Transportation Demands of the 21st Century: A Look to the Future - Possible Paths Forward

MIAMI-DADE MPO
Metropolitan Planning Organization

CUTR
CENTER FOR URBAN TRANSPORTATION RESEARCH

Transportation Demands of the 21st Century: A Look to the Future - Possible Paths Forward

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Introduction

This document, produced by the USF Center for Urban Transportation Research for the Miami-Dade Metropolitan Planning Organization, first presents an overview of the strategic issues that will be shaping transportation policies and programs in the future. The overview is, by necessity, a summary of key issues and only scratches the surface of the myriad issues that impact transportation policies and programs. The goal is to characterize the existing context and anticipated changes with the intention of helping to shape possible paths forward. An appendix, "A Transportation Data Profile," helps set the context by presenting a data profile of Miami-Dade. A separate Executive Summary also is provided.

The context discussion is followed by sections that explore what other localities are doing and the strategies and possible paths forward for Miami-Dade.

The Context

Over the past several decades, planners and policy makers have come to appreciate the significance of transportation on virtually all aspects of quality of life. This more holistic understanding of transportation impacts has led to a far more complex process for transportation planning and decision making. As planners strive to address the full range of considerations and impacts associated with transportation decisions, it has dramatically complicated the process of planning and decision making for transportation. More factors are considered, and more stakeholders are involved. One unintended consequence of these good intentions has been the increasing difficulty in reaching consensus regarding investment and policy decisions for transportation. The increasingly-complex process is facing something of a "perfect storm," with numerous issues converging to create the most dynamic and perhaps most challenging time for transportation policy making in the past several decades.

Among critical issues that are shaping transportation policy are the following:

- expectations of growing travel demand in areas predicted to see continuing growth,
- evolving attitudes regarding the role of autos and the symbolism of auto ownership,
- growing appreciation of the importance of quality transportation to economic competitiveness domestically and internationally,
- recognition of the importance of transportation spending on individual and business budgets,
- short-term energy price spikes and long-term concerns of energy availability and cost,
- concerns about climate change and air quality,
- dramatic increases in infrastructure costs and the prospect of renewed price pressure on commodities critical to infrastructure repair and expansion,
- an aging population and the prospect of greater demands on publicly-provided mobility options,
- ongoing concerns about transportation safety and security,

- dramatic changes in technologies, impacting the costs and performance of various elements/modes of the transportation system,
- a growing awareness of the relationship between transportation and land use and growing interest in leveraging that relationship,
- a recognition that existing revenue sources are inadequate to meet needs, yet tremendous competition for resources and limited public and political resolve to increase taxes or fees for additional revenues for transportation, and
- a new political era with a new administration and pending major reauthorization of the federal transportation legislation – conditions that are expected to lead to a thorough evaluation of jurisdictional roles, transportation spending priorities, and perhaps the means of collecting transportation resources.

Fundamental Goals for Transportation

Planners and the public have realized that transportation impacts numerous aspects of the quality of life. Transportation has been appropriately associated with everything from access to employment and economic opportunity to the availability of healthcare services to the environmental and social impacts on communities. More recently, transportation has become a central element in discussions of climate change. An appreciation of the comprehensive impacts of transportation, while leading to a more holistic framework for decision making, also has served to compound the complexity and, hence, difficulty in reaching decisions.

Perhaps what most epitomizes the conflicting goals for transportation are the current desires to provide the mobility that enables economic competitiveness and personal freedom and opportunity while simultaneously striving to minimize the amount of travel to lessen its impact on energy

Year 2010 Metro-Dade Transportation Plan Goal

Provide for safe, efficient, economical, attractive and integrated transportation system that offers convenient, accessible and affordable mobility for all people and for all goods, conserves energy, and protects both the natural and social environment.

Metropolitan Planning Organization, November 1990

Year 2035 Long Range Transportation Plan Goals

The Miami-Dade Long Range Transportation Plan goals and objectives adopted by the MPO Board:

- Improve Transportation Systems and Travel
- Increase the Safety of the Transportation System for Motorized and Non-motorized Users
- Increase the Security of the Transportation System for Motorized and Non-motorized Users
- Support Economic Vitality
- Protect and Preserve the Environment and Quality of Life and Promote Energy Conservation
- Enhance the Integration and Connectivity of the Transportation System, Across and Between Modes, for People and Freight
- Optimize Sound Investment Strategies for System Improvement and Management/Operation
- Maximize and Preserve the Existing Transportation System

Miami-Dade Metropolitan Planning Organization, September 2008

consumption, air-quality, and climate change. Miami-Dade is not immune to this challenge. The goals for the Miami-Dade 2035 LRP clearly call for the community to design transportation services and investments that both improve travel and minimize environmental consequences. While strategies to support alternative modes, influence development patterns, and optimize performance of transportation systems are consistent with both goals, there remains a clear and undeniable fundamental conflict between initiatives to enhance mobility versus those more directly targeted to minimizing travel.

The more goals are perceived to be competing, the more difficult it is to build a consensus for action. Positions are highly polarized in many urban areas, with some share of the public believing that transportation funds should be focused to support a widely-demonstrated need for additional roadway capacity and another share critical of any or many investments to expand roadway capacity. This constituency is comfortable using congestion as a tool in minimizing travel, with the expectation that this will ultimately force behavior changes. Intransigence in either of these positions can impede the ability to move forward on projects that might fall between the extremes of these positions. If a modest share of stakeholders hold views exclusively in concert with one of the competing goals, it can be sufficient to impede progress, delay projects, and produce litigation.

A second major goal conflict that significantly challenges transportation planning is the desire to be effective and efficient with investments while still being equitable in the return of taxpayer funds for transportation projects. Thus, quantitative or even qualitative measures of project merit are compared to the very human desire to see program benefits distributed in some proportion to how the resources paying for them were collected or how the political power is distributed. For some program areas where needs are proportioned approximately equal to revenue collections, this is not a problem; but for more specialized transportation programs, the nature of investment is not conducive to allocation in proportion to fuel tax, sales tax, or other revenue collection mechanisms. Major high capital cost elements are not easily or appropriately applied to all locations, and efforts to do so can result in very suboptimal performance. Not every corridor needs a freeway interchange or rail line. There are winners and losers, and resource programming that is driven by narrowly-defined measures of equity or political clout can seriously compromise effectiveness goals.

Accommodating this situation within the planning process can be particularly challenging. An already-cynical public is quick to fault planners and decision makers without appreciating the challenges implicit in the current transportation planning environment. The extremely broad and sometimes conflicting goals can create a situation that calls to mind the old proverb that

cautions, "He who begins too much accomplishes little." Planners and decision makers need to exercise caution or risk their transportation resources being so influenced by the plethora of sometimes competing goals that they risk consuming significant time, and resources on investments that strive to satisfy various constituencies but, by diluting the focus, provide very modest transportation benefits.

> *"He who begins too much accomplishes little."*
> Old German Proverb

Growing Travel Demand

Travel demand is influenced by the amount of travel each person carries out and the number of persons. Travel is fundamental to the human desire to interact for social and economic benefit. The desire to travel to socialize continues as it has through the history of mankind. Similarly, travel to enable economic interaction and the transportation of products continues. Growth in knowledge and personal income fuel a desire for specialization in consumption, employment, and social interaction – each creating desires for continued and perhaps more travel.

The geographic specialization of labor and production aided by enhanced communications technologies has created a strong interdependency across geography. This interdependency creates travel demand. Be it importing fresh seasonal produce from the Southern hemisphere or sending a child to a magnet school across town, the dispersion and specialization of people and economic activity create demands for travel and commerce. Absent significant economic upheaval, these conditions are likely to continue to create travel demand and, to the extent that economic growth continues here and abroad, the trends are likely to continue to create pressure for more travel and commerce per person.

Population growth also is forecast to continue. The U.S. is expected to continue to grow far faster than most developed and many developing countries. While the current economic downturn has slowed Florida's growth, the experts expect natural population growth and the fundamental appeal of climate and opportunity to continue to create population growth for Florida. The Bureau of Economic and Business Research predicts Florida's total population will grow by 37 percent from 2007 to in excess of 25 million by 2030. Miami-Dade County is forecast to continue to grow, reaching over 3 million by 2030.

> *"…absent an unprecedented change in the area's and country's economic health, it will still be necessary to plan for growing travel demand."*

Table 1 itemizes factors that will be impacting future travel demands. Transportation needs may grow more modestly in the future than in the past; however, absent an unprecedented change in economic health, it will be necessary to plan for growing travel demand. Socio-demographic conditions, technology, and environmental and other factors are likely to influence the magnitude and nature of that growth in demand and how policy makers and the public choose to accommodate the growth. Table 2 addresses factors that may influence the choice of mode of travelers.

Table 1 Future Travel Demand and Potential Impacts on Miami-Dade

Growth Factors	*Moderation Factors*
Person Travel	
• *Natural population growth* • *Weather and quality of life attraction for immigration* • *Prospect of enhance immigration from Cuba, Caribbean/Latin America* • *Historic income growth* • *Regionalization of travel patterns*	• *Declining relative affordability of Florida slowing immigration* • *Aging population moderating demand* • *Prospect of slowing personal income growth* • *Stabilization of labor force participation* • *Congestion and energy costs dampening travel demand* • *Carbon cap-and-trade or other costs impacting travel affordability* • *High auto availability and use lessen the prospect of a shift to auto travel as a source of new roadway travel demand*
Tourist and Visitor Travel	
• *Growing U.S. and global population* • *Strong appeal as international city*	• *Energy-driven increases in cost of long-distance travel* • *Potentially less favorable exchange rates* • *Global competition for tourists and visitors*
Freight/Truck Travel	
• *Enhanced reputation as critical shipping portal to U.S.* • *Freight volume growth from Panama Canal widening* • *Freight volume growth from improved relations with Cuba*	• *Moderating freight demand growth due to energy prices* • *Declining manufactured goods consumption due to personal, government, and business spending capacity (debt)* • *Slowing of globalization trends due to energy costs and political attitudes*

Table 2 Future Conditions Influencing Mode Choice

Favoring Auto Travel	*Favoring Auto Alternatives*
Person Travel	
• *Historic real income growth favors personal vehicle.* • *Growing availability of low-cost imported vehicles.* • *Improved vehicle fuel efficiency.*	• *Growing auto ownership costs due to climate change legislation, higher fuel costs, or pricing policies may discourage auto use.* • *Aging population and free transit for seniors may encouraging transit use.* • *Growing public support for auto alternatives for environmental, health, or other quality-of-life considerations may encourage transit and other alternative use.* • *Growing investment in auto alternatives at federal, state, and local levels may encouraging transit and other alternative use.*

Transportation System Performance and Economic Competitiveness

The *2009 Urban Mobility Report* ranked Miami-Dade as the 11th most congested large urban area in America based on travel delay per traveler. Political and business leaders from jurisdictions across the country frequently articulate the need to address mobility problems in order to remain competitive in attracting businesses and residents. Remaining competitive in terms of mobility or accessibility is challenging, as there is no consensus on exactly what constitutes competitive mobility. Congestion has been characterized as the situation where someone with the freedom, desire and means to travel gets in the way of someone else with the freedom, desire and means to travel. While congestion can be a deterrent to travel and a drag on business and personal productivity, it also symbolizes a robust economy and is a signal that people and businesses so strongly desire to participate in social or business activities in a given location that they are willing to tolerate the time and money costs of travel to satisfy those desires. But ultimately, people and businesses will choose other locations to carry out their activities if the travel time costs are too high.

> ***Congestion:***
> *The situation in which someone with the freedom, desire, and means to travel gets in the way of someone else with the freedom, desire, and means to travel.*

Frustrations with travel result if the distance and speed of travel and the reliability, convenience, and perhaps the range of choices for carrying out that travel are not satisfactory. The ability and willingness to invest in a transportation system, the productivity of those investments, geography and topography, governance, and personal travel preferences are among the factors that influence the performance of the transportation system. Ultimately, urban areas make tradeoffs between the levels of congestion they are willing to tolerate versus their willingness to incur the financial costs and the environmental or other impacts associated with expanding transportation capacity.

Historically, travelers have increasingly valued their time more highly and made accommodations to travel faster to save time. Greater reliance on higher-classification roads (freeways and expressways), shifts of travel to less-congested off-peak times, and shifts from slower modes of travel (walk, bike, shared ride, and transit) to generally faster modes of travel (drive alone) have enabled travel speeds to increase over the past few decades. During the past decade, more travelers appear to have exhausted their ability to ameliorate the fact that the roadway system is increasingly congested. Thus, the shortage of increases in transportation capacity relative to the increases in travel demand is now resulting in deteriorating travel speeds in most urban areas. As one might expect, congestion levels increase most rapidly for those areas where the mismatch in growth in travel demand and system capacity is greatest.

Increasing congestion in an area such as Miami-Dade is not necessarily indicative of declining urban mobility competitiveness, as virtually all urban areas have experienced increasing congestion. Miami-Dade's competitiveness is impacted only if its mobility deteriorates faster than in competing areas. Data from the Texas Transportation Institute (TTI) indicate that the change in congestion levels in Miami also ranked it 11th in the country for metro areas. Its deterioration in roadway performance tied it with the increases in congestion in New York and San Francisco.

The 2009 Urban Mobility Report ranked Miami-Dade as the 11th most congested large urban area in America based on travel delay per traveler.

Increasing congestion is a cost of travel for persons and businesses, and this cost should influence the willingness to invest in transportation. Theoretically, when the cost of congestion becomes sufficiently onerous relative to the reluctance to invest more resources on capacity improvements, then there will be a willingness to increase investment in capacity or performance. Unfortunately, the lag time for travelers to feel the consequences of underinvestment in transportation may result in a period of time where travelers are frustrated with the system's inability to instantly respond to their willingness to reduce congestion. Part of the challenge of transportation planning is to inform the public of the consequences of today's decisions such that travelers will be able to avoid intolerable congestion levels.

The challenges of avoiding increasing congestion in Miami-Dade are perhaps more complex than in some other urban areas, as the geographic extent of the developed area is constrained and the availability of right-of-way to add new transportation capacity is highly limited. Thus, accommodating growth at the fringe of the urban area is less viable than in areas like Dallas and Atlanta, where peripheral roadway capacity can be implemented and less dense urban development may enable lower cost capacity expansion of the existing transportation network.

Tactics to minimize deterioration in comparative mobility might include the following:

- Monitor transportation system performance change versus peer cities.
- Explore operations initiatives to increase capacity with strategies that minimize the requirements for additional right-of-way or major infrastructure:

- ✓ Enhance roadway operational performance with intelligent transportation system initiatives.
- ✓ Provide choices that enable persons sensitive to congestion to minimize it via priced higher-speed lane options.
- ✓ Use travel demand strategies and full-cost pricing to moderate the amount, timing and locations of travel.

- Expand new capacity where necessary and possible:
  - ✓ Provide transit capacity via guideway and priority treatment options that provide travel speeds that will be insulated from the impacts of deteriorating roadway travel speeds.
  - ✓ Expand roadway capacity through innovative strategies such as elevated lanes and revisited design standards.
- Support a land use pattern that enables many trips purposes to be accommodated by shorter local trips, thus minimizing the consequences of slower speeds.

This menu of strategies illustrates the classic responses to congestion and supplements it with a few evolving strategies such as pricing and technology applications.

Infrastructure Cost and Affordability

Part of the transportation challenge facing urban areas is the fact that the cost of transportation infrastructure has increased significantly in real terms. The Producer Price Index for Streets and Highways, a measure of the cost of building roads and streets, has significantly outpaced the overall cost of living increases over the past several years. As shown in Figure 1, construction costs had been inflating less rapidly than the overall economy up until approximately 2000. Since that time, there has been a dramatic increase in construction costs resulting in a situation where the real cost of transportation infrastructure is significantly higher than previously. Thus, a dollar of transportation revenues today will not purchase nearly as much transportation capacity as a decade ago.

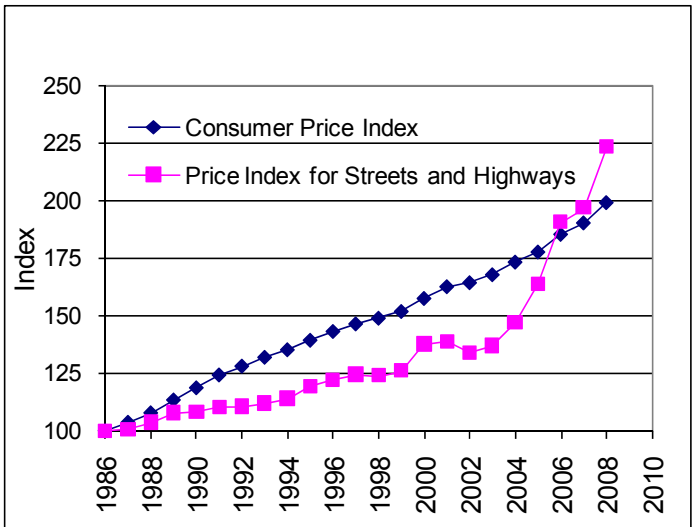


Figure 1 Comparisons of U.S. Transportation Construction Costs vs. Overall inflation

This trend, led by global competition for commodities, higher energy costs, and competition for the workforce, is reversing somewhat in a period of slow economic growth; however, experts predict continued competition for commodities and do not expect infrastructure costs to return to the relative levels that existed in the 1990s. In addition to the fact that asphalt, concrete, steel,

and the equipment, energy, and labor necessary to build transportation infrastructure have increased, other factors also have served to increase the cost of providing transportation capacity beyond those reflected in the comparisons of cost indices. Among these other factors are items such as:

- a shift from rural to more expensive urban design standards for a larger share of new projects, as urban growth and congestion are critical needs,
- more and better maintenance-of-traffic investments as congested roadways are rebuilt and expanded,
- more technology in infrastructure projects such as electronic toll collection, camera monitoring of traffic, and computer-coordinated signals,
- higher cost right-of-way in congested urban environments,
- more mitigation investments as we build in denser urban environments, and
- higher amenity levels required to build consensus for projects.

In Miami-Dade County, the combined local state and federal fuel tax is $0.46 per gallon of gasoline. For this revenue source to have the same purchasing power as 5 to 10 years ago would require an increase of approximately 50 percent, or more than $0.25 per gallon. This would simply restore the buying power in terms of actual construction costs. Further increases would be required to compensate for the other factors shown in bullets above.

The collective impact of these trends has been an inability to repair and expand transportation infrastructure at nearly the rate that was previously possible - and even that was nowhere close to keeping up with the growth in demand. There was not the political or public will to expand resource commitments to transportation at a rate that would keep up with growth in demand and costs. The result is a system increasingly stressed with high travel demand.

While increased use of toll roads, sales, and other taxes used to support transit, impact fees, and concurrency and developer contributions all are part of the overall transportation system revenue streams, the composite impact remains one of limited resources relative to identified needs.

Resource Requirements of a Multimodal Transportation System

A number of conditions are collectively creating a desire to expand the service levels and use of public transportation in urban areas as a desirable means of meeting mobility needs. Motivations for this thinking include:

- serious constraints on the ability to expand roadway capacity, particularly in denser urban areas like Miami-Dade County,
- concerns about the environmental impacts, including possible impacts on climate change associated with continued strong reliance on personal vehicles,
- concerns about affordability of fuel for auto-dependent mobility, particularly for persons with modest incomes, and

- a strong desire to have alternative travel options available for seniors, tourists, and others who might benefit from an alternative means of travel.

Implicit in this interest is the expectation that total benefits relative to costs of public transportation services exceed those for additional investment in roadway transportation capacity. However, the fundamental cost structure of public transportation is significantly different than for private transportation. In personal vehicle travel (auto travel), public investment is limited to the provision and operation of the roadway system funded through user fees. The provision of the roadways, while expensive, constitutes a relatively small share of the total cost of traveling by auto. For auto travel, the individual purchases, maintains, stores/parks, insures, and operates the vehicle. Only a small share of the cost of fuel, the fuel taxes, is routed through the public sector to build the roadway system. The total cost to the traveler of federal, state, and local fuel taxes averages the equivalent of approximately $0.02-$0.03 per vehicle mile of travel on the roadway system.

The fundamental cost structure of public transportation is different. The vehicles are owned and operated, insured, stored, and maintained by the public sector with public sector resources, and for guideway/rail systems, the guideway and supporting facilities also are provided by the public sector. The public transportation users' direct contribution to the cost of service is the fares they pay. Transit fares constitute a modest share of operating costs (approximately 30% nationwide and approximately 20% in Florida) and none of the capital costs. Table 3 itemizes Miami-Dade public transportation costs.

Table 3 Miami-Dade Transit Summary Statistics, 2008

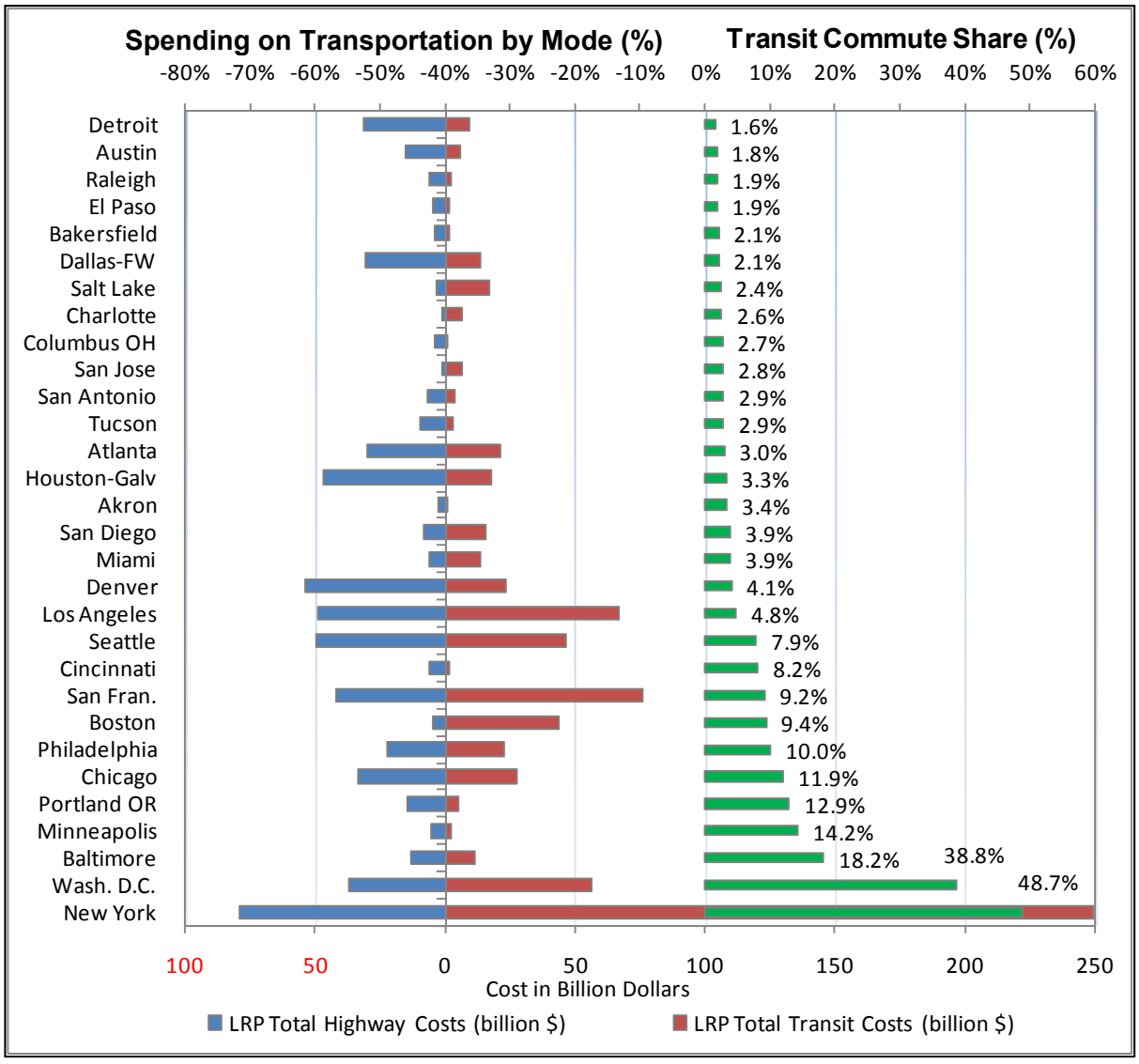
Passenger Miles	577.1m
Total Capital Expense	$180.8m
Total Operating Expense	$582.2m
Fare and Earned Revenues	$84.6m
Government expenditures/passenger mile	$0.997

Source: 2008 NTD data compiled for FDOT

The impact of these fundamental differences in cost structure for auto and public transit lies in the fact that public transit requires a dramatically larger share of the total cost of providing service be routed through government coffers. Public transportation's competitive position is such that it is unable to price per-trip fare costs in such a manner as to provide a high share of total costs directly from passengers. This is partially the result of the fact that auto ownership and operating costs are largely driven by high fixed costs associated with owning the vehicle. This causes subsequent mode choice decisions by auto owners to strongly favor auto use, as the marginal cost for an additional auto trip is very modest. The consequence of these fundamental mode-specific cost structure differences is that policy decisions to expand the role of public transportation in an urban area will require significant increases in publicly-collected resources in order to provide those services. A household that can use transit and might be able to reduce its auto ownership costs (perhaps selling one or

more vehicles) would be able to more than recoup the additional taxes to support the transit service expansion. However, the majority of households that could not reduce auto ownership or use significantly would have higher transportation costs.

It is not uncommon in some urban areas to have a large share or the majority of transportation expenditures programmed to provide public transportation services. Figure 2 reports data on several urban areas and shows the share of their long-range plan resources directed to the roadway and public transportation systems. As one can see by carefully studying the graph, the proportions of spending are not proportional to the share of travel on the various modes – not even for work trips, the most common transit trip type.



Source: Data from David T. Hartgen, Ph.D., P.E., and M. Gregory Fields, *Building Roads to Reduce Traffic Congestion in America's Cities: How Much and at What Cost?* August 2006. Graphic by CUTR.

Figure 2 Transportation Spending and Commute Mode Share for Select Urban Areas

This consequence is a logical result of the different cost structures. Urban areas aspiring to a meaningful increase in transit use must recognize that it will require a meaningful increase in public resources directed to the provision of public transportation infrastructure and services. Ultimately, this may enable lower auto ownership and use costs for residents and other indirect savings and benefits if transit is able to support denser development and produce other travel time and energy savings.

The Transportation - Land Use Connection

Perhaps the most pervasive topic of interest in transportation planning is that of the coordination of transportation and land use. Coordination of transportation and land use dates back over a century with some of the earliest developers building road and rail infrastructure as an integral element of an overall plan to stimulate land development. Transportation and land use coordination is increasingly seen as a potential tool to address transportation needs. The motivation from a transportation perspective is to leverage the fact that higher density development generates measurably less travel per person due to the fact that higher density development reduces trip lengths and enables alternative modes (bike, walk and transit) to be viable options to auto travel.

Several urban areas have carried out broad-based initiatives to explore longer range regional development scenarios and evaluate the transportation infrastructure as well as other impacts of these alternative development scenarios. For example, Tampa, Orlando, Minneapolis, Oregon, Salt Lake City, and others have carried out initiates to involve the public in developing an integrated future land use/ transportation plan. These initiatives serve to quantify and communicate the consequences of alternative development patterns and provide the information base on which policy issues can be debated.

The Miami metropolitan area is ranked as having high degrees of dispersion and decentralization. Central business district employment constitutes 7.5 percent of regional

employment, with 77.5 percent of employment classified as dispersed.[1] These conditions are among those that make it challenging to provide efficient public transit options and reinforce the logic of concentrating new activities along priority corridors in order to make alternative modes more competitive. The limited availability of developable land constrains the development options in Miami-Dade County such that densification of developed areas is implicit if population continues to grow as expected.

The theory of transportation and land use coordination suggests that the desire for accessibility will result in future development choosing to locate in proximity to available transportation capacity. As such, decisions on where to provide transportation capacity are expected to subsequently influence additional development to occur in proximity. However, access by other modes, jurisdictional boundaries, vistas, image, safety, zoning, and numerous other factors also influence the location of development.

Miami-Dade County has a potential advantage in leveraging the relationship between transportation and land use in that land use control and transportation infrastructure provision are both governed and significantly influenced by the same governmental entity – theoretically enabling close coordination. However, using transportation to influence land use is made more difficult if resource commitments to transportation are lagging needs to the point that transportation capacity investment is reactive rather than proactive – responding to existing critical needs rather than shaping future development. Thus, a deficit of resources compromises an area's ability to be proactive in using transportation investments to influence land use.

Energy and Technology Change

Energy consumption and carbon emissions are destined to be critical to transportation in the future. Price and availability of energy, climate change, energy independence, and the uncertainty of fuel pricing and availability are expected to be critical concerns over the next 50 years as transportation transitions from predominant reliance on internal combustion engines to alternative and probably more diverse fuels. Several fundamental principles will impact transportation planning:

1. Historic modal efficiencies are not important. Future investment decisions should be based on expected future modal efficiencies.
2. Future modal efficiencies are affected by several factors. The massive market for personal vehicles provides motivations for dramatic investment for change in this mode. The life

[1]Bumsoo Lee, "Urban Spatial Structure, Commuting, and Growth in U.S. Metropolitan Areas," Table 2-5, Employment shares by location type by the GWR procedure, Ph.D. dissertation, University of Southern California, December 2006, p. 25.

cycle of autos is shorter, enabling new technologies to get in service faster. Fleet modes such as buses have centralized operating facilities that might be better able to accommodate new fueling technologies.

3. The efficiencies of each mode are highly dependent on how well the capacity is used in the mode. High-capacity modes such as transit currently have the potential to be more efficient, depending on how well they are used. The challenge for transit modes is to average large loads over all times of the day and in both peak and off-peak directions of travel.
4. Efficiencies can by attained by fundamental improvements in propulsion efficiencies as well as by resizing/scaling the technology and service to more closely match the market demands. Households are likely to move toward vehicle specialization; small, light, perhaps single-person vehicles for many urban trips and larger multi-passenger vehicles for group travel or longer distance trips. It remains less clear how quickly transit and rail technologies might be able to adapt vehicle size and weight to closely match market needs and complement propulsion technology changes. Longer vehicle lives impact the pace of propulsion efficiency changes, and the need to accommodate peak loads may impact the ability to resize transit vehicles for savings. Adjusting frequencies and train lengths can improve attained efficiencies.

Table 4 Transit Mode Average Occupancies

	National Average	*Miami-Dade Average*
Automated Guideway	6.77	9.32
Vanpool	6.08	6.9
Motor Bus	10.55	10.18
Heavy Rail	25.27	15.62
Commuter Rail	37.52	40.88 (Tri-Rail)

Source: 2007 National Transit Data Base, Miami-Dade MPO

5. Technologies with longer life capital elements or systems elements that deter incremental change could fare more poorly in the march to energy efficiency. Autos and buses have relatively short life cycles, modest capital costs, and autonomous vehicles independent from the guideway; thus, they can enable relatively rapid integration of state-of-the-art technologies. Longer-lived vehicles such as trains are less able to have new technologies produce near-term impacts on overall modal efficiencies. Modes where the vehicle and guideways are integrated systems may be more difficult or expensive to upgrade to newer more efficient technologies.
6. Fair evaluations of efficiencies need to include the full door-to-door trip and both operating and supportive infrastructure energy use. This includes the role of feeder modes, the energy use for infrastructure construction, and the circuitousness of travel inherent in the nature of the mode.
7. Indirect energy impacts of modes need to be considered as well. Urban guideway investments may influence land use in such a way that the overall energy savings benefit goes beyond the relative modal efficiencies, the argument being that rail can induce persons to live in locations where they have shorter trips, more walking, and more transit trips, thus

reducing overall energy use. If this impact can be realized for new projects, it merits inclusion in modal efficiency evaluations.

8. Future efficiencies of travel modes will be very dependent on how well consumers accept and how intensively they use a mode's capacity. The use of each mode is highly relevant to the overall efficiency calculations of future investments. Average auto occupancy is now 1.6, meaning that 2-3 seats are vacant and can accommodate additional passengers or the vehicle can be downsized. Urban buses average about 11 passengers nationally per vehicle in vehicles that can accommodate 40 or more passengers. Different modes have different attainable occupancies. Autos never have empty reverse commute trips or unproductive mileage to and from the beginning of the route. Multi-stop scheduled modes such as the many bus and rail services with off-peak and off-direction travel cannot be expected to have as high of occupancies as point-to-point modes such as express buses.
9. The implementation pace and the energy, environmental, safety, and other impacts of evolving modes and vehicles remain to be fully evaluated. Early evidence suggests that electric and hybrid vehicles, if deployed with characteristics that are attractive to the public, will offer substantial energy and air quality/green house gas emissions benefits.

Chevy Volt Electric Hybrid

The burgeoning interest in an environmentally-sustainable transportation system has to factor in the changes coming in transportation technology, the empirical performance of the various modes, and the objective prospect of changes in public acceptance of various modes and mode features.

Money, Money, Money

Carbon credits are among the possible revenue sources for alternative transportation.

The human tendency is to fantasize about wishes and needs, often conjuring up strong rationalizations as to why one needs or deserves a particular item. As it relates to transportation, people are good at identifying a variety of needs. People envy something implemented in another city, argue about receiving their fair share of revenues, and are quick to cite the time-honored stimulus effect of spending on transportation. People rationalize the inevitability of future demand growth to justify future projects and cite compelling analytic information about unmet needs. The reality of

congestion confirms the need for more capacity to even the most jaded cynic of technical studies and gives credence to long lists of well-intended projects.

The greatest transportation planning challenge is carefully differentiating between compelling needs and wish lists. The line between vision and fantasy can become clouded, even for those with the best of intentions.

In the 1960s, the military industrial complex was characterized as never having conceptualized a weapons system that was not critical to national security, the Army Corps of Engineers was characterized as never finding a river that did not need a dam, and highway departments were criticized for believing the solution to every problem was another lane. Transportation planning must heed these lessons and more carefully test the prudence of transportation plans against the public will. Plans must have sound assumptions with respect to three key elements of human behavior that will influence the success of transportation plans:

1. Is the plan consistent with the public's willingness to pay?
2. Is the plan consistent with revealed travel behavior – i.e., is the public likely to use the facility or service as much as planned, given the probably conditions that will exist?
3. Is the public willing to change residential location or business location preferences if assumed in the demographic assumptions that underlie the plan?

If the public is well informed, then the truest measure of the reasonableness of transportation needs is the consistency between the stated needs and the public's willingness to financially support the plan. Of course, this simple statement is complicated by the complex nature of how transportation is funded by multiple levels of government and the private sector.

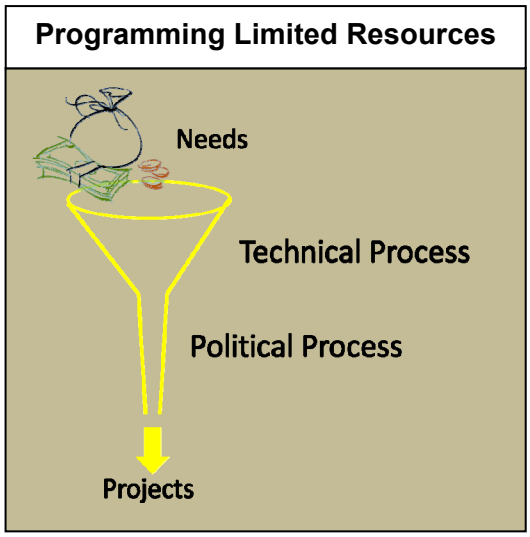
The greatest transportation planning challenge is carefully differentiating between compelling needs and wish lists. The line between vision and fantasy can become clouded even for those with the best of intentions.

Perhaps one of the prognostications about the future that is highly certain is that resources will be limited and competition for them will be fierce. This reality is coupled with extreme degrees of uncertainly that currently face transportation funding, including:

- weakness in revenue growth for traditional funding sources including gas taxes, sales taxes, and property taxes,
- recognition of the need to eventually transition from fuel-tax-based transportation trust funds, as vehicle efficiencies and fuel source changes undermine this traditional revenue source,
- recognition that the current financial climate creates strong competition for public resources and reluctance to increase taxes and fees from travelers,
- uncertainty associated with the pending expiration of current federal transportation legislation and prospects for change based on the mismatch between current programmed spending and revenue streams,
- expectations that climate change concerns and the prospect of carbon taxes or fees will impact transportation and may help fund transportation infrastructure and services,

- personal, business and government debt levels that limit financial flexibility,
- sympathies for infrastructure investment as a possible stimulus strategy for the economy,
- limited private sector contributions through development extractions, concurrency, and impact fees as development slows and may remain slow for an extended period of time, and
- uncertainty regarding privatization opportunities for toll projects, as liquidity is tight and leveraging opportunities far more limited that in the recent past.

The simple schematic to the right portrays the transportation programming process as a funnel that converts resources and needs into programmed projects. The process of selecting which projects are funded and will proceed through the process has both technical and political elements. With constrained resources, the transportation programming process often reverts to one where technical compliance governs entry into the queue and political considerations and funding availability govern the project prioritization process. Among the challenges for urban areas will be determining what basis they want to use to prioritize spending scarce resources.



Yesterday vs. Today - Competing for Federal New Starts Money

- *In 1976, with limited competition, the Federal Transit Administration (FTA, then the Urban Mass Transit Administration) committed 80% of the costs for the first stage of the Metrorail rapid transit system, with the county and state incurring the remaining cost.*
- *Initial costs averaged approximately $45 million per mile for the last new heavy rail system initiated in the U.S.*
- *Federal participation in current rail projects, while variable, is congressionally capped at 60% and averages far less. For example, the Dulles corridor WMATA rail extension is scheduled to receive 17.1% federal funding. Multiyear programs for rail in cities like Dallas and Denver have programmed less than 30% of total funding from federal resources.*
- *In 2009, over 100 Alternatives Analysis studies were under way across the country to look at the prospect of rail or other premium transit. A total of 13communities are in preliminary engineering, 7 are in final design, and 19 currently have full funding agreements for federal participation – a very competitive environment for limited funding.*

A Perspective on Federal New Starts Money Potentially Available for Miami-Dade

- *In 2006, Florida had 2.65% of national transit ridership.*
- *In 2007, Florida had 6.04% of national population.*
- *The 2008 federal "New Starts" appropriation was ~ $1.55B*
- *Based on "transit share," the entire state of Florida's proportionate share of new starts funding would be ~$41 million annually.*
- *Based on "population share," Florida should get ~$93 million annually of the New Starts allocation.*
- *If transit funding is more than doubled in reauthorization as proposed by the American Public Transit Association, these share amounts could increase proportionately, depending on program priorities.*
- *Several Florida metro areas are planning to pursue New Starts funding in the near future.*
- *Short-term political and technical considerations could produce outsized returns but, over time, any urban area or Florida's share will likely revert towards a proportionate share.*
- *What is the likely amount of New Starts funds for Miami-Dade or other Florida urban areas?*

A Path Forward – Recommended Strategies

In light of the context described in the prior section, this section explores the implication in terms of how the planning process might be adapted to accommodate these considerations and what types of initiatives or projects might be most likely to be relevant in this context. This paper has focused on general trends critical to travel behavior and transportation and how they may impact transportation planning in Miami-Dade County. This initiative did not include an intensive review of individual programs or projects or conduct a specific assessment of the state of practice in Miami-Dade County. Thus, the observations that follow are general in nature and designed to encourage the transportation planning community in Miami-Dade to reflect on current activities and practices in the context of the issues raised in this paper. The specifics of how Miami-Dade County could respond to these observations are most appropriately left to the planning professionals in Miami-Dade. Changes may be as subtle as individuals approaching an issue with an enriched understanding of how it might be impacted as time moves forward to consideration of more substantial changes in methods and practices.

How Planning Might Change

Dealing with uncertainty through robustness in planning

In many ways, it appears that the U.S. may be entering a new era in terms of transportation and transportation planning. The last half century was characterized by rapid increases in auto-

availability, continued dispersion of population and employment, the evolution of the interstate era, women joining the workforce, growing overall travel, and declining use of alternative modes as privately-operated autos dominated travel. The planning process was dominated by auto-based planning, with predominant reliance on four-step modeling and development of long-range plans dominated by capacity-expansion initiatives. While methods and priorities changed over time and across urban areas, these fundamental tenets of transportation planning and investment were quite common during this era.

Looking ahead, it appears that we may be entering an era characterized by a different set of factors driving transportation planning. Individual travel levels appear to be stabilizing, with the increases in trip rates and the shifts to auto no longer as likely going forward. Perhaps more significantly, the supply side of transportation planning is likely to be very different, including:

- dramatic changes in infrastructure costs,
- very constrained right-of-way availability for new lower-cost surface transportation capacity,
- greater attention to environmental concerns including climate change,
- the probability of rapidly-varying energy costs underlain by an upward trend, creating uncertainty regarding future travel demand growth and transportation revenues, and
- the prospect of an uncertain global economy, which can impact demands and resource availability.

Glimpses of recent adaptations to these and other trends have included changes in how planning and implementation of transportation services and projects is carried out. Among the changes are:

- a shift toward more complex financial partnerships among various levels of government and the public and private sector,
- a general tendency to be reactive rather than proactive, as resource constraints often result in responding to crises and addressing historical problems rather than being able to preempt future problems or leverage opportunities,
- a shift toward more and larger regional study areas for planning, reflecting the need to accommodate expanding market areas for urban travel as urban areas grow,
- a frustration with the cumbersomeness of a highly-prescribed planning process yet a desire to include the broad range of stakeholders and goals that make it very difficult to minimize the comprehensive, inclusive processes that characterize planning,
- evolution to more aggressive consideration of policy and operational strategies to optimize existing investments – including attempts to move toward more sophisticated activity based modeling and integrated transportation–land use modeling to support policy focused planning,
- a continuing and growing interest in the incidence of impacts of transportation investments and services on population segments including age, race and ethnicity, disability status, income, and geographic jurisdiction, and
- a growing interest in longer-range planning based both on the recognition that major systems often take decades to implement given

planning process, approval, and funding constraints and an admiration of some of the master planning initiatives of Asian and European countries.

Most recently, the presence of a significant power change in Washington, the growing discussion of the federal role in transportation (as happens cyclically near the expiration of federal transportation legislation, next scheduled for September 2009), and the prospects that transportation will be a significant element of energy independence and climate change initiatives over the next several years, reinforce the prospect of precedent setting changes in how transportation planning is carried out. The uncertainty that surrounds transportation is exacerbated by an economic situation that is increasingly compared to the most severe in decades. Competition for scarce financial resources, the challenge that transportation is likely to face in garnering decision-maker attention and even some questioning of the fundamental premise of continued growth in Florida all portend a dynamic and challenging path forward.

The context in which transportation finds itself suggests several characteristics about how a path forward might be defined. The immediate future and most probably the long-term future are likely to be characterized by a great deal of uncertainty, and transportation planning has to be conducted in a manner that acknowledges and deals with that uncertainty. Key elements in such a strategy should accommodate the following:

Acknowledge and adapt to uncertainty in key factors that impact transportation

Funding, travel demand, energy availability and cost, governance, and land-use development are among the key factors that impact transportation and for which there is very credible evidence to suggest there will be a great deal of change and uncertainty in the future. Given this uncertainty it is critical that transportation planning seek robust plans that strive to provide promising performance for a broad range of probable future scenarios. Thus, planning should seek robust solutions whose performance is likely to be beneficial in many or most of the probable future scenarios.[2] Evaluating the robustness of plans will require the ability to test performance under a range of assumptions.

[2] For a more comprehensive discussion of this concept, see Robert J. Lempert et. al, "Shaping the Next One Hundred Years," prepared for the Rand Pardee Center, 2003.

Embrace adaptability to accommodate change

Implicit with change is the need to quickly adapt to take advantage of opportunities. This might include being able to quickly leverage new funding programs that might materialize, quickly respond to changing requirements by having a professional capacity in place, or modifying plans and design features to adapt to cost, right-of-way or other challenges for projects. In terms of projects, adaptability might mean recognizing a travelway may accommodate a variety of modes or technologies over time in both short- and long-term cycles (a rail line handles commuter rail in the peak periods and freight in the off-peak, a corridor accommodated BRT in the near term and rail guideway in the longer term).

The Tampa-Hillsborough County Expressway Authority's elevated, reversible, cantilevered, car-and-bus-only, median-located, electronically-tolled lanes exemplify an innovative transportation investment with minimal right-of–way requirements.

Use innovative strategies governed by careful risk assessment

The current environment begs the consideration of innovative strategies for addressing transportation problems. This might include innovation in every aspect of providing transportation, from planning practices to decision making strategies to funding, procurement, partnering, materials, and delivery strategies. Innovation can stir energy in project teams and identify strategies and methods that might be viable or competitive given the circumstances that currently exist. Elements as fundamental as design standards might benefit from reconsideration in light of evolving conditions. Readily-available literature and case studies document innovative initiatives under way across the country, and Miami-Dade has been active in innovative congestion-mitigating initiatives.

Often, the constraints of limited resources and critical conditions can create opportunities to apply innovative solutions that previously might not have been viable. A culture of innovation should be encouraged, and initiatives to seek out innovative solutions should be ongoing.

Refine the political and technical rolls in transportation planning and decision making

The Miami-Dade area urgently needs to improve its credibility regarding transportation planning and administration that stems from conditions as old as the original Metrorail planning to as recent as the controversies regarding the ability to deliver on current transportation plans. Reaffirmation of roles, accountability mechanisms, and communications strategies can help to

restore the trust necessary to enable risk taking and engender the support to carry initiatives through the inevitable challenges that accompany transportation plan implementation. Too often, the transportation planning process is consumed by a desire to see a project or program implemented where the traditional planning goals of offering creative solutions, being a broker of knowledge, and supporting informed decision making suffers. Refining and defining the political versus technical considerations in transportation decision making will aid in positioning Miami-Dade to make progress in transportation.

Rethink costs and benefits

The U.S. is fundamentally rethinking the measures of value for various investments. In some ways, the talk of billions or trillions of dollars being lost and similar magnitude investments being made on a regular basis to bolster various industries or programs undermines a sense of value. After all, if it is worth spending "X" dollars to bail out that business or institution, then it is certainly worth spending a small fraction of that amount to implement an infrastructure project for our community. Aggressive spending has been characterized as a positive stimulus to the economy but also fueled a sense of entitlement and occasionally a decoupling of the act of spending from the concept of value received from that spending.
On the other hand, evidence is suggesting that the current national economic crisis is re-instilling a keener sensitivity to value, as every entity from individual households to businesses to all levels of government scrutinize spending. Going forward, transportation spending is likely to get even more intense scrutiny. After the ribbons are cut, transportation infrastructure's contribution to economic activity and quality of life are derived by its ability to provide transportation at a cost that benefits the travelers without onerously impacting others. We may be entering a period where wise, prudent, and disciplined spending that delivers value to constituencies is more highly cherished by the public. Transportation investments must be financially as well as environmentally sustainable – and there may be a growing constituency for planning and investments that support that tenet.

How Project Priorities Might Change

Table 5 Responding to Travel Demand

Tactics	Short Term	Long Term
Increase Transportation Supply	Transportation System Management	Capacity Expansion
Reduce or Redistribute Travel Demand	Transportation Demand Management, Pricing	*Modify Land Use,* Change Pricing, Etc.

The toolbox of solutions to the transportation problem can be categorized as in Table 5, which differentiates between short- and long-term strategies as well as between transportation supply and transportation demand moderating strategies. As is often the case with diverse and pervasive problems, solutions require a spectrum of strategies that respond to the local context. For this discussion, attention is directed to strategies in the tool box for addressing long-term problems associated with meeting growing travel demand. It is recognized that significant transportation planning and spending will be carried out just to sustain the existing systems in good repair and accommodate the state-of-

the-practice safety features. However, the critical challenge will be to meet the demands that exceed the capacity of current systems. Florida and Miami-Dade are anticipated to grow and have continued growth in travel demand – thus, meaningful changes in travel behavior and/or additional transportation system capacity will be required.

Demand modification

Across the country, urban areas are embracing strategies designed to moderate demand for travel as a major element of their overall transportation planning strategy. The premise underlying demand management is to enable individuals to carry out their activities but in a manner that reduces or shifts the time of their travel so as be less of a burden on the transportation system. Thus, travel is shifted in time, amount, or mode so that it lessens the burden on the transportation system in the peak periods. The principal strategies to accomplish these objectives include:

1. Enhanced information for the traveler with the intention of influencing travel.
2. Modifications to travel pricing to influence travel.
3. Modifications to land use/development trends and the urban environment with the intention of influencing travel.

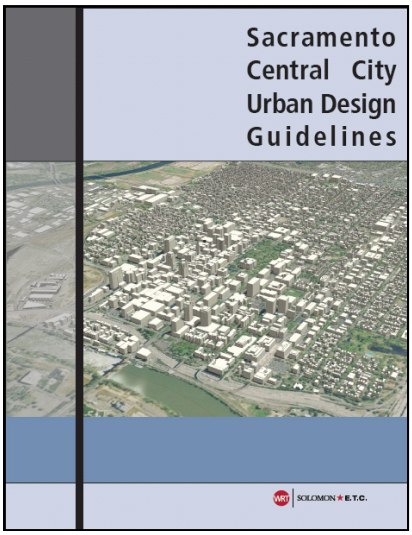
Enhanced Traveler Information: Initiatives toward this objective include programs such as the "511" travel information systems, enhanced web sites with travel information, tools for informing travelers about the true cost of travel options and impacts such as carbon footprints, and real-time information about parking availability, traffic conditions, flight arrivals, and related travel information. Computing and wireless communications have enabled a dramatic expansion of quality information for travelers.

Operations control centers aid incident management and provide traffic information.

Transportation Pricing: Travel cost influences behavior and can provide a revenue stream for building and operating transportation. Increased use of toll facilities had been a multi-decade trend as larger shares of travel are accommodated on tolled facilities. More recently, innovative pricing such as basing the price on the time of day or demand levels for a given facility (often referred to as congestion pricing) are increasingly seen as strategies to increase overall capacity and shift demand such that facilities are optimally used.

Various electronic toll technologies speed traffic and enable pricing strategies

Employer subsidies for carpoolers, cordon line charges for single-occupant vehicles, “eco” passes for transit users, and other public and private sector initiatives are designed to influence travel behavior.



Modifications to Land Use: The strategy receiving perhaps the most attention as a meaningful strategy for influencing travel demand is to alter land use. The density, mix, and design of land uses are altered to both reduce the length of trips and to enable alternatives to driving to be more competitive. Pedestrian features, priority and amenities for transit and concentration of activity such that these modes can be provided more cost effectively have been shown to be able to reduce travel for individuals who chose to locate in such urban environments. Planning initiatives to support these objectives include leveraging transit service availability, particularly fixed guideway transit, and designing the mix of activities to support accommodating many travel needs within communities and designing the interface between the land use and the transportation network so as to provide convenient, safe and attractive pedestrian, bike and transit interface.

Innovative bus-only shoulder lanes in Minneapolis

Capacity expansion

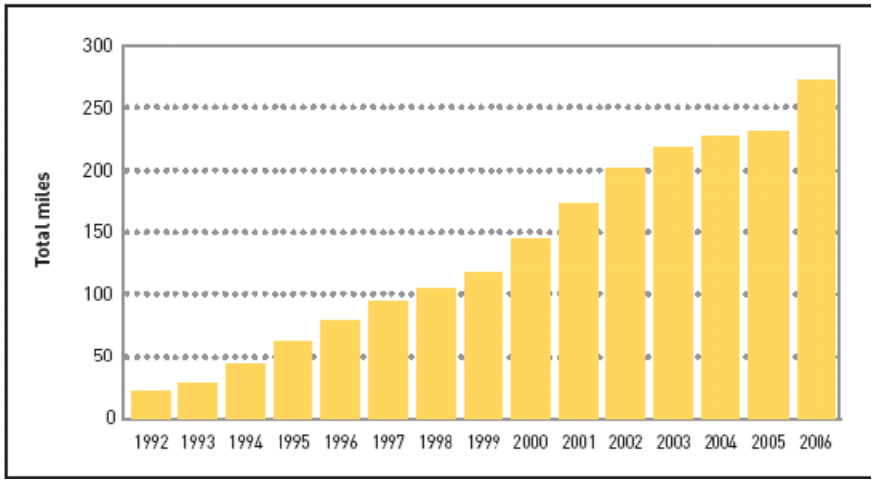
In many urban areas, capacity expansion for traditional roadway travel demand has been constrained by cost, right-of-way availability, and the prospect of intolerable impacts to the existing activities in the corridor. While some communities have these traditional options available, particularly in the suburban exurban fringe areas, the greater challenge is accommodating increased demands in already fully developed areas. Thus, there is growing attention to innovative ways to expand capacity.

Often, capacity enhancements involve redeveloping existing corridors or facilities to enhance capacity using designs or treatments that incorporate some innovative elements. Strategies might include compromising traditional design standards to fit more lanes into existing rights-of-way, using elevated or cantilevered structures to accommodate additional lanes, optimizing the configuration of lanes and ramps to maximize the traffic flow, using reversible lanes, implementing shoulder operation on select

L.A.’s Metro Orange Line Bus Rapid Transit provides high quality and capacity at modest cost.

facilities where feasible, and installing ramp metering and/or dynamic traffic and control systems. This innovation extends to other modes as well, most notably transit, where the high cost of new systems have led to exploration of Bus Rapid Transit and other strategies that leverage some existing infrastructure or right-of-way.

Miles of Bus Shoulder Lanes Built each Year in Minneapolis-St. Paul



Source: Metropolitan Council 2007 Transit System Performance Evaluation

Often, these capacity enhancements offer greater flexibility for future refinement, much faster implementation timelines, and lower cost and impacts while capturing many of the transportation and some of the intangible benefits of infrastructure investments.

What Miami-Dade is Doing

While there remain substantial unmet transportation needs, existing resources are being deployed in new ways to help address transportation needs and opportunities. The list of initiatives below highlights some of those innovative activities.

Funding

After years as being recognized as among the most congested urban areas and after repeated attempts to garner public support for a transportation sales tax surcharge, in July 2002 the Miami-Dade Board of County Commissioners approved Ordinance 02-116, imposing a half percent Charter County Transit System surtax, and Ordinance 02-117, creating the Citizens' Independent Transportation Trust. By a margin of two to one, Miami-Dade voters approved the People's Transportation Plan and the half-penny transportation surtax. Many improvements have been made to Miami-Dade County's bus and rail service since passage of the surtax including:

Golden Passport

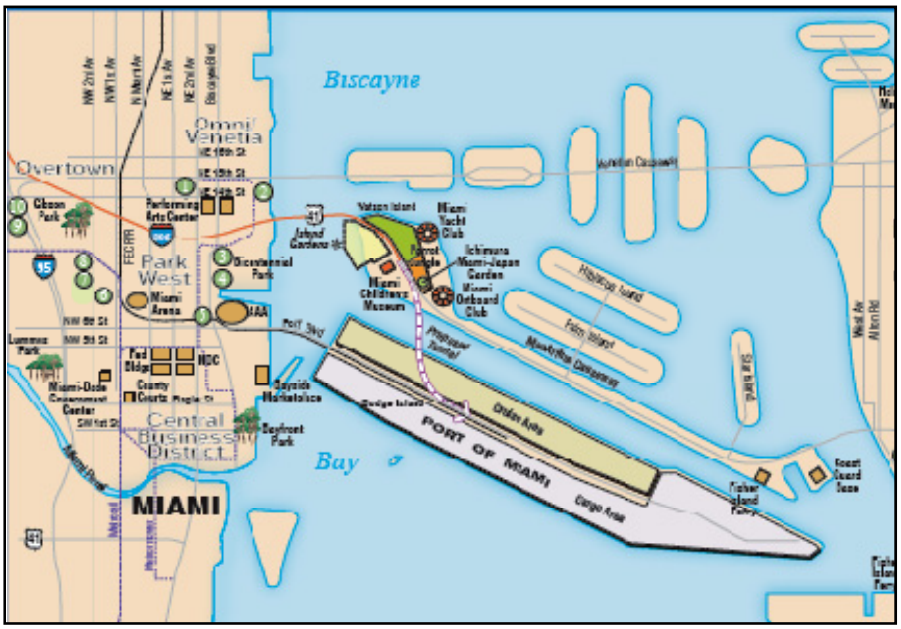
- Golden Passport program, which provides free public transportation to all senior citizens 65 years of age and older and to those who receive Social Security benefits.
- Free Metromover service, for all in downtown Miami.

- 24-hour Metrobus service, on 21 routes, 7 new bus routes, the execution of over 358,000 additional hours of bus service, and the implementation of 4,500,000 additional bus service miles.

While below the levels of dedicated funding location like Dallas, Los Angeles, Cleveland, and Seattle, this dedicated revenue stream provides the opportunity to support a strong operating program and priority capital projects.

Public Private Partnership Efforts

The Port of Miami Tunnel Project involves a collaboration of Miami-Dade County, the City of Miami, the Florida Department of Transportation (FDOT), and a private consortium to develop the Seaport Tunnel. The tunnel, from the port to the MacArthur Causeway, is expected to cost at least $610 million and represents a particularly complex consortium of stakeholders working to develop a project that will enable the port to continue in its role of being a critical economic generator for the region. Complex projects of this type and the resulting public/private partnership exemplify the types of initiatives that may be required for continued progress in addressing transportation challenges.



Port of Miami Tunnel

Managed Lanes

FDOT District 4 and District 6 offices are conducting a Pilot Project to provide managed lanes on the existing I-95 corridor from I-395 in Miami-Dade County to I-595 in Broward County. This project embraces the four T's requested of applicants for the U.S. DOT's Urban Partnership Agreements, as follows:

- Tolling - near-term congestion relief with variable tolling on the Pilot Project and long-term relief with increased toll/traffic volume on the

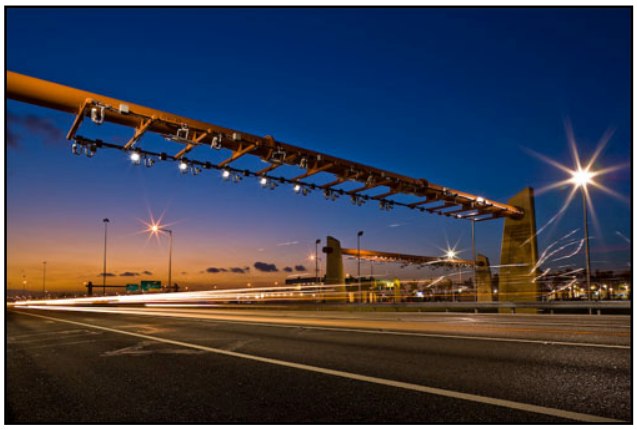
I-95 managed lanes

subsequent elevated lanes.

- Transit - the addition of managed lanes will provide uncongested routes for express bus service, initially on I-95 and subsequently on a network of managed lanes.
- Technology - antennas, video enforcement systems, variable-pricing software, changeable message signs, and other technology are integrated in the facility concept.
- Telecommuting - the business community is supporting this project with expanded commitments to flextime and telecommuting.

The Pilot project introduces the concept of managed lanes to commuters on the I-95 corridor, while generating net revenues that help finance the project. Early project success has resulted in exploration of expansion opportunities in the near future.

Open Road Tolling



Open road tolling, MDX Miami

The Gratigny Parkway, operated by the Miami-Dade Expressway Authority (MDX), is the first of six roadways in Florida to go "open road tolling." Under open road tolling, toll booths are eliminated and fees are collected electronically using SunPass transponders. Drivers who do not have a SunPass will have their license plates photographed and then will receive a bill in the mail. Visitors who use rental cars will have the option of adding the toll to their rental bill. Other roadways slated to have the "open road tolling" system in the coming years include the Don Shula Expressway, the Dolphin Expressway, and the Homestead Extension on the Florida Turnpike.

Bus Rapid Transit

Bus Rapid Transit

Miami Dade Transit and the Metropolitan Planning Organization are working together in the implementation of Bus Rapid Transit facilities along major arterials. Currently, this effort includes participation of the several stakeholders and the community of Kendall and adjacent areas where the initial project is being planned. BRT initiatives offer premium transit services attractive to travelers with a far faster implementation period and lower cost than is required to build guideway projects.

Bus Operations on Roadway Shoulders

Miami-Dade Transit has implemented bus operations on roadway shoulders along SR-874 and SR-878. This is another joint effort with MDX that allows MDT buses to use the shoulders along these facilities when the speed in the regular traffic lanes reaches 25 mph. Under this condition, bus drivers can use the shoulders at a maximum speed of no more than 35 mph. This trial operation represents efforts to take advantage of opportunities to improve productivity and services for customers where possible.

Bus on shoulders

Trunk and Feeder Bus System

MDT, like many transit agencies nationally, is reevaluating services to enhance performance. Specific attention is being given to use of trunk and feeder bus services to maximize the existing resources (manpower, funding, fleet, etc.). Under this service concept, travel is faster for passengers and more productive for the agency for longer distance trips while community needs are met with feeder services. This improves the competitive position of bus services.

South Florida Vanpool Program

Vanpool services have proven to be a very attractive mode for specific needs and provide a service that reduces roadway demand and is substantially supported by the users. Miami-Dade County's successful Vanpool Program currently has over 195 vans in place. This program has been expanded to Broward and Palm Beach counties, becoming a regional program that saved over 500,000 person trips and 20 million passenger miles per year.

South Florida Vanpool Program

Traffic Operation Improvements

In conjunction with the MPO, the Department of Public Works has been actively improving traffic flow at priority intersections where congestion and safety have been a problem. In addition to traditional improvements, there is a new project were 30 locations are being evaluated for converting regular traffic lanes to turbo lanes at T-intersections.

Other initiatives are under way to make improvements in seaport, airport, freight, intermodal, and other projects across the county. These transportation improvements require the

collaborative effort of the various transportation planning and operating agencies in the region and increasingly require active participation by stakeholders.

Steps Toward Change

The planning processes that govern moving projects toward implementation is highly prescribed by state, local, and federal guidance and currently beset by expectations of changes in processes and priorities as the federal government moves toward reauthorization of its major federal transportation legislation. Thus, it is not simple to change how transportation is planned. That said, perhaps the most critical considerations in adapting planning to the current conditions are the attitudes and values that the local planners and decision makers have toward the future of transportation.

The single most critical challenge will be to instill a commitment to enhance mobility as a priority goal for transportation program expenditures. While economic stimulus, environmental mitigation, community building, and other goals are both relevant and meritorious within the realm of public and decision maker priorities, unless transportation program dollars result in meaningful increases in capacity for travel options the public desires, mobility aspirations will not be met.

The second critical requirement, and a related one, is that the planners with support of the decision makers use measures of value or cost effectiveness in their evaluations. This is neither to discount the legitimacy of other objectives nor to imply that cost effectiveness has not been a goal in existing processes. But clearly, the plethora of other objectives has served to discount and overwhelm the importance of getting additional transportation capacity for additional investments. While equity and economic development are legitimate local interests, contributions to improved regional mobility are a prerequisite for investments to accomplish mobility goals.

Third, innovation should be pursued in processes and solutions. Agencies should be proactive rather than reactive. They should scan the globe for potentially relevant strategies and investments and implement processes that integrate new perspectives and out of the box thinking. They should invest in brainstorming sessions, outside expertise, and creative design competitions or strategies. They should not pursue innovation for the sake of innovation but aggressively seek solutions that might have been precluded by prior design standards or practices that do not reflect current trends and conditions or today's criticality of moving forward with mobility improvements.

Fourth, a culture of success should be built, with well-conceived and well-executed investments. Agencies should be pragmatic – unrealistic visions can lead to cynicism and disappointments and stand in the way of progress toward accomplishing attainable goals. They should leverage the integrated county government structure by positioning Miami-Dade to take advantage of the probable greater interest in transportation and land use coordination likely in the next federal transportation legislation.

Transportation is integral to the quality of life and economic activity. It deserves and requires leadership attention and a disciplined plan of action unless urban areas are content to see continued deterioration in personal mobility and impeded commerce. The complex, multifaceted interweaving of transportation and its impacts into many aspects of our lives and the economy results in transportation planning being inherently complex and challenging. However, the opportunity and need to pursue change has arrived.

> *. . . The linking of knowledge to action [is] the essential meaning of planning.*
>
> Planning Theory
> *Burchell and Sternlieb, 1978*

Appendix A
A Transportation Data Profile

Appendix A: Table of Contents

INTRODUCTION

This appendix presents a data profile of transportation and transportation-related information for Miami-Dade County. This data helps build the foundation of knowledge regarding transportation and travel behavior that can foster informed thinking about how best to meet future transportation needs and respond to opportunities for Miami-Dade County. While historic trends are not necessarily destined to be continued into the future, they provide a knowledge base that can be used to understand probable future conditions.

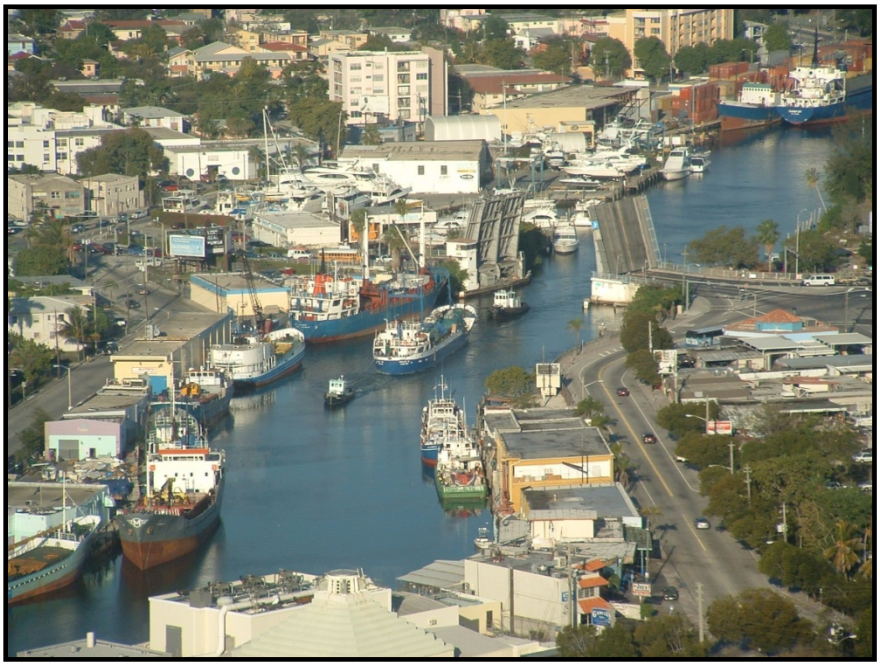
Travel is fundamental to the human desire to interact for social and economic benefit. The desire to travel to socialize will continue as it has through the history of mankind. Similarly, the role of travel in enabling economic interaction and the transportation of products will continue. The fundamental trend toward interdependence of people and specialization of labor continues to underlie the historic trend toward trade and urbanization of the population. The geographic specialization of labor and production has created a strong interdependency across geography. This interdependency creates travel demand. Be it importing fresh seasonal produce from the Southern hemisphere, taking a trip across the country to visit a grandchild, visiting a medical specialist across the state, or sending a child to a magnet school across town, the dispersion and specialization of people and economic activity create demands for travel and commerce. Absent significant economic upheaval, these conditions are likely to continue to create travel demand. If long-term economic growth continues here and abroad, the trends are likely to continue to create pressure for more travel and commerce. Both growing knowledge and increasing personal incomes contribute to a continuing desire and need for travel. Yet, historic trends regarding demographics and travel may change in the future. Numerous phenomena that have shaped transportation over the past generation cannot be replicated and will be replaced with new influences on travel demand. Rapid growth of immigration, dramatic increases in labor force participation - particularly with women and the baby-boom age cohort joining the workforce - have dramatically increased travel over the past several decades. Huge growth in auto availability, growing personal

income, dispersion of population to suburbs and exurbs, the maturation of the interstate system, and other factors have influenced past travel trends.

Looking ahead, among the factors anticipated to influence travel are the aging of the baby boom generation, dramatic increases in the cost of transportation infrastructure, a decline in the relative affordability of Florida as a place for retirement and relocation, significant cost increases for energy - the fuel for transportation, a growing awareness of and concerns regarding climate change and environmental impacts of transportation, strong competition for scarce public resources to support transportation services and investments, and ever-changing governance and institutional arrangements including trends toward regional planning and private sector participation in addressing transportation service and infrastructure needs.

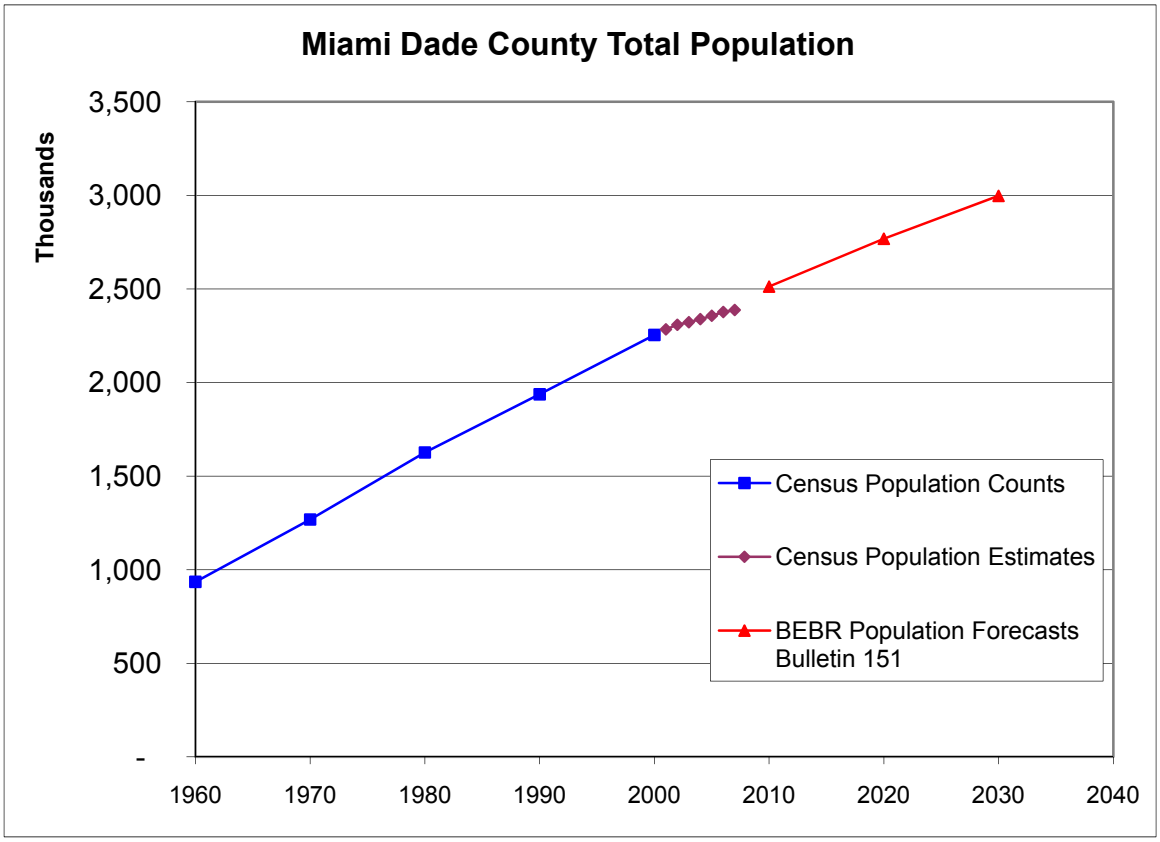
This document presents several historic data trends for Miami-Dade County. This information is useful as a foundation to more fully explore policy issues and considerations that will influence how best to plan for future transportation needs for Miami Dade County.

The report is organized into three major sections. The first section presents the factors that influence travel demand. This is followed by information on transportation and infrastructure; the concluding section presents data on transportation system performance. The predominant focus is on travel by residents of Miami-Dade County; however, freight travel, travel by visitors, and travel by interfacing modes of air, rail, and sea are mentioned.



TRAVEL DEMAND - DEMOGRAPHICS

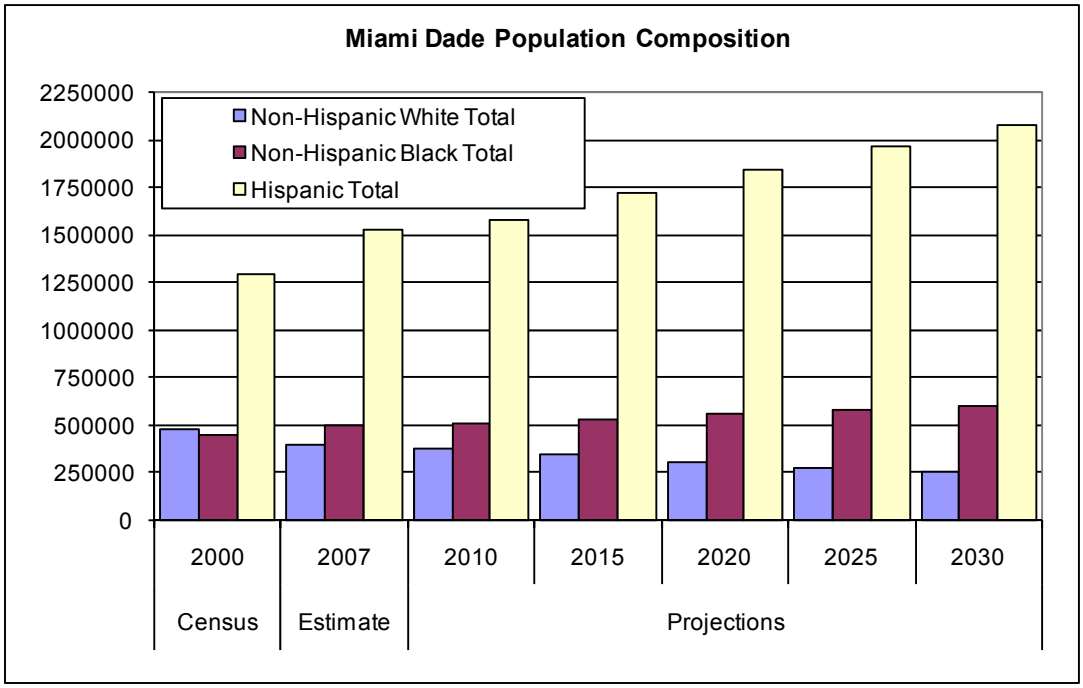
POPULATION: Population drives travel demand. Persons travel locally on surface modes to carry out their daily activities including working, shopping, recreating, personal business, education, healthcare, worship, and socialization. They purchase products and services that create commercial and freight travel to and within the urban area. The dominant influence on future travel needs will be the size and characteristics of the future population.



Sources: U.S. Census Bureau, Bureau of Economic and Business Research (BEBR) at the University of Florida

- From 1960 through 2000, population growth averaged over 2.2%, with an average of 32,000 new residents annually.
- Forecasts of future growth indicate the rate of growth dropping below 1 percent on average from 2000 through 2030, with approximately 24,000 new residents annually.
- Current economic conditions and the housing market contraction have slowed in migration with growth currently well below historic and forecast rates.
- Population growth has and is likely to remain a key driver to future travel demand.

ETHNICITY AND RACE: Characteristics of the population influence the amount and nature of the travel demands. Age, income, ethnicity and race, density, and auto ownership are known to influence travel.



Source: Bureau of Economic and Business Research (BEBR) at the University of Florida

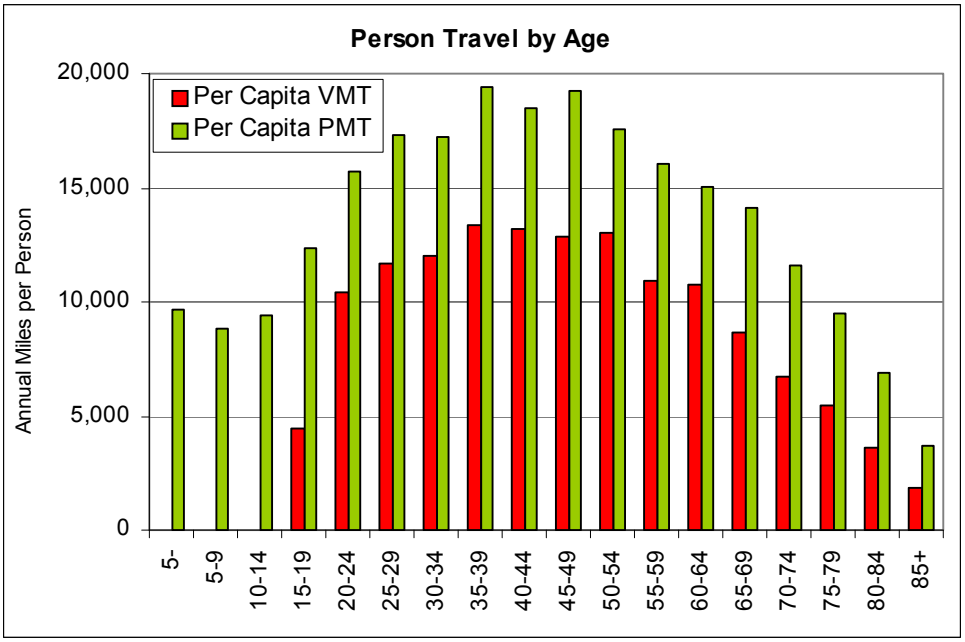
- Historically different populations have had different propensities regarding mode use and residential location and household characteristics that impact their travel behavior.
- Research suggests that some of these are related to socio-economic conditions while others may have a cultural relationship.

Population by Race					
Source	Year	White	Black	Hispanic	Asian
Census	1960	796,054	137,299	n/a	n/a
Census	1970	1,071,662	189,666	n/a	n/a
Census	1980	1,262,275	280,434	580,994	12,264
Census	1990	1,413,015	397,993	953,407	26,307
Census	2000	1,570,558	457,214	1,291,737	31,753
ACS	2003	1,634,017	458,703	1,398,974	32,007
ACS	2004	1,685,228	463,787	1,403,983	34,203
ACS	2005	1,662,089	457,837	1,423,697	32,884
ACS	2006	1,716,162	472,022	1,471,709	35,964
ACS	2007	1,770,133	481,868	1,479,530	40,569

Source: Census, ACS

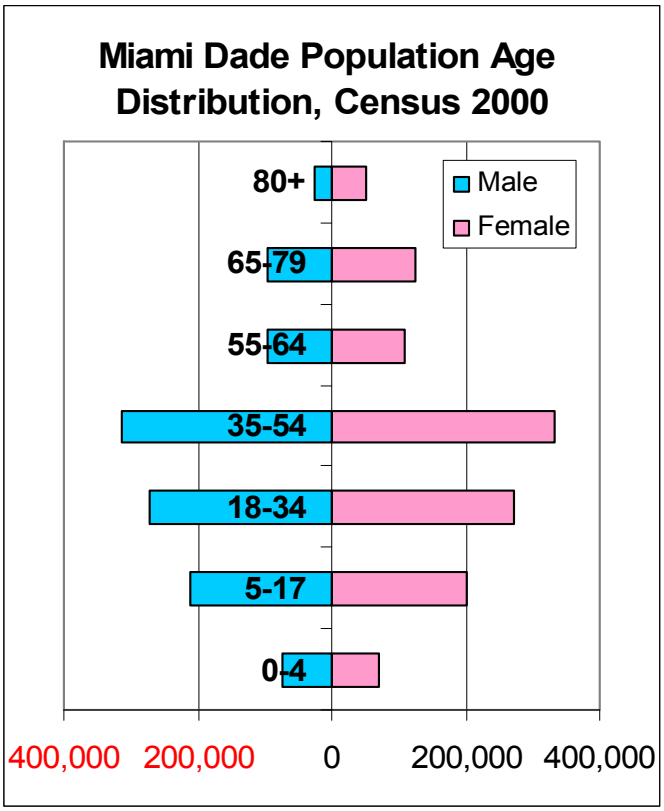
- Propensities to walk, share rides, and use transit have been shown to vary across race/ethnicity groups.
- Generally, the Hispanic population has had somewhat lower travel levels and higher use of shared ride auto travel.

AGE: The age distribution of the population influences travel demand. Persons travel as passengers while young but do generate travel for healthcare, school, childcare and other purposes. As people age, they travel more, and when they reach the age of licensure, they began to produce vehicle travel directly (VMT). Persons travel most in their adult years when they typically have resources to travel, have established household travel requirements, and often have responsibilities for meeting the transportation needs of household members. As persons move to empty nester and retirement ages, they begin to reduce their travel levels.



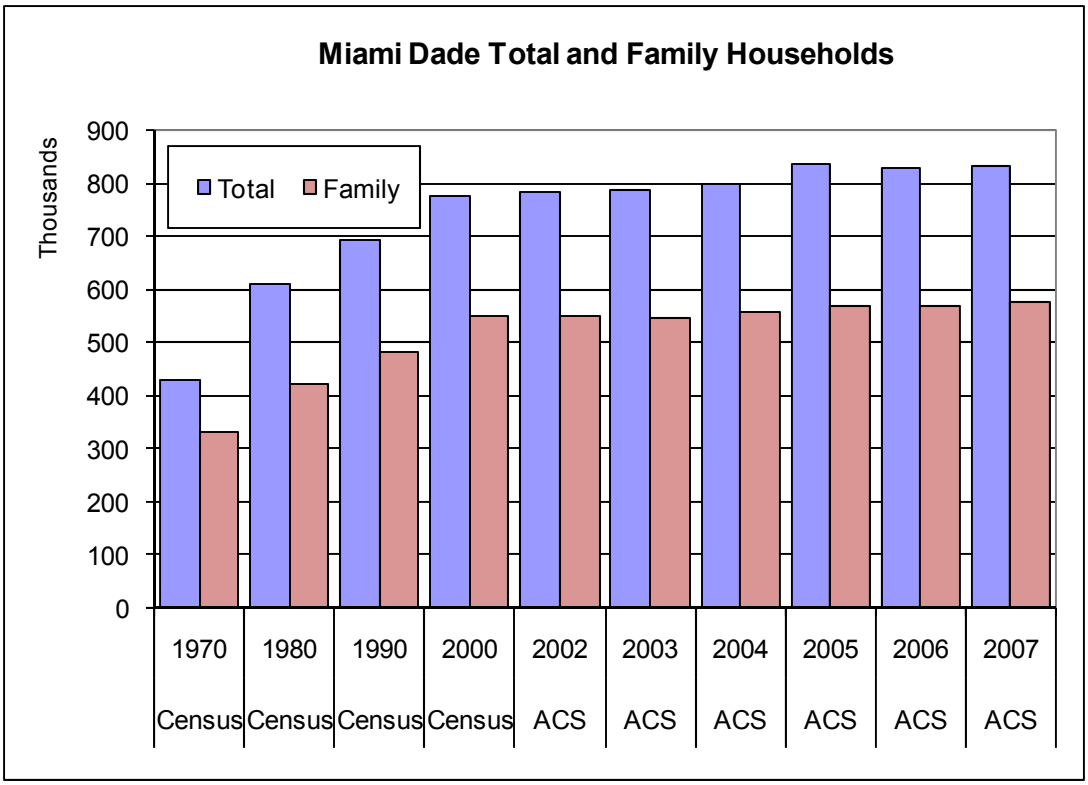
Source: CUTR analysis of U.S. National Household Travel Survey data for Miami Dade County.

- Miami-Dade has a mean age of 37.8 in 2006 vs. 39.8 for Florida and 36.4 for the U.S in 2006, according to the American Community Survey.



Source: CUTR analysis of Bureau of Economic and Business Research (BEBR) at the University of Florida data

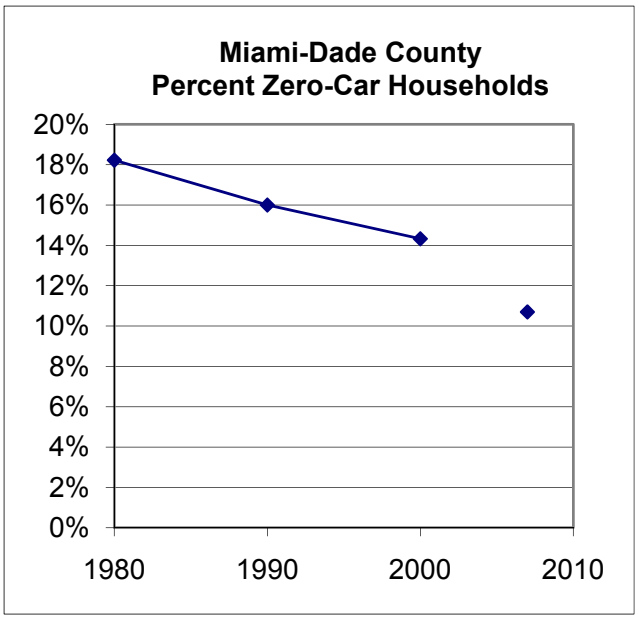
HOUSEHOLDS: The number of households and their average size influences travel. Some travel purposes, such as grocery shopping, typically serve the household. Smaller households more often have to travel for socialization. Trip generation is typically measured at the household level.



Source: U.S. Census, ACS

- Average household size for Miami-Dade County was 2.84 in 2000, compared to a Florida average of 2.48 and a national average of 2.61.
- Average household size has declined from 2.91 in 1970 to 2.84 in 2000.
- For a given population, having more households has historically meant more travel.

VEHICLE OWNERSHIP: Vehicle ownership is a large factor in understanding travel behavior. Historically, increases in vehicle ownership have been strongly tied to increased total travel and increased auto travel combined with declines in the share of travel on other modes. This is particularly true in situations where additional vehicles enable another adult household member to shift to auto travel. Some segments of the population have seen a saturation of vehicle availability where there is at least one vehicle per worker or per adult in the household. In these cases, increased auto availability has a more limited impact on travel. For households with financial constraints on auto ownership, increases in auto ownership are likely to result in more travel and more auto oriented travel. Some households have legal, mental, or physical health constraints to auto ownership. In areas with quality transit services, there is some evidence of some households that are able to own vehicles choosing not to.



Source: U.S. Census, ACS

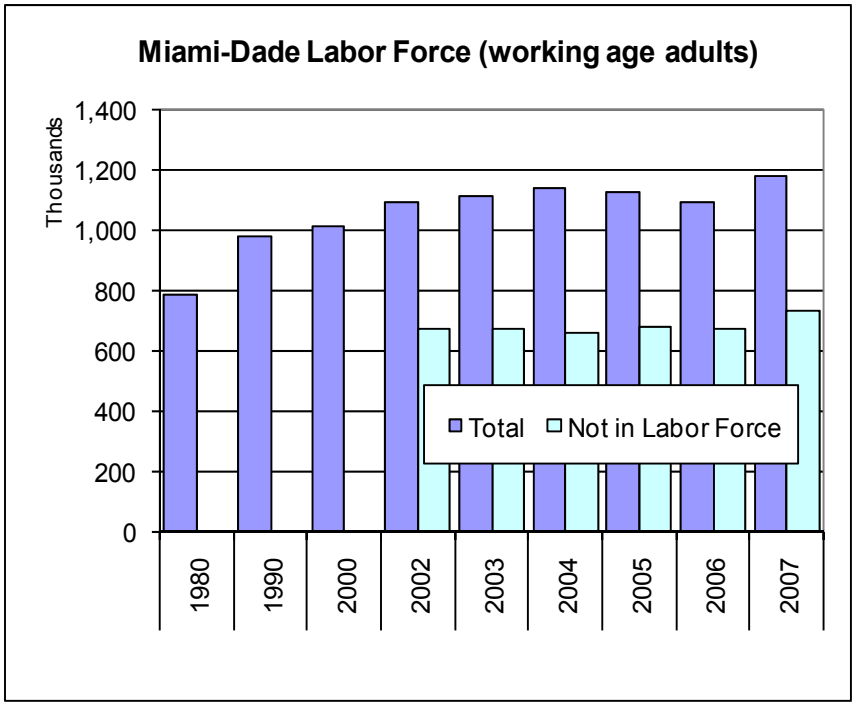
Vehicle Availability			
	Miami-Dade	*Florida*	*U.S.*
Zero-Car Households, 2007 ACS	94,452	465,693	9,803,809
% Zero-Car, 2007 ACS	10.7%	6.2	8.7
Mean # Cars/HH, 2000 Census	1.51	1.58	1.69

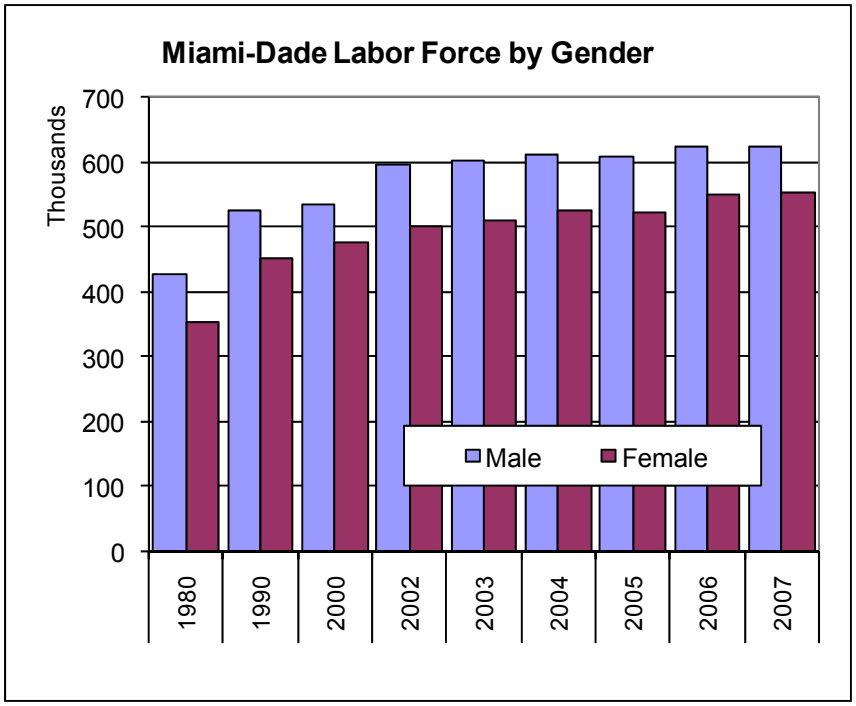
Source: American Community Survey (ACS)

- The decline in the share of zero-car households results in their being fewer total households without cars in Miami-Dade County now than in 1980 – thus fewer persons are dependent on non-auto modes.
- Miami-Dade has a larger share of zero-car households than the average for Florida or the U.S., but many urban areas have higher shares of households without cars.

LABOR FORCE: The labor force is critical to transportation in a number of ways. Workers travel to and from work creating approximately one-fifth of all travel. The working population is critical to providing the resources that enable travel and participation in activities that require travel. Commuting typically defines the single most congested period of travel and hence is critical in determining the peak transportation capacity needs which determines the cost of transportation infrastructure and services.

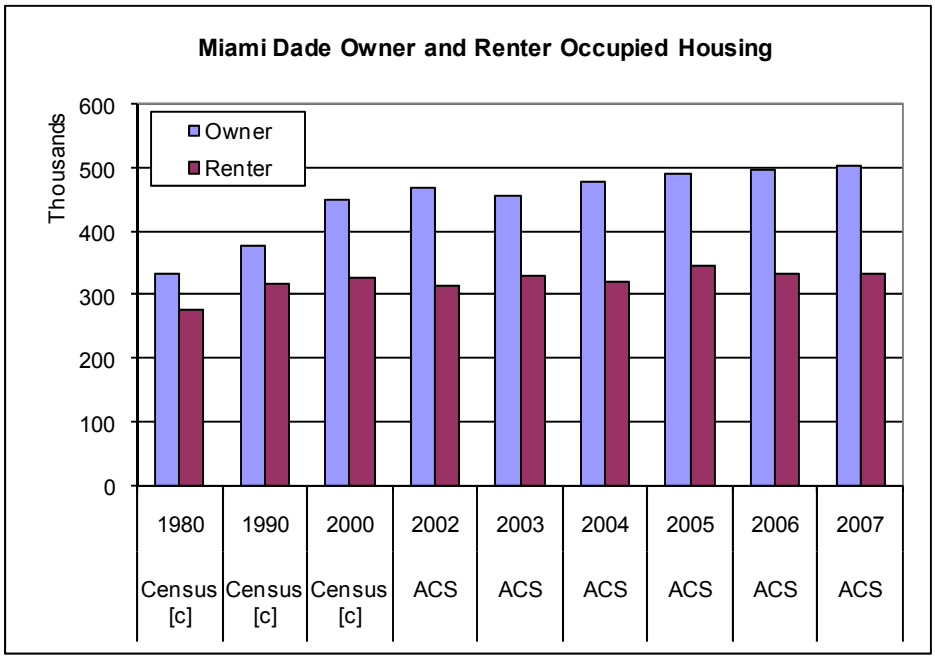
- In Miami-Dade County, 48.6 percent of the total population was in the labor force in 2000.
- In Florida, the percentage was 48.7.
- In the U.S., the percentage of population in the labor force is 50.7.





Source: U.S. Census, ACS

HOME OWNERSHIP: Home ownership has been shown to be highly correlated with some transportation behaviors. Home owners tend to be more stable and tend to have lower use of public transit. Larger households tend to have somewhat lower per capita travel. Large households also are associated with younger populations with higher fertility and very high housing cost locations where economic or cultural conditions lead to extended families sharing residences.

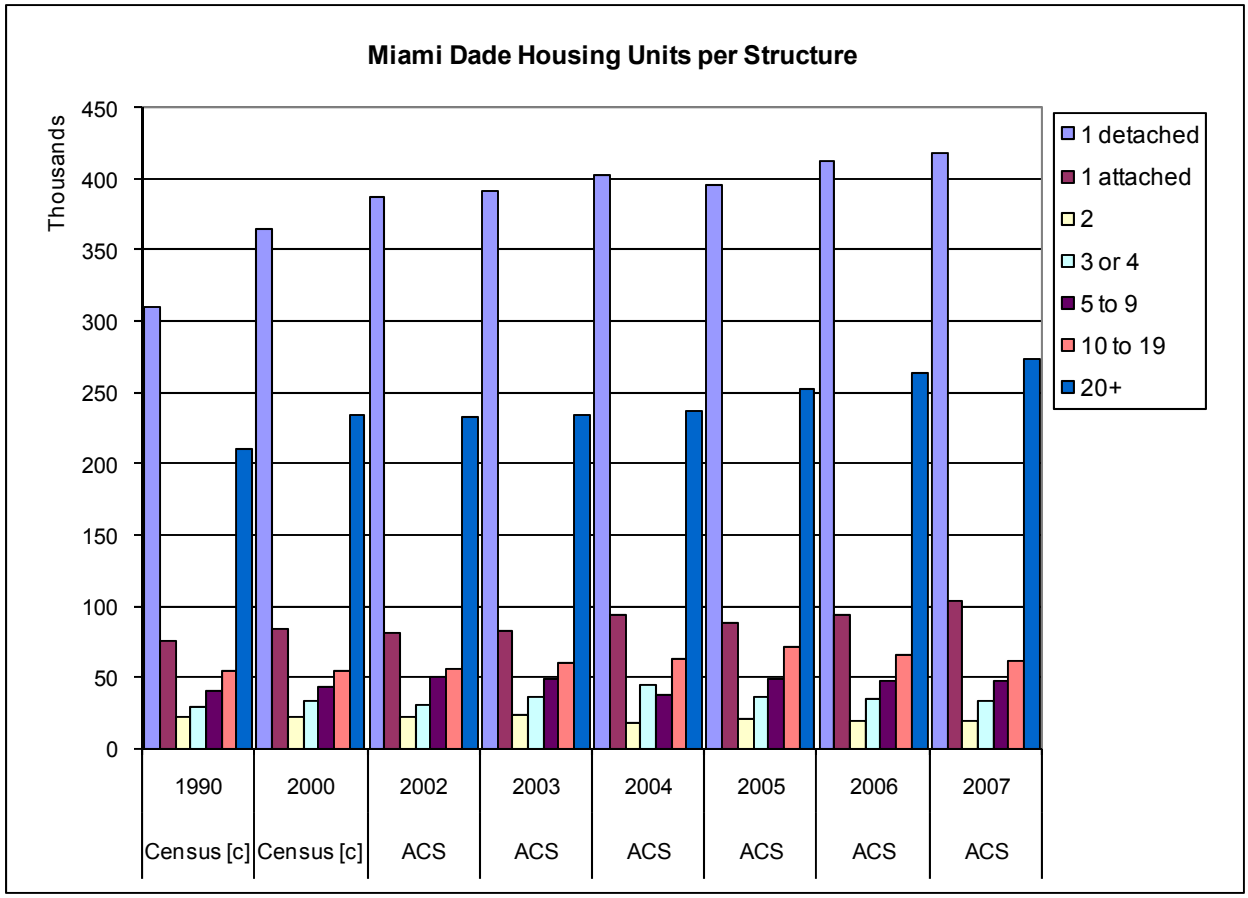


Source: Census, American Community Survey (ACS).

Miami-Dade County Average Household Size		
Census	1970	2.91
	1980	2.63
	1990	2.75
	2000	2.84
ACS	2002	2.92
ACS	2003	2.92
ACS	2004	2.9
ACS	2005	2.79
ACS	2006	2.82
ACS	2007	2.78

- The average household size in Miami-Dade County is 2.78.
- The average household size in Florida is 2.49.
- The average household size in the U.S. is 2.61.
- Home ownership in Miami-Dade is 59.8%.
- Home ownership in Florida is 70.3%.
- Home ownership in the U.S. is 67.3%.

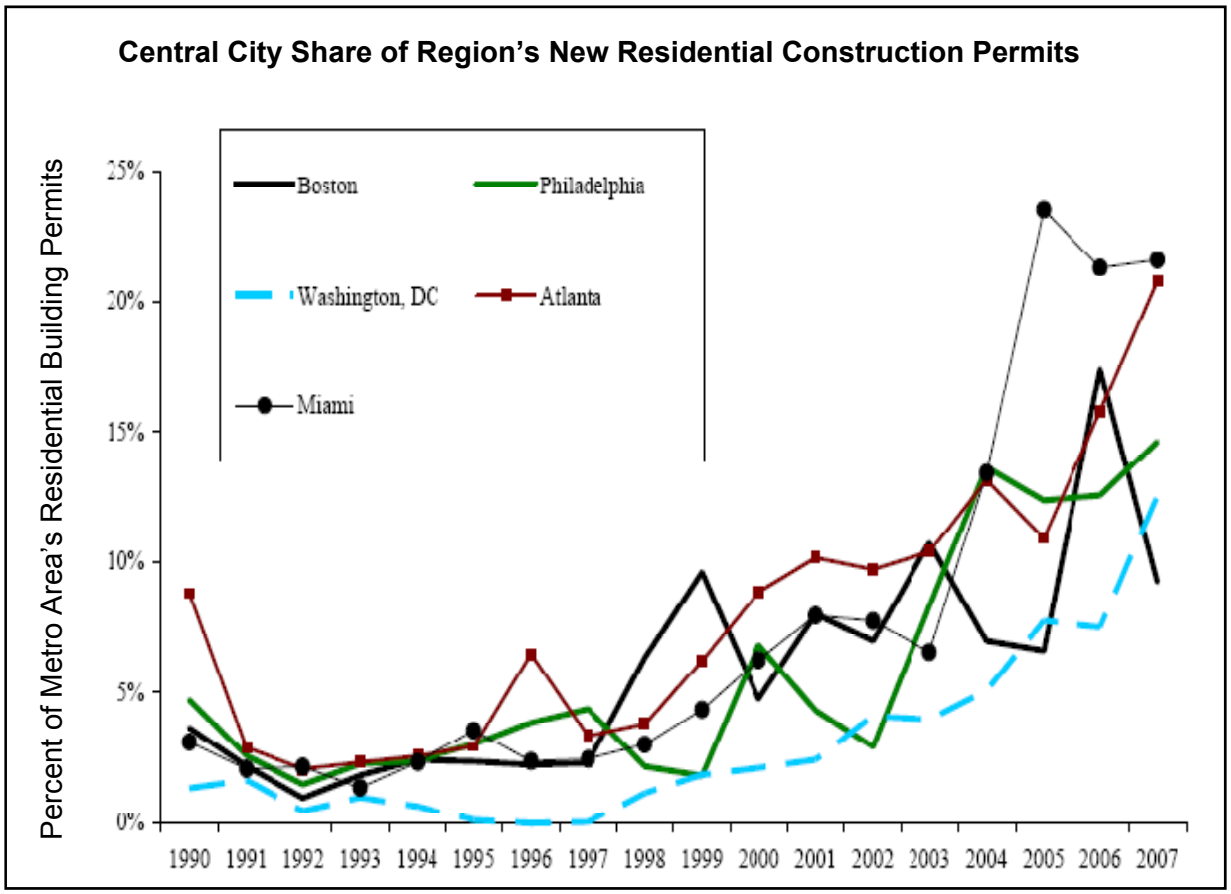
HOUSING DENSITY: Housing unit concentration is one aspect of land use density. Higher densities and greater reliance on multiunit structures have implications on transportation. Typically, higher density results in less travel, as more destinations are likely to be in closer proximity. Higher density enables more competitive public transit services, as there is more likely to be sufficient demand to offer more frequent and more comprehensive services that will be more attractive to travelers. In addition, parking is more likely to be limited or costly favoring alternative modes.



Source: Census, ACS Note: "1 attached" refers to row houses or homes attached to businesses.

- Miami-Dade County had slightly less than 42% of residents in detached (on their own lot) single family dwellings in 1990. That has grown to approximately 44% as of the most recent data.
- In Florida, 54% of residents live in single family detached dwellings.
- Nationwide, 62% of residents live in single family detached dwellings.
- Land availability, pricing and perhaps consumer preferences are likely to influence future trends.

New residential development gives a hint as to where future resident population will reside. Miami has shown a significant increase in core residential development. Post recession trends will give a clearer picture of future development trends.



Source: *Residential Construction Trends in America's Metropolitan Regions*, *U.S. Environmental Protection Agency*. January, 2009

America's Most Popular Big Cities					
Percentage who would like to line in…					
Metro Area	College Grads %	Metro Area	College Grads %	Metro Area	College Grads %
Denver	43	San Antonio	29	Chicago	24
San Diego	40	Boston	28	Houston	23
Seattle	38	**Miami**	**28**	Las Vegas	23
Orlando	34	Atlanta	26	Los Angles	21
Tampa	34	Washington D.C.	25	Baltimore	20
San Francisco	34	New York	24	St. Louis	18
Phoenix	33	Dallas	24	Pittsburgh	16
Portland	31	Philadelphia	24	Minneapolis	16
Sacramento	29				
Note: For statistical significance comparisons between cities, margins of at least 4-6 percentage points are required depending on the city score.					

LOCATION PREFERENCES: Future growth is influenced by the desirability of locations to potential new and existing residents as well as the natural growth of the resident population (rate of births and deaths). Miami-Dade's future transportation needs will be significantly shaped by the future rate of growth. For Miami residential growth has come from both domestic and international immigration as well as natural growth. An October 2008, Pew Survey provides a glimpse of feelings about Miami from 2,260 U.S. residents who were surveyed.

Preferred Cities by Education
Percentage who would like to line in…

Metro Area	College grads Percent	Metro Area	High School grads or less Percent
Denver	59	Orlando	35
San Diego	54	Denver	34
Seattle	51	Tampa	34
San Francisco	46	Seattle	32
Boston	43	Phoenix	31
Portland	41	**Miami**	**30**
Philadelphia	38	San Diego	30
Washington D.C.	38	Sacramento	28
Tampa	35	Las Vegas	26
Phoenix	33	San Francisco	26
Chicago	33		

Note: for statistical significance comparisons between cities, a margin of at least 9 percentage points is required.

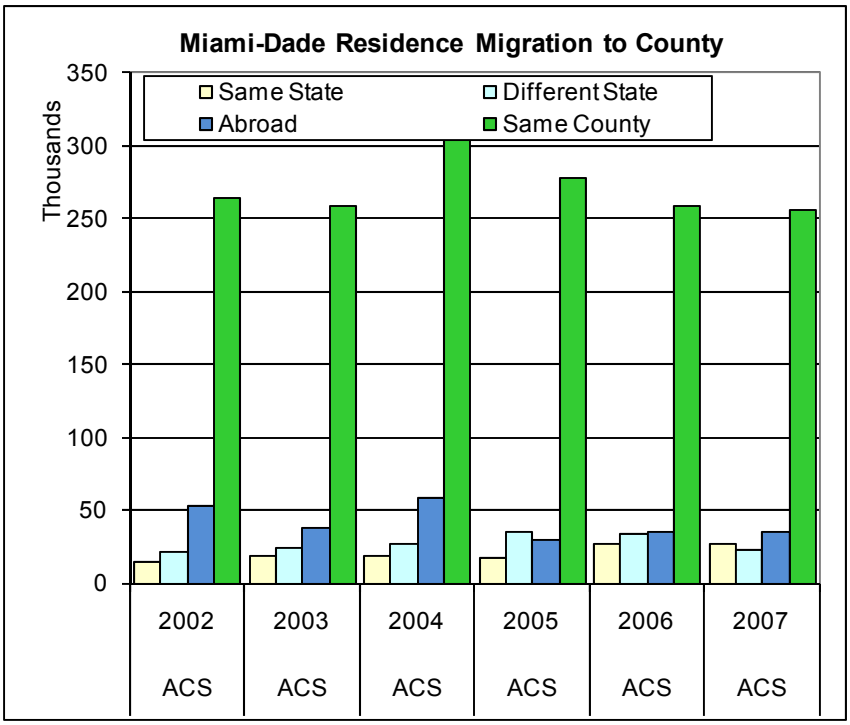
Preferred Cities by Income
Percentage who would like to line in…

Metro Area	$100k or more Percent	Metro Area	Less Than $30k Percent
San Diego	59	Seattle	35
Denver	54	Orlando	34
San Francisco	51	Denver	34
Boston	46	San Diego	32
Seattle	43	**Miami**	31
San Antonio	41	Los Angles	30
Portland	38	Washington D.C.	30
Tampa	38	Sacramento	28
New York	35	San Francisco	26
Chicago	33	Tampa	26

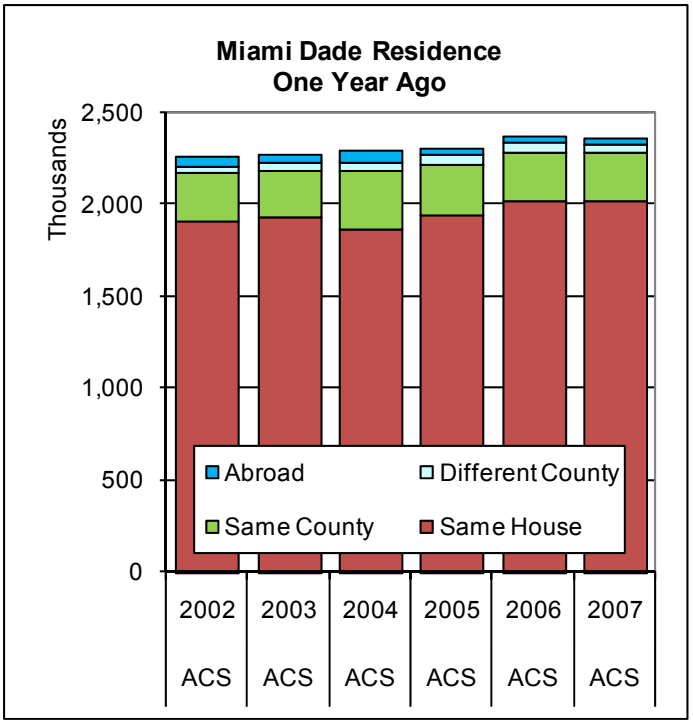
Note: For statistically significance comparisons between cities, a margin of at least 12-13 percentage points is required.

Source of Tables: *For Nearly Half of America, Grass Is Greener Somewhere Else*, Pew Research Center, A Social & Demographics Trends Report, January 2009.

MIGRATION: Travel behavior is impacted by the mobility of population. A mobile population impacts the ability to plan for travel needs and requires additional initiatives to communicate travel options. Miami-Dade, as a major portal for international immigration, has high levels of foreign and out-of-state in migration but also high levels of residents locating to other Florida counties or beyond.

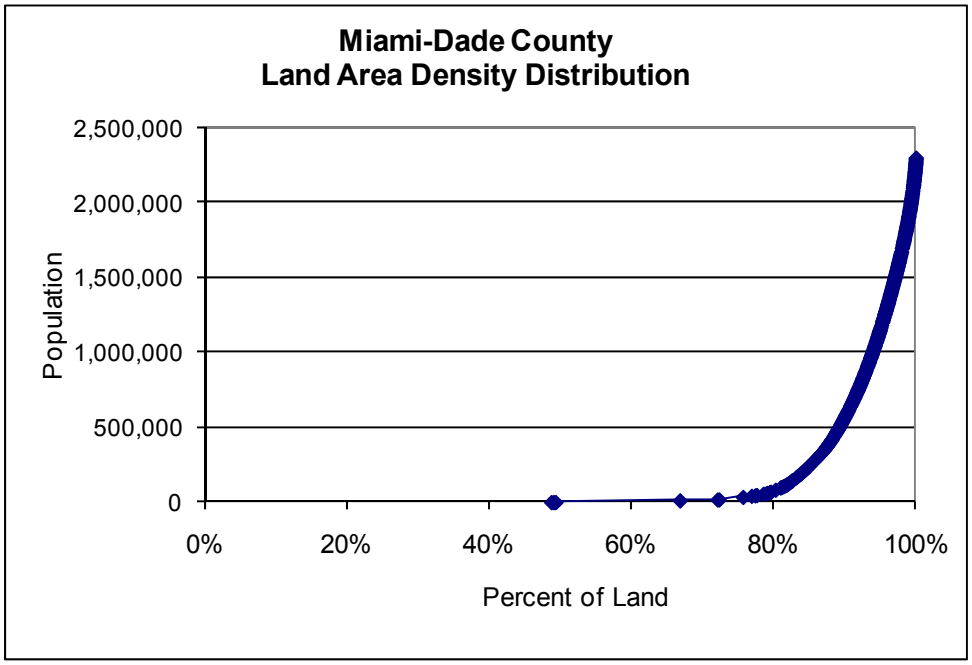


- Miami-Dade County had 86.8% of its residents living in the same house one year ago.
- In Florida, 82.1% of residents lived in the same home one year ago.
- Nationwide, 84.0% of residents lived in the same home one year ago.
- In Miami-Dade County, 26.9% of residents are not U.S. citizens vs. 10.3% for Florida and 7.3% for the U.S.



Source: U.S. Census, ACS

DENSITY: Density is one of the most important characteristics of land use that influences travel. Dense development concentrates activity in less space. This enables shorter trip length to many destinations and influences the competitiveness of the various modes by affecting the levels of transit service, roadway congestion, parking cost or availability, pedestrian accessibility and related factors. Miami-Dade County has much of the densest development in Florida. Average density is modest due to the land areas in the western part of the county that is not developable; however, the density in the developed area is substantial.



Source: U.S. Census

Miami-Dade County Population per Square Mile				
Source	Year	Population	Gross Land Area	Population per square mile
Census	1960	935,000	1,946.06	480.46
Census	1970	1,268,000	1,946.06	651.57
Census	1980	1,626,000	1,946.06	835.53
Census	1990	1,937,094	1,946.06	995.39
Census	2000	2,253,779	1,946.06	1,158.12
ACS	2002	2,286,228	1,946.06	1,174.80
ACS	2003	2,294,651	1,946.06	1,179.13
ACS	2004	2,316,708	1,946.06	1,190.46
ACS	2005	2,329,187	1,946.06	1,196.87
ACS	2006	2,402,208	1,946.06	1,234.40
ACS	2007	2,387,170	1,946.06	1,226.67

- 51% of the Miami-Dade County population lives in census tracts with a density between 4,000 and 10,000 persons per square mile.
- 31% of the population lives in tracts with densities greater than 10,000 persons per square mile.
- Travel for persons living at 10,000 persons per square mile can be as little as half that for residents in exurban and rural low density areas.

EMPLOYMENT DISTRIBUTION: Travel is also influenced by employment distribution. The table below presents comparative data on the nature of employment distribution in the top 15 metro areas in the country. Dispersion refers to the extent of clustering of employment in concentrations. Decentralization refers to the distance employment is from the center of the area. Miami-Dade is relatively typical with the majority of employment dispersed beyond the CBD and subcenters. This results in many-to-many travel patterns that are challenging to serve with high capacity transit services.

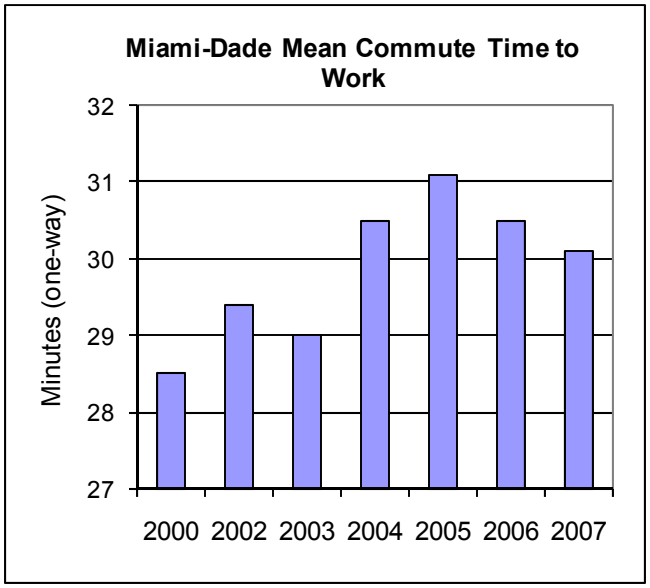
Metro name	Population	Employment	No. of Sub- centers	Share of Employment (%)				Rank Among Top 79 Metro Areas		
				CBD	Sub-centers	Dispersed	Sub/ All centers	Dis-persed	Decen-tralized	Poly-centric B/(A+B)
				A	B		B/(A+B)			
3 million and plus			17	7.1	15.0	77.9	64.8			
Philadelphia	6,188	2,781	6	8.6	4.5	86.9	34.3	13	35	49
Boston	5,829	2,974	12	8.0	8.0	84.0	50.1	33	26	31
Atlanta	4,112	2,088	6	8.0	10.7	81.3	57.2	43	25	19
Chicago	9,158	4,248	17	7.0	11.9	81.1	62.9	45	17	13
Washington	7,608	3,815	16	7.4	11.8	80.8	61.3	46	20	16
Phoenix	3,252	1,464	9	7.1	12.9	79.9	64.4	51	18	12
Dallas	5,222	2,566	10	4.9	15.8	79.3	76.2	54	4	5
New York	21,200	9,418	33	9.9	11.2	78.8	53.0	57	46	25
Seattle	3,555	1,745	7	9.3	11.9	78.8	56.0	58	43	21
Miami	3,876	1,624	6	7.5	15.0	77.5	66.8	63	21	10
Detroit	5,456	2,509	22	5.2	22.2	72.6	81.1	72	5	2
Houston	4,670	2,076	14	8.0	20.8	71.2	72.3	75	24	8
San Francisco	7,039	3,513	22	5.9	24.2	70.0	80.5	76	10	3
Los Angeles	16,370	6,717	53	2.8	28.8	68.4	91.0	78	1	1

Source: Bumsoo Lee, "Urban Spatial Structure, Commuting, and Growth in U.S. Metropolitan Areas, Ph.D. dissertation, UCLA, 2006, Table 2-5, p. 25.

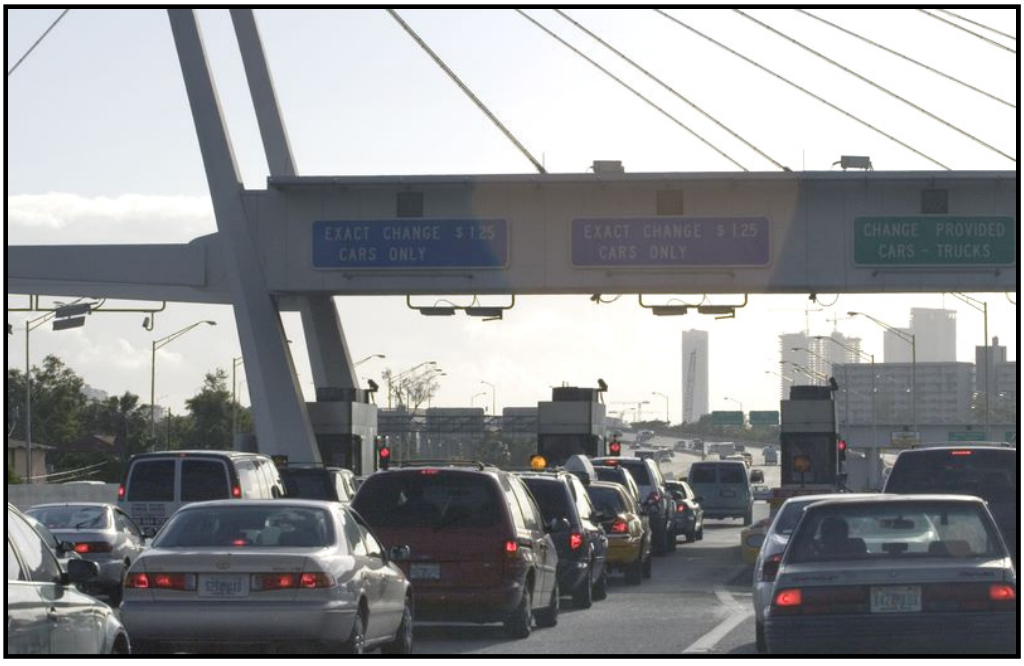
TRAVEL

COMMUTING: Commuting is one of the most critical elements of travel, as it comprises approximately 20% of traffic and defines peak conditions. Work trips are recurring, generally low occupancy, and shape much of the remaining daily travel schedule for travelers. These, generally peak-period trips, define the capacity needs of transportation services and facilities. The most recent annual data suggests a slight decline in commute times.

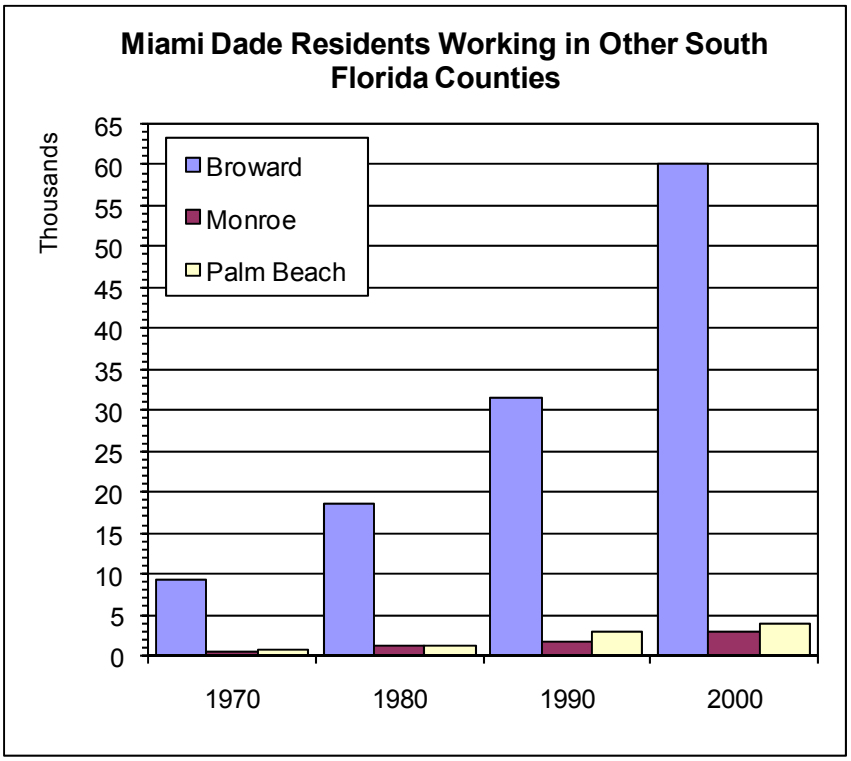
- In the 2000 census, Miami-Dade County had a mean commute time of 28.5 minutes.
- In Florida, the mean commute time was 24.3.
- Nationwide, the mean commute time was 24.4.



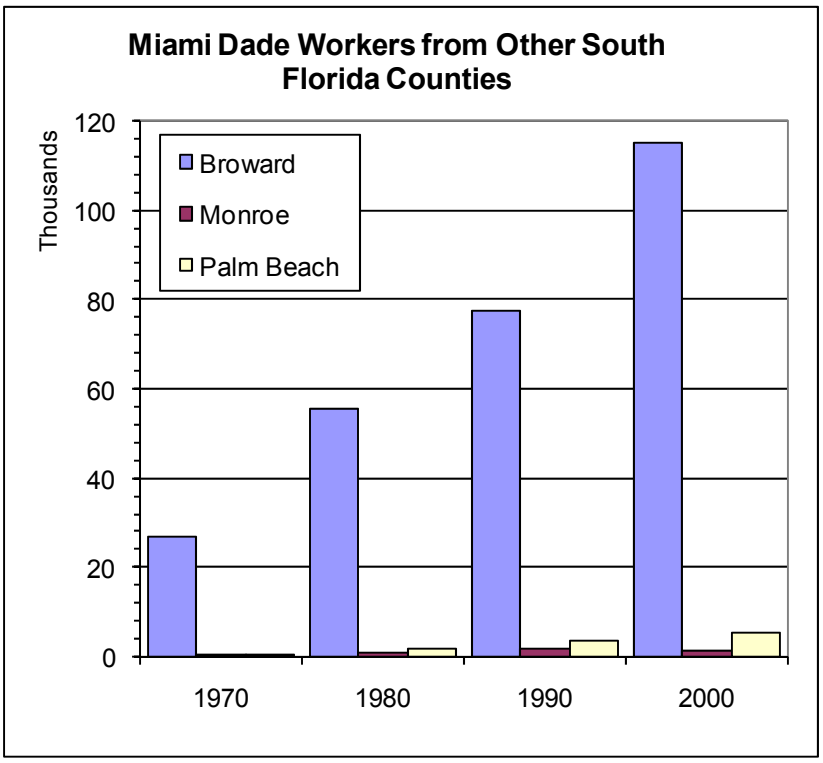
Source: U.S. Census, ACS



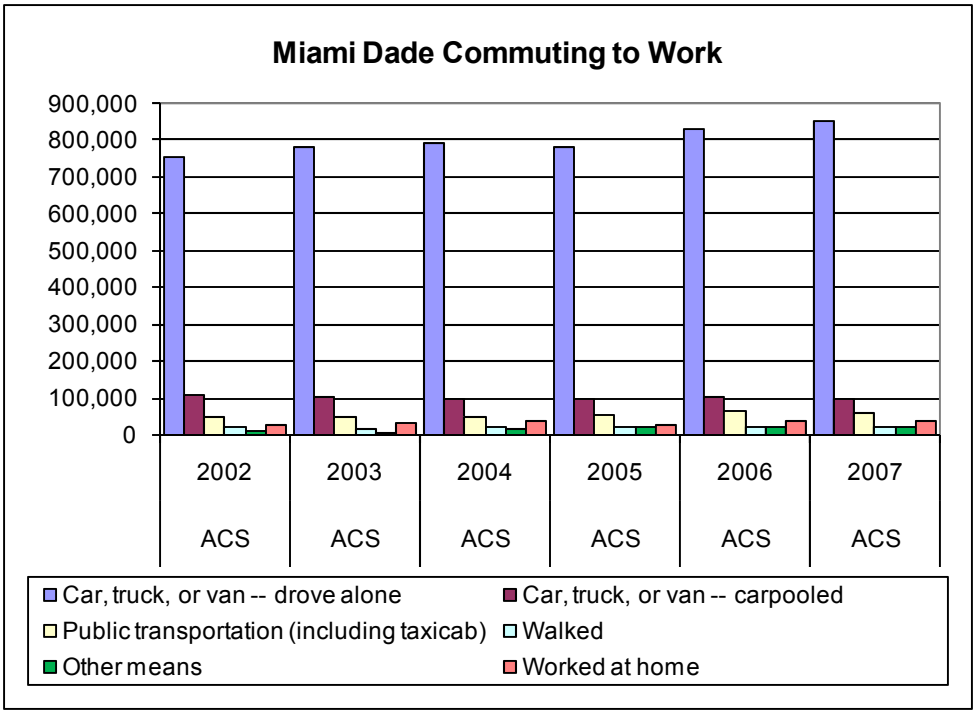
COMMUTING DISTANCES: Commuting distances are impacted by job housing locations and the nature of the transportation system as well as by socio-demographic trends. The commuting patterns are partially described by cross-county commuting patterns. Miami-Dade County is an integral part of the metro area and work commuting between adjacent counties is common.



Source: U.S. Census, 1970-2000



COMMUTING MODES: Commuting modes are reported on the census long form and more recently on the American Community Survey. Commuting modes is a key indicator of the acceptance of and demand for the alternative travel options.



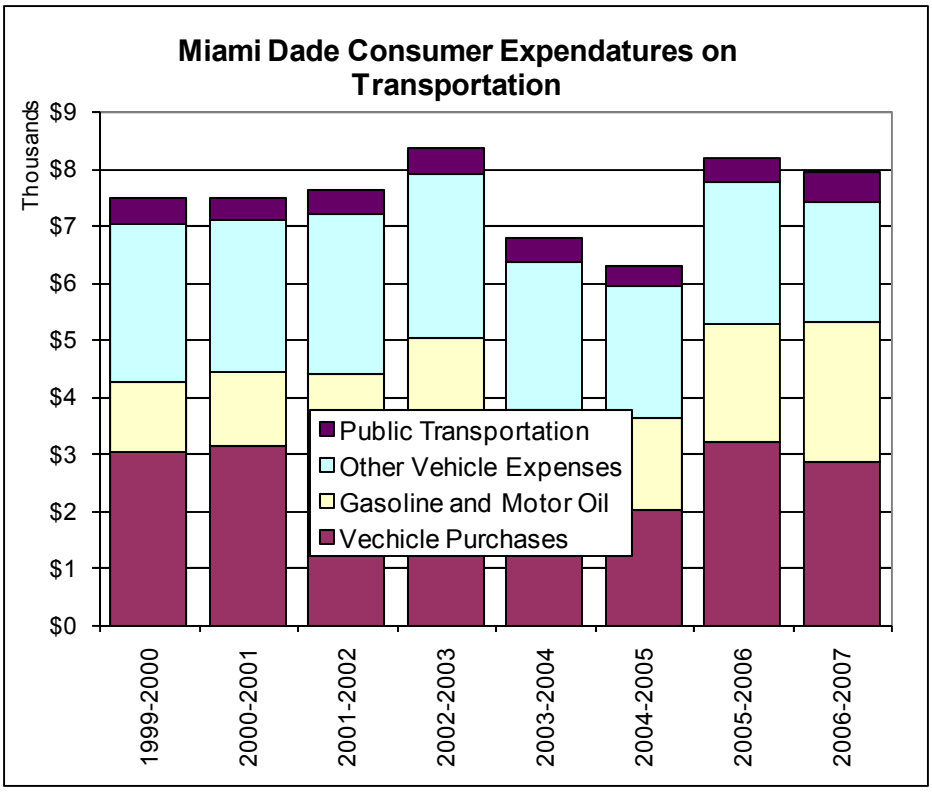
Source: U.S. Census, ACS

- Miami-Dade has the highest transit commute mode share in Florida.
- Florida is more auto dependent than the rest of the nation.
- Work at home is one of the faster growing categories but lags in Miami-Dade County.

COMMUTING TO WORK, 2007	United States	Florida	Miami-Dade County
Workers 16 years and over			
Car, truck, or van -- drove alone	76.1%	79.6%	77.8%
Car, truck, or van -- carpooled	10.4%	10.5%	9.1%
Public transportation (including taxicab)	4. 9%	1.9%	5.3%
Walked	2.8%	1.6%	2.2%
Other means	1.7%	2.1%	2.1%
Worked at home	4.1%	4.2%	3.5%

Source: U.S. Census, ACS

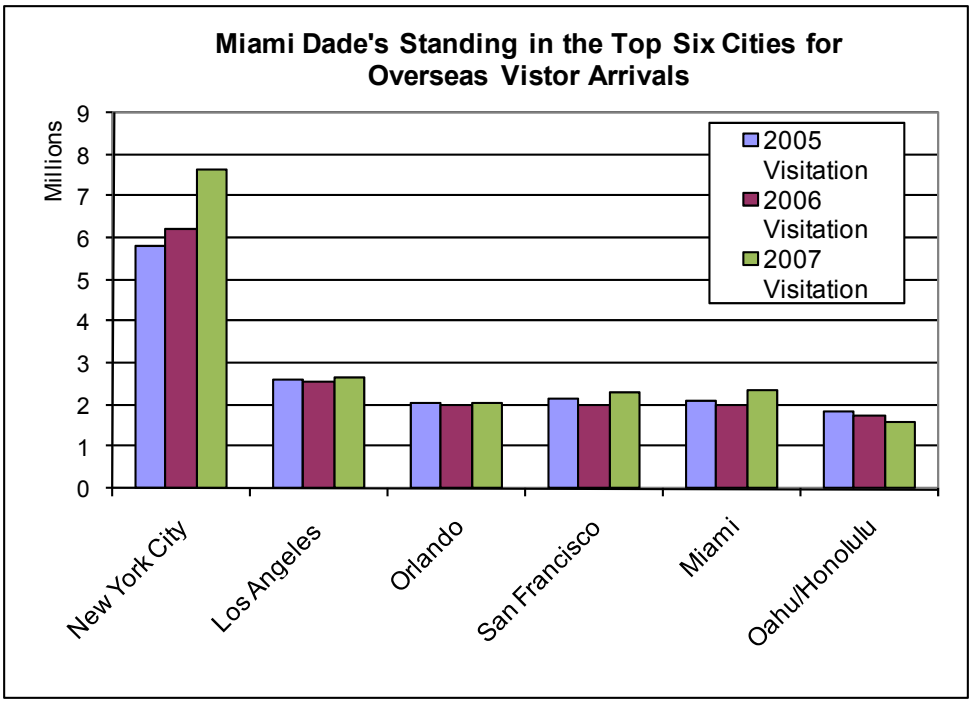
TRAVEL EXPENDITURES: Travel spending constitutes a significant share of household expenditures. The major expenses include payment of lease or purchase costs/payments for vehicles, operating costs for vehicles including insurance, maintenance, and fuel. Public transit spending includes all costs for purchased services such as airline tickets, cab fares, and transit fares.



Source: Bureau of Labor Statistics, Consumer Expenditure Survey

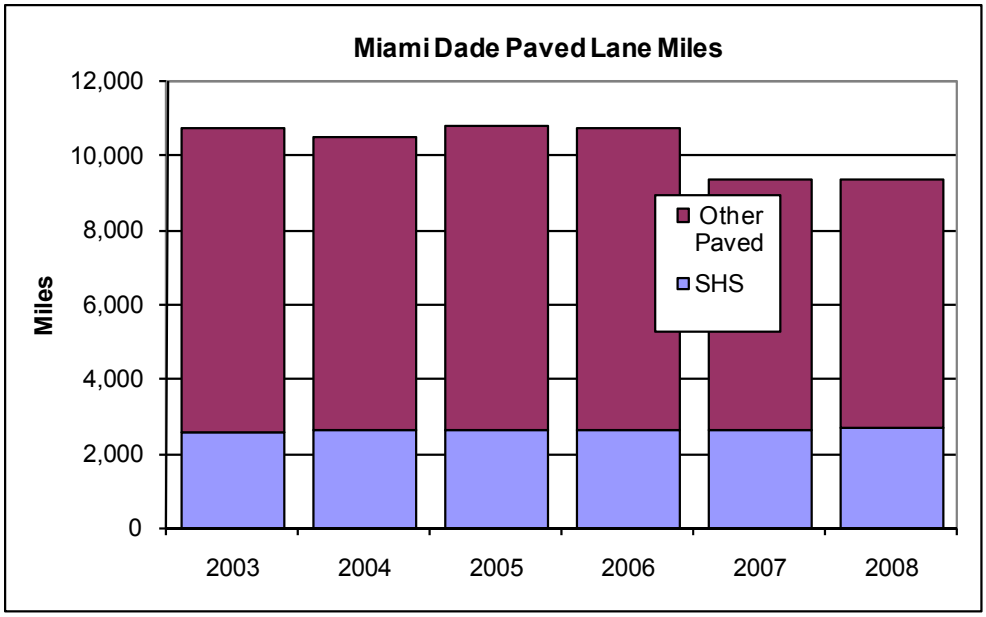
- In Miami-Dade County, household expenditures on transportation totaled $8,186 in the 2005-2006 fiscal year 12-month period.
- This compares with $8,000 nationally.

TOURIST TRAVEL: Tourist travel is another element of overall travel demand. In Florida tourist travel is a significant component of demand and influences investment and service needs and designs. Miami is the fifth ranked U.S city for overseas visitors.



Source: 2007 Florida Visitor Study, VISIT FLORIDA

ROADWAY INFRASTRUCTURE: Roadway Infrastructure is a critical component of mobility, as it is the network for the vast majority of person and freight travel. Centerline miles is a measure of the linear amount of roadway network. Lane miles takes into consideration the roadway lanes and hence provides a measure of capacity. In spite of strong growth in population and travel demand, roadway capacity has grown very slowly. Local roads are designed for property access and not capacity, thus, capacity is provided by collector and higher classifications of roads. It is these categories where growth was very modest. Ultimately, this produces greater congestion, diversion to other means of travel or foregone travel.



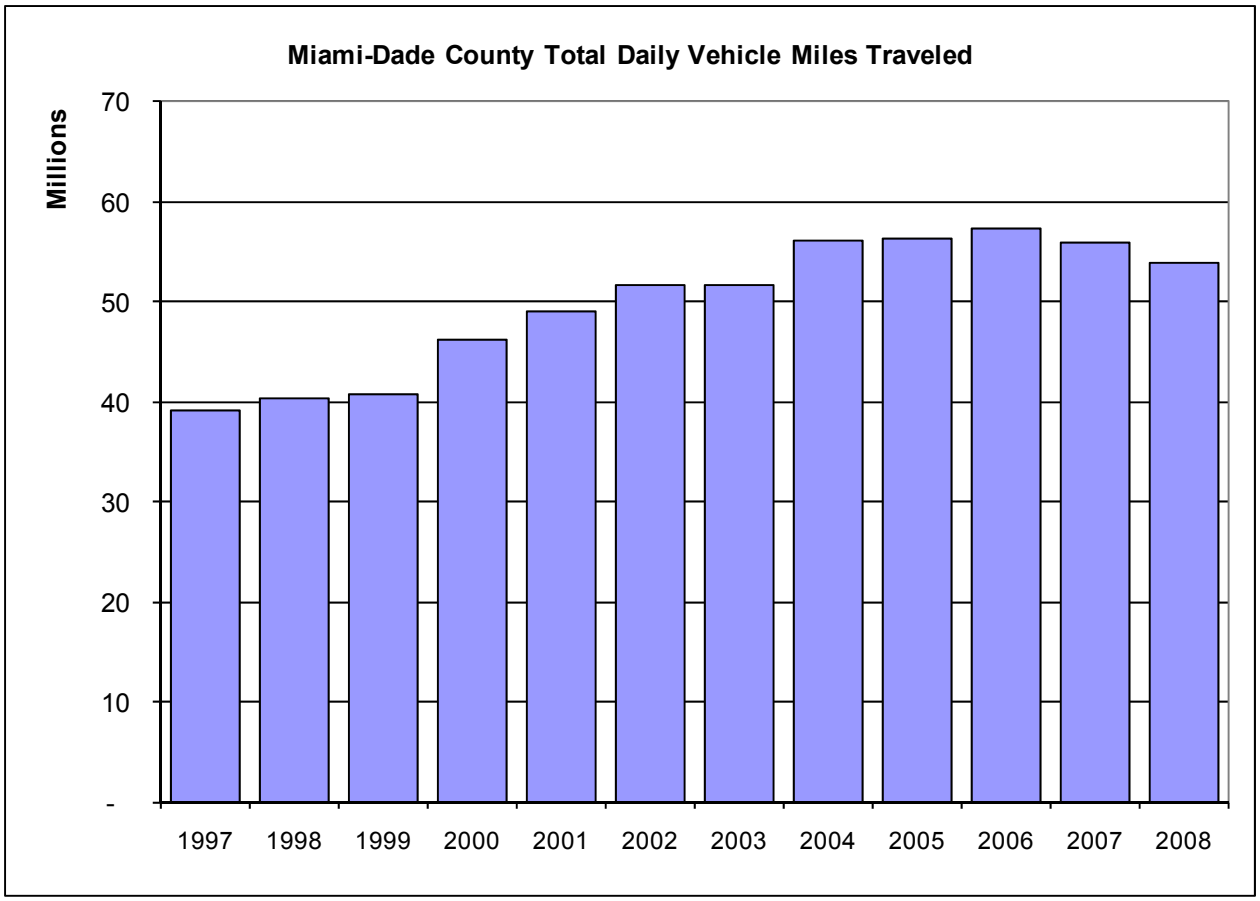
Source: Florida Department of Transportation, Highway Mileage Reports.

Note: Reporting of roadway mileage is affected by definitions, reclassifications and local data collection efforts. For minor classes of roads there are often fluctuations that are not meaningful in terms of capacity changes.

Miami-Dade Centerline Miles							
Year	Inter-state	Turnpike & Freeways	Other Principle Arterials	Minor Arterials	Urban/ Major Collector	Rural Minor Collector	Locals
2000	28.4	92.5	304.9	405.2	451.8	0.0	5,619.2
2001	28.4	92.5	304.7	404.0	451.6	0.0	5,582.7
2002	28.4	92.3	304.7	404.8	456.3	0.0	7,531.2
2003	28.4	92.5	304.6	407.5	454.7	0.0	7,555.6
2004	28.4	101.3	296.2	427.3	520.9	32.4	7,206.8
2005	28.4	98.7	298.8	427.5	520.9	32.4	7,509.1
2006	28.4	101.2	300.1	424.7	520.3	32.4	7,419.4
2007	28.4	101.2	300.2	424.6	520.0	32.4	6,419.9
2008	28.4	108.5	299.5	424.6	518.7	32.4	5,925.0
2000-2007	0	16.0	-5.4	19.4	66.9	32.4	305.8

Source: FDOT Mileage Report

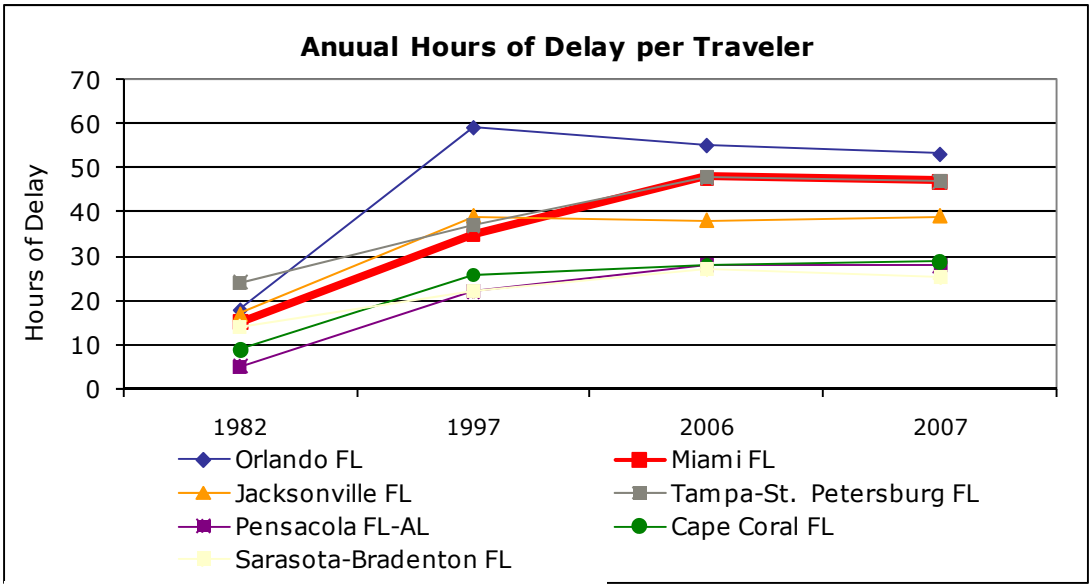
VEHICLE TRAVEL: Vehicle travel is measured in terms of vehicle miles of travel and the measure captures all elements of roadway travel by residents, tourists and visitors, and freight and commercial vehicles. It is the single most comprehensive measure of demand and as roadways are the dominant mode it is the largest means of travel.



Source: Florida Department of Transportation, Highway Mileage Reports.

- The historical growth of VMT has slowed and showed a decline in 2007.
- 2008 data indicate a decline in VMT nationally due to fuel prices and a slowing economy. A similar trend is observed in Miami-Dade.

CONGESTION: Congestion is a measure of the performance of the roadway system. While there is no perfect measure of congestion, the most widely-used measure is a measure of congestion delay and the travel time index. These measures are calculated as part of *The 2009 Urban Mobility Report*, a biannually produced portrait of congestion trends nationally.



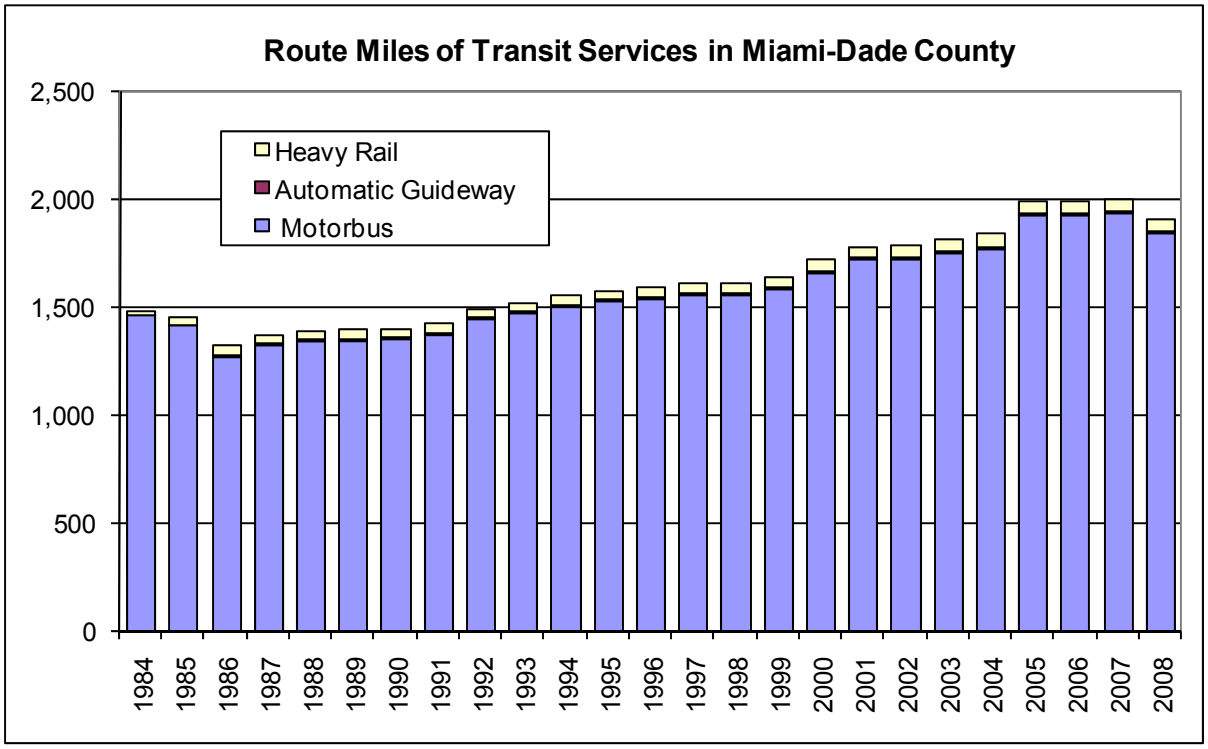
Source: *The 2009 Urban Mobility Report*

Annual Delay per Traveler, 1982 to 2007

Urban Area	Population Group	Annual Hours of Delay per Traveler				Long Term Change 1982 to 2007		
		2007	2006	1997	1982	Hours	Rank	Rank in U.S.
Florida								
Orlando FL	Large	53	55	59	18	35	1	6
Miami FL	Very Large	47	48	35	15	32	2	11
Jacksonville FL	Large	39	38	39	17	22	5	36
Tampa-St. Petersburg FL	Large	47	48	37	24	23	3	32
Weighted Mean Delay per Traveler		**44.53**	**45.46**	**37.21**	**16.78**	**27.80**		
Group means for U.S. (By Population Group)								
Very Large Average		51	52	43	21	33		
Large Average		35	36	30	11	26		

Source: *The 2009 Urban Mobility Report*

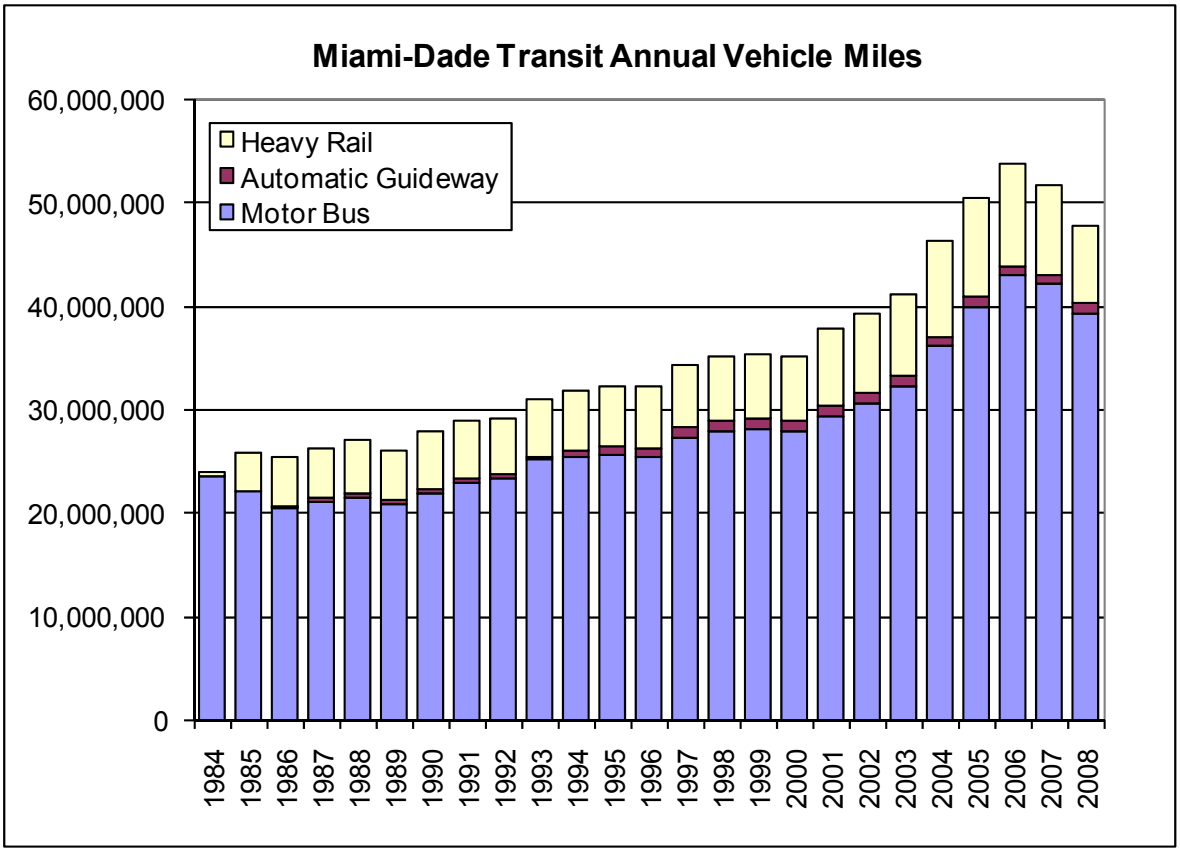
TRANSIT SERVICE COVERAGE: Transit service coverage, expressed as route miles of transit, is an indicator of the extensiveness of the network of transit services. More coverage enables more persons to have access to the service and/or more direct connections between origins and destinations.



Source: National Transit Database, FTIS.

- Service coverage has generally increased modestly with a few periods of retrenchment.

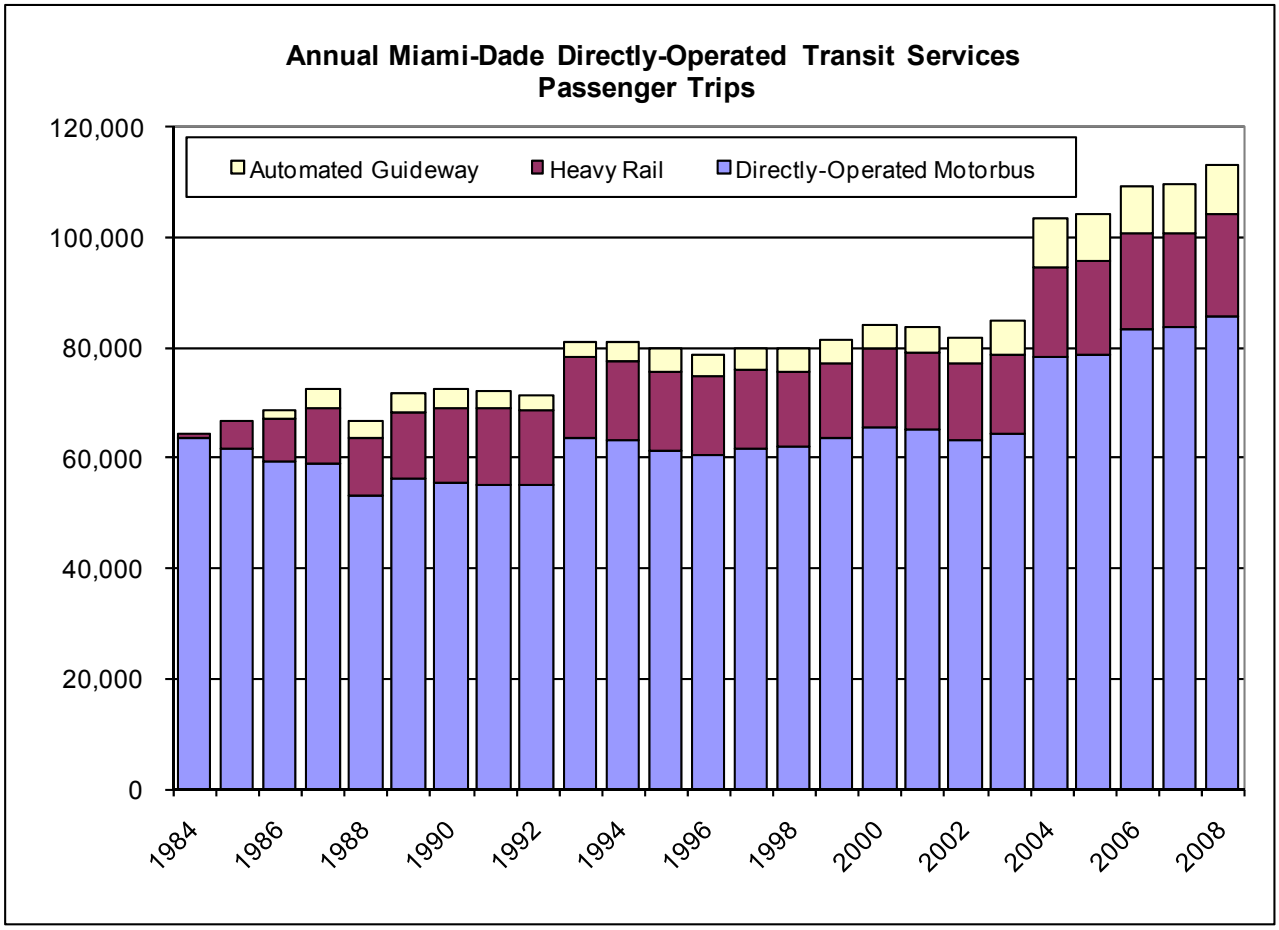
TRANSIT SERVICE: Transit service, as measured by vehicle miles of service, represents a major investment in service and infrastructure to enable mobility. The supply of service defines the potential role that transit can play in meeting mobility needs.



Source: National Transit Database

- Service supply for all modes of transit travel has increased with more significant increases since 2002.
- Both motor bus and heavy rail service had increased over 50 percent between 2000 and 2006 but have recently been scaled back.

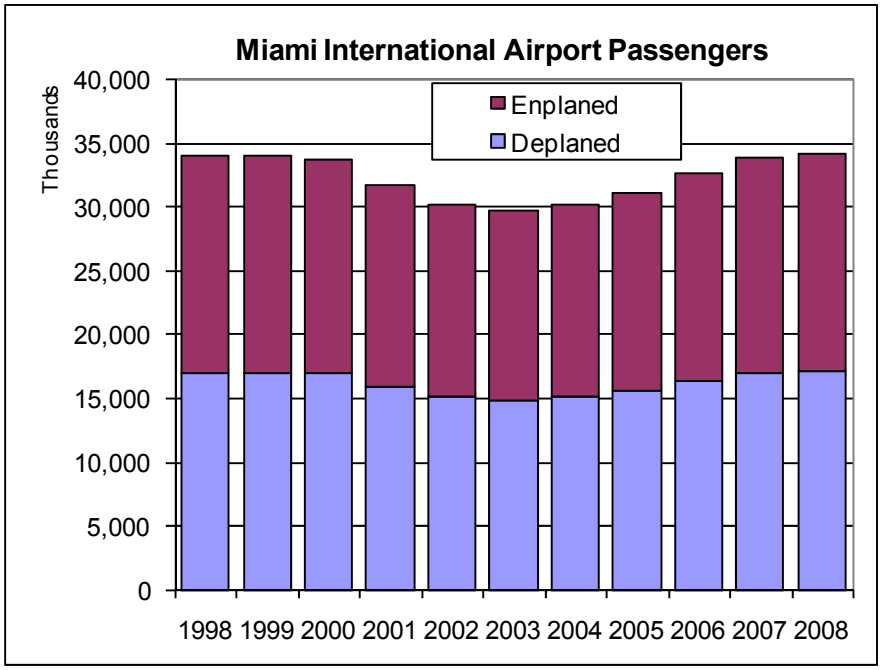
TRANSIT RIDERSHIP: Transit ridership is an indication of how much transit service is used. Use of transit is influenced by the levels of service, population, service quality and competitive characteristics of the competing modes. Factors such as convenience, travel speed, and cost are most important in the level of transit use.



Source: National Transit Database

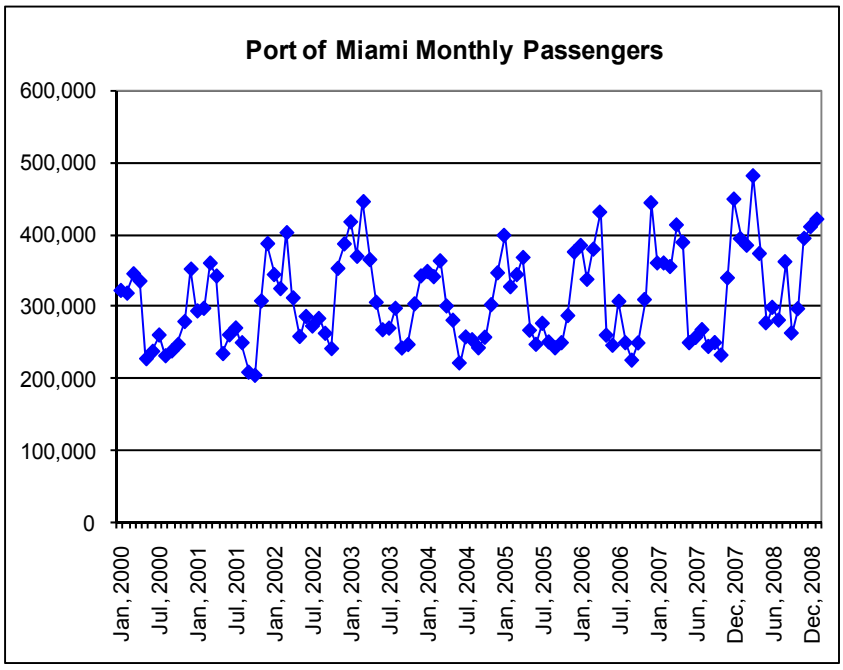
- Transit ridership growth has continued in spite of recent service cutbacks.

AIR AND SEAPORT TRAVEL: Air and seaport travel is a critical component of travel demand, as it accommodates significant tourist and business travel demand. The level of activities at the airport and seaport significantly influence the surface transportation systems.



Source: Miami Dade Aviation Department Year End Reports

- Cruise activities have shown an overall growth trend with fluctuations.
- Air travel activity was impacted by September 11, 2001, and economic trends.



Source: Port of Miami