely large area, and that despite dramatic population growth from immigration and natural increase, gross population densities in North America remain very low in comparison with those in Europe. The overall population density of Canada, for example, stands at 2.9 people per square kilometer, and the density of the United States stands at 30.1 people per square kilometer. By contrast, the overall population density of France is 106.9 people per square kilometer. Of course, in all three countries urban densities can be orders of magnitude higher than rural densities.

In very low density areas, such as those that characterize almost all of North America, it is more costly and sometimes inefficient to provide any form of public transport, and the automobile long ago became an absolute necessity in rural and agricultural communities, permitting them to become populated to a far greater degree than would be the case without automobiles. In very dense urban areas, by contrast, automobiles are costly to store and maintain. Not surprisingly, if we look at data for the United States, motorization rates are highest in the most rural areas and lowest in the most urban, and the differences are substantial. James Flink showed that the diffusion of automobiles in the first decades of the twentieth century was highly correlated with the income of the population. While the rich in both rural and urban areas acquired cars earlier than lower income people, it was



also true that large, lower density western states showed substantially higher rates of automobile ownership prior to 1920 than more urbanized eastern states. Private automobiles simply had more utility for rural farm families than for urban families employed in manufacturing or commerce. The isolation of rural life was greatly reduced by automobiles, and rural families became motorized earliest (Flink, 1970). Michael Berger, for example, shows that prior to 1920 most visitors to national parks were members of automobile-owning rural households; and that most tourists visiting urban areas and families visiting state fairs were rural farm families. Changes in land use and economic activity that followed from adoption of the automobile were also most dramatic in rural areas. For example, the acquisition of the automobile was in the first three decades of the twentieth century, widely accompanied by the consolidation of small rural one-room school houses into larger consolidated schools; by the combination of tiny rural churches into larger ones, and by the closure of rural general stores in favor of large chain grocery stores and farm supply companies (Berger, 1979).

Charles Lave recently showed that this historical pattern persists until the present day. The highest motorization rate among the fifty states in the USA occurs in mostly rural Idaho, where there are 1.016 vehicles per person, where the average driver travels 14,498 miles per year, and where only 2.0% of all trips to work are made using public transportation. By contrast, in the much more heavily urbanized state of New York there are only 0.541 vehicles per person, the average driver travels only 10,475 miles per year, and some 25.5% of all workers use public transport for their journeys to work. In rural Wyoming, per capita use of motor fuel is 1,016 gallons per year; a figure that is several times the 360 gallons per person of fuel used in the State of New York (Lave, 1994). Parts of North America - Boston, New York City, Toronto, and Montreal - are much like Europe and their travel patterns resemble those of Europe. Other parts - rural South Dakota, Wyoming, and Saskatchewan are more like the Australian outback than they are like Bordeaux or Burgundy. To understand the motorization of North America it is necessary to disaggregate such diverse environments - averaging them together provides a most misleading picture.

## 2. Historical roots of metropolitan differences in motorization

While it is generally true that motorization rates in North America are much higher in rural areas than they are in urban areas, it is also important to observe that motorization rates and transit usage also varies enormously from one metropolitan area to another. In both the United States and Canada, transit use is concentrated in certain metropolitan areas which, not surprisingly, also have the lowest rates of automobile ownership and use. Other metropolitan areas, by

contrast, seem almost totally dependent upon automobiles for urban travel, and in those metropolitan areas transit is used almost exclusively by a minority of poor people, recent immigrants, and the very young and very old. In both Toronto and New York City, for example, 27% of urban trips are made by public transport, and an even higher share of peak hour work trips. In Toronto citizens made 186 transit trips per capita in 1991. In Montreal, 34 % of all trips were made by public transport in the same year, amounting to 196 trips per capita per year (Pucher and LeFevre, p. 165). At the other end of the spectrum, in St. Catherines public transport was able to capture only five percent of modal share and public transport users made only 29 transit trips per capita per year. And in Phoenix, Dallas, and Detroit public transit use amounted to less than three percent of all trips in 1991 (Pucher and Lefevre, p. 180).

Variation in rates of automobile ownership and use among North American cities can largely be explained on the basis of differences in the historical development of those cities. North American cities that had reached substantial size - half a million or more inhabitants - prior to the advent of public transit technology around 1880, were by their nature extremely dense because they depended upon walking as the major means of urban transport. Those cities - including Toronto, Montreal, New York, Boston, Philadelphia and Chicago - that were large metropolises prior to the invention of public transportation technology - continue to have dense central cores in which transit is dominant and in which it is difficult to accomplish most travel by auto. In these cities, the typically high densities of the late nineteenth century were seen at the time as oppressive and unhealthful, and well before the arrival of the automobile public transit was welcomed as a means of "decongesting" the central cores. Suburbanization began when transit technology allowed settlements at some distance from the core to be viable. In North America public transit was clearly the force behind early suburbanization, while conversely rapid suburbanization provided the market for the early successes of public transportation.

Many North American cities that are today among the largest urban areas, like Los Angeles, Phoenix and Dallas, were sleepy little cow towns or railroad junctions at the time that transit technology was introduced, and their periods of most rapid growth followed the invention of public transportation. In those cities public transport encouraged low density development from the very start, and a dense urban core never developed at all. Los Angeles, for example grew from a population of less than 3,000 people in 1870 to a city of 320,000 people in 1910. Most of this growth occurred at low density along streetcar lines to outlying areas. It grew to a population of 577,000 by 1920, already relying on the automobile to allow people to live in suburban communities that did not in all cases have transit connections to downtown. It is a fundamental mistake to think that North American

sun belt cities like Los Angeles lost their density» to the automobile. Rather, because they grew to maturity after the advent of public transit they never experienced a high density phase of development.

Unfortunately for public transit investors, the automobile was invented less than twenty years after the introduction of viable steam and electricity-powered public transport systems. In every North American city, the decentralization that was started by the invention of public transport only accelerated with the coming of the automobile. Now, low to moderate development could take place away from the street car lines. In all cities - new ones and old ones, twentieth century growth has taken place primarily away from transit routes and at low to moderate density in the suburbs. In cities that had strong cores that were fully developed prior to the advent of the automobile, those cores still exist and transit is still viable to at least some extent. In cities that experienced most of their development in the twentieth century, the cores never existed and never needed to exist, and consequently these are the automobile-oriented cities in which transit never captured a substantial proportion of all trips. Although the outlying suburbs of all North American cities resemble one another a great deal, it is also true that the downtowns of large automobile-oriented cities of North America - Phoenix, Tucson, and Dallas, for example - are more different from the cores of the older transit-oriented cities of Toronto, New York and Boston than those older core-oriented cities are from European cities. The relative youthfulness of many North American cities, then, their establishment after the advent of multiple transportation technologies, says a great deal about their form and the ways in which they function.

### 3. Continued suburbanization of North American metropolises

The majority of the North American population is now suburban and the majority of employment in North America takes place at suburban locations. The suburbanization of residences and of employment in North America is both a cause of and an effect of increased motorization. Technical definitions of suburbs are different in the USA, Canada, and Europe, but the term connotes in all cases areas that are within metropolitan areas but outside their downtown cores. Suburban densities vary widely, but they are generally substantially lower than densities in the central city core, and at the urban fringe they taper off toward rural densities. In the early years of the twentieth century, suburban areas grew up near intercity rail lines and most suburbanites in the labor force commuted by train to central city jobs. Later, starting after World War I, bus routes and the automobile enabled suburbs to grow where there were no rail lines. The trend toward suburban residence continues unabated in the United States. There, population in the core cities of metropolitan areas declined between 1980 and 1990, while almost all of the

metropolitan area growth of seventeen million people in one decade occurred in suburban areas. This trend is more prominent in the USA than it is in Canada, though the similarities are greater than the differences between the two countries (Pisarski, 1996).

While central cities retained for a time the greatest concentrations of industrial and commercial employment, a shift in the economic base from manufacturing to commerce and services enabled a larger share of economic activity to follow its labor force to suburban locations. While inner cities have held onto or slowly lost employment, suburban jobs have grown dramatically. In the United States about 44% of all jobs are today located in central cities, while about 48% are located in suburban areas.

The predominant flow of travel between home and work in North America is from suburb to suburb. Because public transport routes provide their most frequent and most efficient service within the core central cities of metropolitan areas and from moderate density older suburbs to downtown city cores, an ever smaller proportion of work trips can be made conveniently using public transport. Thus, increasing suburbanization of residences and employment is accompanied by increasing motorization and increased utilization of automobiles for trips of all sorts.

#### 4. Motorization and changes in the gender division of labor

Another major shift in the labor force is also partly responsible for increasing motorization in North America. Over the past thirty years the proportion of women in the paid labor force has grown substantially. In the USA, over 77% of women aged 35 to 44 were working in 1990 compared with only 40% in 1960. Sandra Rosenbloom has argued persuasively that a family in which a wife and mother is in the paid labor force is one in which automobile ownership becomes increasingly necessary, especially if they reside at a suburban location. Household travel patterns become more complex as household members balance their needs for child care and after school activities with those of working parents. The relative inflexibility of public transit, in terms of both location and time, make it difficult to serve the needs of multiple-worker households with children (Rosenbloom, 1991). Not surprisingly, national surveys of travel and automobile ownership show that the greatest growth in automobile ownership and use over the past twenty years are among women.

Interestingly, the proportion of all travel that is work related is declining steadily in North America. The most recent national survey of households in the USA shows that today less than 20% of all trips and about 23% of all vehicle miles of travel are accounted for by commuting to work. Travel for recreational, social, and personal business purposes have grown more rapidly than work travel, in part as a result of

the growing standard of living. Automobile trips to serve others - for example chauffeuring children and elderly parents to recreational activities and to medical appointments - are growing more rapidly than work trips as a proportion of all travel, reflecting the changing composition of the population and the dispersion in space of the activities in which members of these age groups engage.

Increasing motorization in North America can be seen to have many complex social and demographic underpinnings. Automobile ownership rates and automobile usage remain highest in rural areas, while increasing suburbanization contributes to growth in automobile use within metropolitan areas. That increasing suburbanization is itself a complex result of changes in the metropolitan economy and particularly of the suburbanization of service and commercial employment and of the increased participation of women in the labor force.

## 5. Motorization and the cost of travel

It is reasonable to hypothesize that the extent to which a population is likely to rely upon automobiles for their travel can be substantially influenced by the cost of automobile ownership and use in relation to the cost of alternative modes. It is difficult to provide exact cost figures for automobile ownership and use in comparison with other travel modes, such as public transit. Some costs, like the purchase price of new or used vehicles and the cost of insurance vary little with quantity of travel and tend to decline per unit of driving as household travel increases. Other travel cost elements, like fuel and maintenance, tend to increase with the amount of driving. Automobile costs can be estimated, then, only as a function of the amount of driving, and these costs vary substantially among states and provinces in North America. Pisarski (1996, Table 2-11) has shown that automobile costs have probably risen per mile of driving over recent years. A table from Pisarski's analysis is reproduced as Table 2.

On the other hand, it appears to most analysts that in the United States the vast majority of workers are provided free or low-cost parking spaces at their work places and at shopping locations, and recent studies have shown that bridge and highway tolls and state and national gasoline taxes have decreased in real terms over the years. Newman and Kenworthy(1989) point out, however, that the number of parking spaces in downtown Toronto per thousand workers is 198, approximately half as many as the average of the ten largest cities in the United States, and Cervero (1986) notes that in one transit-oriented Toronto suburb provision is made for 0.3 parking spaces per thousand square feet of development, in contrast with levels of parking provision in the United States of 4.0 spaces per thousand square feet in suburban office complexes. Differences of this magnitude between the

United States and Canada go part of the way to explaining the differences between these two countries in motorization rates and transit mode shares.

Table 2 : vehicle operating costs, per mile

		1990	1992	1995
Operating costs(cents)	Gas and oil	5.4	5.9	5.8
	Maintenance	2.1	2.2	2.6
	Tires	0.9	0.9	1.2
	Total (cents)	8.4	9.0	9.6
Ownership costs(dollars)	Insurance	657	787	783
	License, taxes, registration	156	174	203
	Depreciation	2,242	2,717	3,073
	Finance	638	796	686
	Total (dollars)	3,693	4,474	4,745
Total cost permile (cents)	@ 10,000 miles/year	39.3	47.4	50.6
	@ 15,000 miles/year	33.0	38.8	41.2
	@ 20,000 miles/year	29.4	34.8	37.0

NOTE: Data were provided by American Automobile Association, based on data produced by Runzheimer International. Ownership and operating costs are based on an average of selected small, medium, and large vehicles.

A recent study of gasoline taxation in California showed that in Areal terms» (correcting for inflation) combined federal and state fuel taxes have fallen dramatically because of increasing fuel efficiency of vehicles and because legislative bodies have been reluctant to increase the rate of taxation per gallon of fuel. For example, in California, the total of federal and state gasoline tax is 36.5 cents per gallon and an increase of some 30 cents per gallon (nearly doubling the current tax) would be needed to tax gasoline at the same rate per vehicle mile of driving as existed in the year 1960 (Brown, et al, 1998).

It is also difficult to generalize regarding the relative cost of public transit versus the automobile in North America, since transit fares and vehicle operating costs all vary substantially from one location to another. Nevertheless, many analysts are of the opinion that in general the cost to the user of public transit has not decreased dramatically in relation to the cost of automobile ownership and use. Declining subsidies to public transportation, and extensions of many transit routes to growing suburban communities where transit operations are costly and relatively less efficient than on high-density inner-city routes, leave the cost of automobile

transportation in North America relatively low in relation to the cost of public transportation. These cost differences magnify travel time penalties faced by transit users and are especially pronounced when compared with the relative costs of public transportation and automobile ownership and use in Europe. Clearly, many transportation scholars and analysts attribute the continued high rates of motorization in North America at least in part to the long-term pattern of travel costs there (Pucher and Lefèvre, 1996).

### Motorization, Urban Form and Congestion: An Intellectual Challenge

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The relationship between, motorization, urban form and congestion is today in North American cities being hotly debated, and in my mind there is no clear resolution to this vigorous argument.

Until 1835, when public transport was introduced in many cities, virtually every North American resided within walking distance of where he or she worked. By the start of this century, transportation had evolved rapidly from horsecars to omnibuses to street railways, which allowed cities to expand dramatically. Still, cities were crowded, dirty, dense, congested places. The first national conference on City Planning and the Problems of Congestion held in Washing in 1909 was characterized by many speeches in which the leading thinkers of the day insisted that the disease, poverty, darkness and vice of the North American city was caused by the scourge of high-density living, and that it was the job of urban transportation planners to build public transit routes to outlying areas for the explicit purpose of lowering density. For example, Charles Horton Cooley stated in 1891: "Humanity demands that men have sunlight, fresh air, grass, and trees. It demands these things for the man himself and still more earnestly for his wife and children. On the other hand, industrial conditions require concentration. It is the office of urban transportation to reconcile these conflicting requirements; insofar as it is efficient, it enables men to work in aggregates and yet to live in decent isolation. The greater its efficiency in speed, cheapness, and convenience, the greater the area over which a given industrial population may be spread."

Mary Kingsbury Simkhovich, the only woman to address the first annual conference on city planning, urged that new immigrants to New York City should be whisked to low-density suburbs before they had a chance to settle in lower Manhattan and be destroyed by the urban densities and the vices and diseases that they induced. Subways to new outlying communities were urged, combined with low flat fares, so that low-income people could afford to live at low density at the edge in order to avoid the pitfalls of inner-city living.

While there is little debate about what the long term trends in motorization and urban development have been in North America in the twentieth century, there is enormous disagreement over the consequences of those trends and whether policymakers should accept them or attempt to intervene for the purpose of reversing them. Scholars who examine trends in travel, congestion, and urban form are sharply divided in their interpretations of the consequences of increased motorization and decentralization.

Despite the fact that it was conventional wisdom early in this century that subways and streetcars would lead to lower density and encourage suburbanization and that was seen as a good thing, we today have a new conventional wisdom endorsed by Peter Calthorpe(1993) and Peter Newman and Jeffrey Kenworthy(1989). This school of thought believes that increasing decentralization, the steady lowering of densities of both residential and commercial activities, and the continued increase in reliance on automobiles for travel of all purposes, are inherently unhealthful and that they constitute a major problem for transportation policymakers and political leaders. Adherents of this view argue that motorization is causing congestion to increase, travel times to slow, air quality to worsen, and over time energy resources to be consumed. It is especially of concern that decentralization is interpreted to be the cause of «spatial mismatches» in employment. The urban poor, primarily members of racial and ethnic minority groups who possess relatively low levels of technical skills and own automobiles at lower rates than richer and whiter components of the population, are believed by many to have decreasing access to employment opportunities that increasingly occur at low densities at the urban fringe, away from public transit, and far from where they live(Kain, 1968).

Solutions to North American urban ills are to this group of scholars and policymakers very much dependent upon intervening in these trends and changing them. They urge more vigorous use of land use controls to consciously increase residential and commercial densities in the vicinity of transit routes, and more investment in public transportation for the purpose of expanding rail and bus networks to reach a larger proportion of the suburban population. Also part of the solution to members of this camp are increased restrictions on automobiles in the form of higher taxes and parking charges and greater introduction of traffic calming and automobile free areas(Newman and Kenworthy, 1989).

Another school of thought, however, vigorously disagrees with this increasingly conventional liberal argument and prescription for improvement. Members of this school argue that decentralization is itself the most obvious solution to urban congestion and not a part of the problem. They counter claims of increasing congestion by showing that peak hour travel times among North American commuters are remaining roughly constant, in some cities decreasing over time,



and in others increasing slightly but nowhere dramatically (Gordon, Richardson, and Jun, 1991). This occurs because people leave congested central cities and commute from suburban homes to suburban jobs at much higher speeds on relatively less congested suburban roads. It also occurs because ever more flexible work hours and increased use of computers and telecommuting enable more and more workers to gradually adjust to spreading urban areas by traveling at a wider variety of times and places that avoid congestion and disperse travel volumes. Proponents of this position argue that attempting to concentrate population near transit would be futile, that it will fail for lack of an adequate market of commuters seeking such environments, and that to the extent that it might succeed it would probably worsen traffic congestion by increasingly concentrating trip ends in time and space. They point to technological changes in vehicles that have dramatically reduced air pollution and increased fuel efficiency, and argue that we need not change urban form to eliminate these unpleasant byproducts of increasing motorization. In fact, they argue that changing conditions in the labor market and increasing reliance on telecommunications technology systematically weaken the connection between urban form and transportation (Giuliano, 1995).

My personal view is that this debate is probably unnecessary, and I have - perhaps naively and perhaps out of cowardice or confusion - refused to take one side or the other. The automobile, telephone, radio, and later computers and other forms of information processing have all facilitated suburbanization, and the lowering of densities has occurred to levels well below those that were envisioned by the planners at the turn of the century. The neotraditionalists would like us to increase densities to the point that public transit might begin to again be viable and mixed use communities might again be sustainable, but certainly not to the overbearing levels typical of the central city of 1850 to 1900. In fact, the lower densities sought by planners in 1910 were actually higher than the higher densities sought by planners in 1998, as we continue to seek some holy grail or golden mean consisting of sufficient density to create a stimulating and diverse urban environment in which public transit is a viable transportation option while not so dense as to cause crowding, traffic congestion, and various forms of contagion.

We don't really know what this golden mean is - what is an optimal urban density; yet we have divided ourselves most unproductively into armed camps. One camp believes that the automobile is an unmitigated evil, polluting the air and consuming energy and encouraging sprawl. The other group believes that the automobile is the fullest expression of the best of capitalist society, providing freedom of choice with respect to travel and living environments.

We often stage debates between these perspectives, and there are books arguing that one future is better than another and ought to be pursued with vigor. I myself remain confused and indecisive. I cannot with any confidence offer any

pronouncements as to whether future changes in urban form can substantially contribute to urban livability or reduced traffic congestion. I am not certain that increased density is either good or bad. I can, I think, predict with some certainty that the trend toward lower densities overall will continue as a general trend in North America, and probably even more so in other countries, with the greatest changes still ahead in developing countries where motorization is proceeding at the fastest rate.

Empirically, it would appear that by increasing the density of residential and commercial activities in an urban area we do indeed reduce the number of daily automobile trips per household, as people rely more upon transit and walking and other modes. But, it would appear that over a reasonable range of densities, a doubling of residential density can yield something like a 15 percent reduction in daily trip generation per household. But, of course, while doubling the number of households reduces trips per household, it increases the number of households per square kilometer, so that total travel increases. Downtown New York produces far more vehicle trips per unit of area than does any low density suburb. Yet many planners and theorists urge us to densify our communities in order to have lower travel rates per household, while tolerating higher congestion levels per square kilometer because of the larger number of households.

On the other hand some other analysts argue that the best way to reduce traffic congestion in our communities is to reduce density. If a community has only six or eight dwelling units per acre, it obviously will produce fewer trips per acre than one that has 20 or 30 dwelling units per acre, so to improve the quality of community life, it could be argued that we should build at lower densities. It is argued that people don't want to live at New York densities, and we should build many more low and moderate density suburbs in order to allow larger numbers of people to live in less traffic-impacted communities, even though the consequence of this is to cover a larger proportion of the land area with lower-density communities and thus to undoubtedly encourage more travel in total though less per unit of area.

Which approach is better? While the neotraditionalists argue for higher density and transit-oriented development, and their critics insist that most people like less-congested communities and prefer low-density suburbs, which in any case do not really increase the generation of traffic. While a spirited debate takes place over these issues, I stand back and ask whether it's worth debating about at all in the abstract. I see a future with more variety - in fact more of each of these choices and many others as both inevitable and desirable. I have seen several efforts to lower allowable densities in some communities in order to reduce traffic congestion, while other communities, most notably Portland, Oregon, are constructing urban limit lines in order to force higher densities within certain

boundaries in order to reduce traffic congestion. Critics of each of these approaches rage and rail against one another.

Yet, transportation planning in North America is largely carried out at the regional level, and land use is largely regulated at the local or municipal level. Though transport and land use are functionally interdependent, for the most part we find it difficult to orchestrate them so that they are determined in concert with one another. Transportation planners, in reality, have little influence over local land use and still plan in a reactive mode in response to local decisions about land use.

While these debates take place, North Americans have created a society in which there are more registered cars per licensed driver than any other in the world, and we also spend more public money on transit per rider served than any country in the world, and while we are probably the most mobile society that has ever existed, we do still have people who lack health care or employment or educational opportunities for lack of access. To me, the inability of some elderly people to get to health care, the inability of many people to search for work beyond their neighborhoods because of the cost of time and travel, and the frustration that parents face because they have to drive their children everywhere are more important social issues than the physical forms of our cities or the levels of traffic congestion on particular streets. While these issues are not entirely independent of urban form, they are also not exclusively the result of urban form either, and their solutions can be found in many approaches and strategies that reach beyond urban form.

Suppose it is now 2050, and we are looking back from that vantage point on the year 1998, asking what changes occurred between 1998 and 2050 in the relationship between travel and urban form. I believe that in the year 2050, North American society and its transportation planners will simply not consider the relationship between urban form and travel to be as significant as we do today. Those issues will have become over time increasingly uncoupled from one another. The debates we are having now might be an interesting footnote in a history book, but looking back on these current debates and on the communities that we are creating from the perspective of 50 years in the future, I believe that we will hardly remember that this debate ever took place.

Because the population will have continued to grow between 1998 and 2050, metropolitan areas in North America will be much larger than they are today. Much of California, for example, will be to some extent urban. The differentiation between urban, suburban, and rural will, however, be far less pronounced than it is today. We will have in general larger urban regions but they will be less intensely developed than they are today - except for nodes of dense development that exist for cultural reasons to satisfy the demands of people who choose to live at and work

at higher densities. But the quality of life, the nature of daily living and the travel patterns of families will be more varied from household to household than they are today, and less associated with population density or land use density. Because we will communicate with one another in so many ways over so many parts of the world, we will find ourselves working at different hours from one another, and the work different people do will be fundamentally different in time and location; we will work at home and in offices and in factories, and we will work in the morning or afternoon or evening. We will travel at a wider variety of times, and our travel will be more broadly distributed in space and time, and that dispersion of travel in both space and time will be one of the major factors that will allow us to manage an enormous increase in travel volumes without an enormous increase in congestion.

People who in 1998 believe that we cannot sustain increased motorization without choking ourselves on congestion and air pollution will have been proven wrong because we will travel at a wider variety of times and places and, even though we will travel more, we will not all be competing for limited transportation capacity at the same hours of the day. Greater transportation capacity through automation of transport facilities and the use of communications technology will also contribute to broader ranges of choices in how we communicate with one another and travel to and interact with one another. Less air pollution and greater energy efficiency will continue to be to a far greater extent the result of changes in technology rather than the result of changes in urban form, and people won't even associate those issues with urban form; nor will they remember that anyone ever did. Urban form will be less of a determinant of travel and human interaction than ever, and that greater independence will allow for a greater variety of urban forms as a reflection more of tastes and historical differences among cities and differences in climate in industrial mixes rather than of transportation technologies.

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