

Low Density Transit in the United States: Year 2050

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Introduction

The land use trends of the 1990's and the new millennium are best characterized by suburban, low-density development. A prosperous economic climate coupled with the perception of a higher quality of life, paved the way for a construction boom in the suburbs and fringe. During this period of robust development, little thought was given to accommodating pedestrians, bicyclists, or other transportation alternatives. As a result, most of these low-density areas are extremely automobile dependent and there is little political, technical, and economic feasibility to introduce other transportation options.

Providing transit service to suburbs and rural areas will present numerous challenges for transportation planners over the next fifty years. Changes in demographics, public policy, and availability of natural resources are likely to increase the demand for transportation alternatives in low-density areas. The demographics of the United States will change dramatically by the year 2050. By the year 2045, the number of Americans over the age of 65 will almost double from 35 million in 2003 to 62.6 million by 2045.¹ According to U.S. Census population projections, the distribution of age is expected to level off by 2050.

Changes in public policy are also likely to increase demand for low-density transit operations. Today in 2003, some states are considering stricter laws for licensed drivers over the age of 75 years old. If these stricter measures prevail, fewer elderly drivers will qualify for driver's licenses, which will increase the demand for alternative modes of transportation. Finally, the world's dwindling supply of oil may cause an increase in the cost of gasoline in the United States. As gasoline prices increase and it becomes scarce, other alternatives will be sought by drivers. In low-density, automobile dependent areas, a new interest in public transportation may emerge.

This report will focus on the unique challenges of providing public transportation in low-density areas. Changes in demographics, public policy, natural resources, and public demand will be considered in determining the best transit models for these areas. Since traditional transit models are designed to provide service to high density areas, it will be necessary to look at existing low-density transit models and develop new models to fit this niche.

Problem Statement

The low-density development and Euclidian land use patterns (separate zoning named after the court case *Village of Euclid, Ohio v. Ambler Realty Co. 1926*) found in suburban and rural areas make it virtually impossible to implement a traditional transit program that usually serves high-density, urban areas. By the year 2050, there will be increased demand from residents to provide rural and low-

¹ Population Projections Program, Population Division, U.S. Census Bureau, Washington, D.C. 20233

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density transit operations. In efforts to respond to this demand, local governments will seek new transportation models that provide efficient and economically viable transit operations.

Part One: Events Leading up to 2050

Population Shifts and Trends

The 1900's can be characterized as a century of great shifts in population. At the beginning of the 20th century, 75% of U.S. residents lived in rural areas, while only 25% lived in urban areas.² By the end of the century, these numbers had flip-flopped and today approximately 75% of the population lives in urban areas. Suburbs, part of the urban area, experienced the greatest amount of growth. In 1920 12% of U.S. residents lived in the suburbs, but by 2000 that percentage had grown to 52%³.

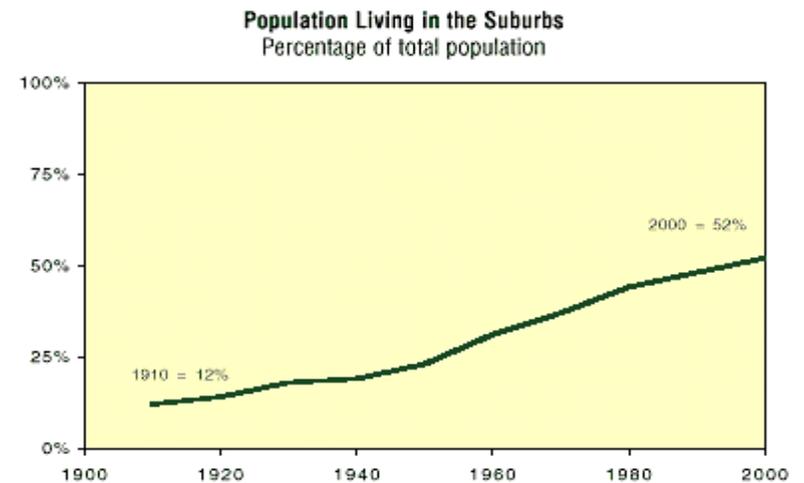
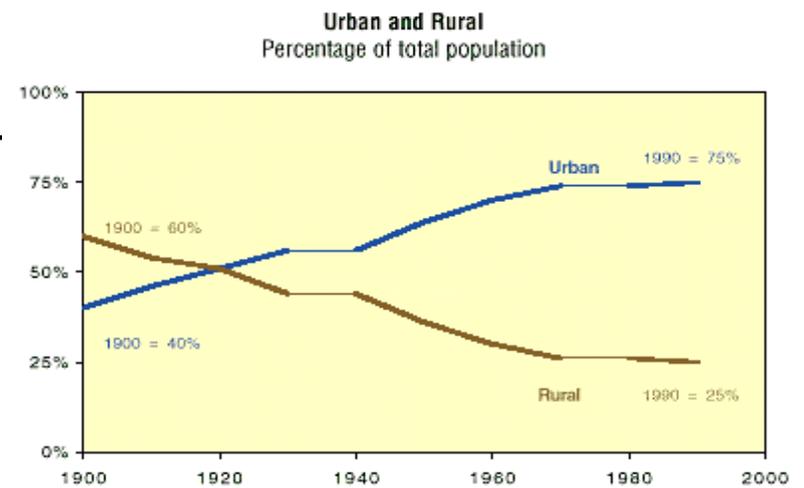
The flight to the suburbs was aided by federal policies such as the National Housing Act of 1934, which was intended to increase homeownership; and the National Interstate and Defense Highway Act of 1956 that funded the interstate highway system. Cheap land outside of the city was now easily reachable via the newly constructed freeways. Suburban population growth boomed.

Land Use

Land use patterns in suburban areas are characterized by Euclidean zoning that does not allow for mixed uses. Businesses are separated from residential and the automobile is the primary, if not only, mode of transportation. Consumption of land occurs faster than population growth. It is estimated by the U.S. Department of Agriculture that between 1982 and 1997, per capita land consumption was .366 (in acres) up 16% over this period. This means that it takes about .366 acres for the average American for housing, retail,

² 2000 U.S. Census

³ "THE FIRST MEASURED CENTURY: An Illustrated Guide to Trends in America, 1900–2000." Theodore Caplow, Louis Hicks and Ben J. Wattenberg. <http://www.PBS.org>. November 2003.



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Transportation ,recreation, religious, and school purposes. Based upon the proliferation of big box retailers and continued expansion of roads, it is likely that land consumption per capita will continue to grow.

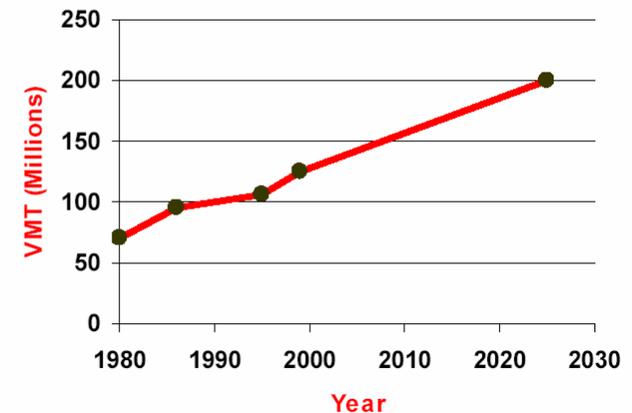
Environmental Policy

As automobile dependence continues to grow, air quality in the United States has become poorer. According to the U.S. Environmental Protection Agency (EPA), “tailpipe emissions from cars and trucks account for almost a third of the air pollution in the United States.” In efforts to mitigate the environmental damage caused by automobile emissions and other pollutants, the federal government enacted several pieces of legislation. The Clean Air Act Amendments of 1990 gave the EPA greater authority to regulate automobile emissions. Many areas of the county have mandatory, periodic inspection and maintenance programs designed to monitor emissions and reduce the number of heavy polluters. Emissions standards are particularly important in areas where the automobile is the only viable mode of transportation as is the case in low-density areas.

Energy Supply

According to the Energy Information Administration (EIA) of the U.S. Department of Energy, “the United States of America is the world's largest energy producer, consumer, and net importer.” In the context of low-density, auto-dependent communities, the consumption of oil is particularly important. According to the U.S. Census, the average American makes 3.3 trips per person on a typical weekday. In low-density areas, where residential uses are separated from business and retail uses, vehicle miles traveled (VMT) are greater than in high-density, compactly developed areas. Higher VMT in low-density areas in turn contribute to higher gasoline consumption. When high VMT are coupled with SUV use, which average around 20.7 mpg, the rate of oil consumption is even greater. It is difficult to determine the actual amount of oil left in the world, but the EIA predicts that “motor gasoline demand is projected to increase 2.6%, reflecting a continued acceleration of economic growth and a 6% decline in retail pump prices.” If gas prices continue to be low and VMT continue to increase because of low-density development, it is expected that oil consumption will not decrease.

MOBILITY 2025 UPDATE Vehicle Miles of Travel



SOURCE: NCTCOG Transportation Department

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Characteristics of the Suburbs

Suburban communities are characterized by low-density, Euclidean zoning that generally does not mix land uses. As a result, residential developments are separate from business, retail, and industry. Business and industrial parks dot the landscapes with one-story buildings, large parking lots, and large setbacks from streets and other buildings. Big box retailers and strip malls are also staples of suburban developments with large setbacks and vast parking lots. Residential developments usually occur in subdivisions and often have little interconnectivity with other subdivisions. Single-family homes are set on large lots of 1/3 of an acre or more. Homes are set further back from the road and may or may not have sidewalks. Many new subdivisions require all homes to have three car garages.

Street patterns in suburban communities do not follow the typical urban street grid pattern. Instead, four to six lane roads go through the major commercial areas and branch off into residential streets with many cul-de-sacs. Expansion of roads to accommodate new growth and traffic is common, but little consideration is given to investing in to other modes of transportation. As a result, automobile dependence is a way of life in most suburban communities and the low-density, segregated land use patterns exacerbate the situation.

Travel Patterns

Contrary to popular belief, most suburbs are not simply bedroom communities anymore. Between 1960 and 1980, two-thirds of all metropolitan job growth occurred in the suburbs.⁴ In 1990, 52% of all metropolitan jobs were located in the suburbs and one-third of commutes are suburb-to-suburb.⁵ The 2000 U.S. Census offers further insight into the travel patterns of U.S. workers. Over 54% of commutes are more than 20 minutes and 75.7% of workers drive alone to work.

⁴ Katherine Hooper. "Innovative Suburb-to Suburb Transit Practices." Transit Cooperative Research Program. (Washington, D.C.: National Academy Press, 1995).

⁵ Robert Cervero. "Guidelines for Enhancing Mobility Using Public Transportation." Report 55: Transit Cooperative Research Program. (Washington, D.C., National Academy Press, 1999).



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Less than 15% of workers live within 10 minutes of work. As distances between home and work continue to increase so do congestion and travel times.

Part Two: Adapting Transit to the Suburbs

Today, in 2003, there are several low-density transit systems in the United States that could possibly serve as models for the year 2050. The following sections of this report will focus on the unique challenges posed by low-density communities, present day models, and innovative approaches to offering transit service. Before proceeding, it is important to understand the assumptions made about society in the year 2050 in this report. First, there will not be major shortages of energy supplies such as oil that will force residents to use transit. Second, oil prices in 2050 will not be so cost prohibitive that most residents will be forced to use transit for economic reasons. Third, major investments in rapid transit will not be made for suburb-to-suburb travel. Therefore, buses will most likely be the most economically viable transit mode. Fourth, there will not be any sweeping changes in public opinion regarding sustainability of natural resources. These assumptions define the low end of the future for transit. If these assumptions prove to be wrong, the future could be very different and transit could have an expanded role.

Despite the overwhelming automobile dependence found in suburban communities, not all residents have access to an automobile. Residents who are transit disadvantaged generally include the elderly, school-age children, disabled, and the poor. Traditionally, these populations reside in central cities, where transit is provided, or remain isolated in rural areas. As suburbs continue to grow and baby-boomers hit peak age in 2030, demand for transit in suburban areas may increase. The challenge for low-density areas is to respond to these demands in a way that is effective and economically viable.

A comprehensive suburban transit model may address one or all of the following travel patterns: suburb-to-suburb travel, intra-suburb travel, and inter-city travel. For the purposes of this report, emphasis will be given to suburb-to-suburb travel and intra-suburb travel via buses.

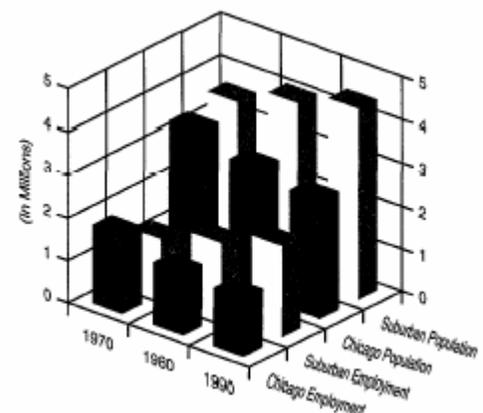
Who Provides Transit Service?

Figuring out who is responsible for operating a low-density transit system is a major challenge. Suburban travel patterns often cross jurisdictional boundaries. Since population distribution is less dense than that of cities, there are fewer passengers overall, which means that a large fleet of conventional 40 foot buses is not efficient. A regional approach is probably the most cost-effective way of operating a suburban transit system, but the most difficult to create politically. Successful regional suburban models such as PACE in Metropolitan Chicago, have created a regional transit authority to oversee the operations.

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PACE: Metropolitan Chicago

PACE has provided bus transit in metropolitan Chicago since 1983 and is the suburban arm of the Chicago Regional Transit Authority (RTA). PACE serves six counties—Cook, DuPage, Kane, Lake, McHenry, and Will—over 3446 square miles, which is the size of the state of Connecticut. In 2003, the total annual system ridership was 34.9 million passengers.⁶ The six-county region includes 210 municipalities and approximately 48% of PACE's trips are suburb-to-suburb.⁷ PACE is the 14th largest bus system in North America serving 130,000 daily riders, which includes 240 routes, 450 vanpools and a Dial-A-Ride program.⁸ In addition, PACE operates 356 paratransit buses for the elderly and disabled. The average fare for each trip is \$1.50.



The growth in suburban Chicago closely mirrors suburban growth nationally. Between 1980 and 1990, the City of Chicago experienced a 7.3% decline in population and 6.2% decline in employment base. During the same period, suburban population grew by 9.3% and employment base increased by 24.7%.⁹ As a result, 40% of metropolitan Chicago's office space is in the suburbs, most of which are largely transit inaccessible.

⁶ PACE Bus web site. <http://www.pacebus.com/sub/about/default.asp>. December 2003.

⁷ Hooper (see note 3)

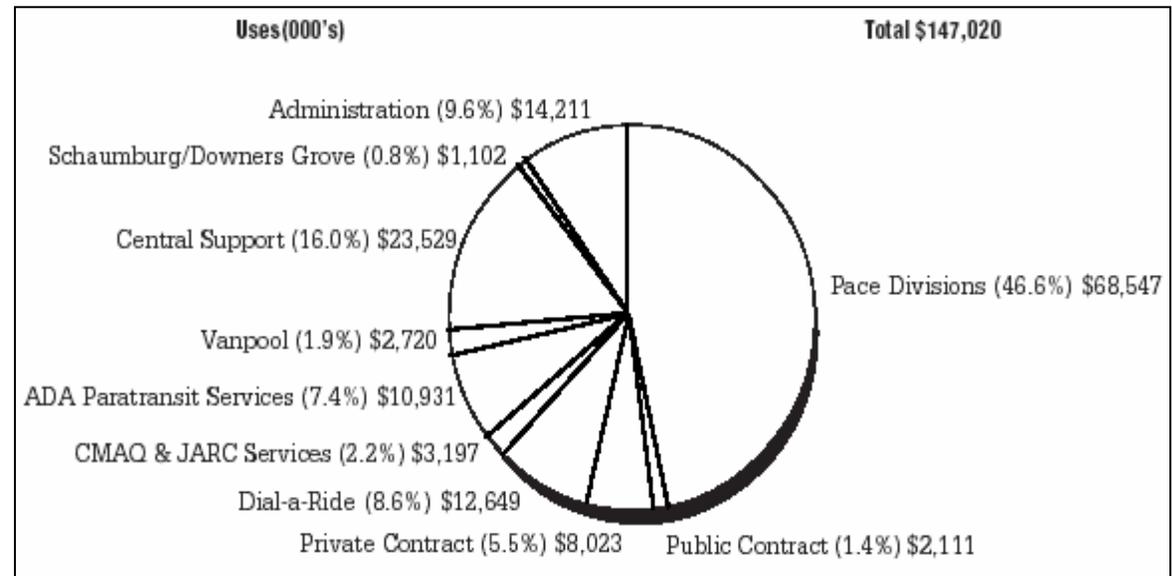
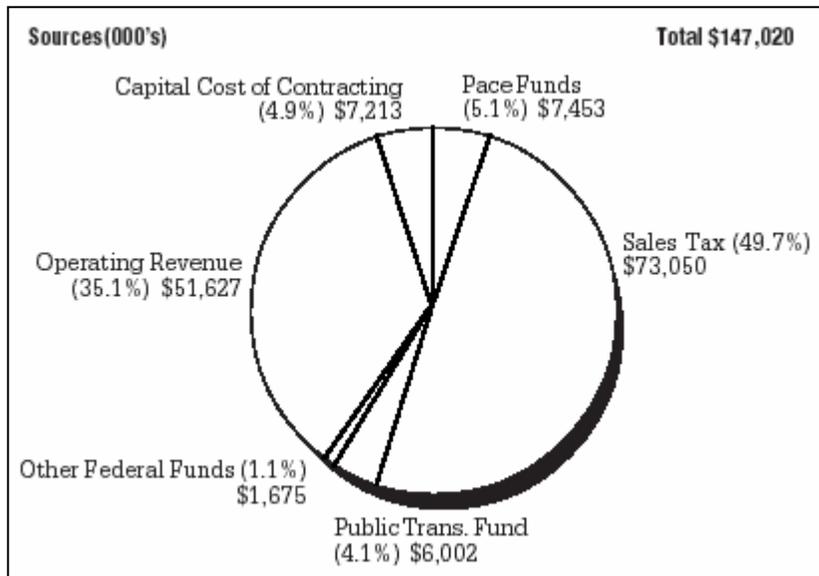
⁸ PACE Bus web site. <http://www.pacebus.com/sub/about/default.asp>. December 2003.

⁹ Cervero (see note 4)

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Budget

PACE is funded primarily through the RTA, along with Federal and PACE funding. The Amended RTA Act allows the RTA to levy a 1% sales tax in Cook County and .25% sales tax in DuPage, McHenry, Lake, Kane, and Will counties. PACE expects to receive \$73 million in 2004.¹⁰ The Amended RTA Act also establishes a Public Transportation Fund (PTF) in the State of Illinois treasury that is equal to 25% of total sales tax revenues. The RTA allocates the PTF funding at its discretion giving PACE \$6 million for operating purposes. Since 1996, PACE has also received assistance from the federal government through the Congestion Mitigation/Air Quality (CMAQ) program.



¹⁰ PACE Bus web site. 2004 Annual Budget Document. http://www.pacebus.com/sub/about/annual_budget.asp. December 2003

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PACE: Secrets to Success

The success of PACE can be attributed to many factors. However, there are a few factors that set PACE apart from other suburban transit systems.

Illinois Law

Federal and state legislative measures have improved the transit environment in metropolitan Chicago. Northeastern Illinois, which includes the Chicago suburbs, is a severe nonattainment area under the Clean Air Act of 1990, which regulates air quality standards. Based upon its nonattainment status, the state of Illinois is required to take action to improve its air quality. As a result, the state of Illinois legislature passed the Employee Commute Options (ECO) Act. The law targets suburban employers with 100 employees and requires them to increase the average passenger occupancy (APO) of automobiles to 1.36 by July 1998¹¹. This applies to employees arriving at the employment site during peak times.

PACE anticipated that the law would increase demand for alternative modes of transit. However, in March 1995, the Governor of Illinois cancelled the requirement due to budgetary constraints.¹² However, some employers issues are still interested in PACE and forming partnerships.

Private-Public Partnerships

PACE's success can be attributed to the private-public relationships forged with Chicago area employers. These partnerships range from the creation of educational programs for employees to financial support for transit. While much of the contact with employers is informational through marketing efforts, some contacts, especially with large companies or ones that have relocated from the city, are particularly fruitful.

Recently, PACE announced a partnership with United Postal Service (UPS) that resulted in two fully funded bus stations and new routes to UPS. According to the November 25, 2003 press release "UPS donated the land for the new terminals, and continues to fund 80 percent of the Pace bus service to its CACH. That subsidy totals about \$1 million a year."¹³ These private-public

¹¹ Cervero (see note 4)

¹² Cervero (see note 4)

¹³ PACE Bus web site (see reference 7)

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partnerships are instrumental in improving service to area employers and their employees. When Sears relocated from the Sears Tower in Chicago to Hoffman Estates, PACE was successful in attracting 25% of the 5000 employees to its transit system.¹⁴

Transit Oriented Development

PACE realizes that Transit Oriented Development (TOD) is an essential part of ensuring a viable transit system. In efforts to ensure that new developments are transit sensitive, PACE created a document titled "Development Guidelines" to assist planners and developers. The guidelines offer information on the benefits of transit oriented development on transit systems, the benefits to the environment, and possible reductions in traffic congestion. PACE offers free site plan reviews and suggests transit friendly options to municipalities. PACE believes that "Public transportation, as a means for improving mobility, maintaining employment, conserving natural resources as well as reducing traffic congestion and associated emissions, can be--and should be-- coordinated with land use planning."¹⁵ While use of the guidelines is purely voluntary, it is recognized that the most effective transit services depend on the ease in which passengers can reach bus service.

Vanpool¹⁶



PACE operates the second largest vanpool program in the United States with 450 vanpools. The traditional vanpool program pairs 5-15 commuters who live and work near each other. Each vanpool commuter pays for a portion of the gas, insurance, and maintenance costs of the van. For example, a commuter in a 9-10 passenger vanpool that commutes 31-40 miles roundtrip each day will pay \$59 per month to participate.

Employees are able to pay for this pre-tax through the Commuters Choice Benefits Program. In efforts to accommodate participants in the event of a family emergency, the vanpool program offers \$100 for Guaranteed Ride Home reimbursement. Additionally, participants who must use transit to get to their designated pick up location, can receive a monthly pass for free transit to this location. Other variations of the vanpool program are also offered such as: Employer Shuttle, Metra Feeders, ADvANTAGE Van, and Non-Emergency Medical.

Other Suburban Models

New Jersey Transit: Newark, New Jersey

¹⁴ Cervero (see note 4)

¹⁵ PACE Bus web site. "Development Guidelines". http://www.pacebus.com/sub/guidelines/development_guidelines/intro.htm. December 2003.

¹⁶ All information obtained from PACE bus web site. <http://www.pacebus.com/sub/vanpool/default.asp>. December 2003.

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Like the Chicago suburbs, there was significant growth in the New Jersey suburbs in the 1980's. According to a Rutgers University study, approximately 80% of new jobs created in New Jersey during the 1980's occurred in the suburbs. Recognizing the fact that suburban transit markets are distinctly different from urban transit markets, New Jersey Transit (NJ Transit) created the WHEELS program. The WHEELS program is comprised of three components fixed route bus, rail, and suburban employment. Since this report focuses on bus transit models, the rail component of this program will not be considered.

The marketing of the WHEELS program focuses on suburban employment needs and was created for this sole purpose. Like PACE, NJ Transit offers numerous nontraditional transit options to suburban commuters that include flexible routes and mini-buses.

Environmental concerns are also addressed by NJ Transit. In 1995, 18 of 21 New Jersey counties were in severe nonattainment areas for ozone as mandated by the Clean Air Act Amendments of 1990. The New Jersey State Legislature also passed employer trip reduction (ETR) legislation that required employers with over 100 employees to obtain an average passenger occupancy rate of not less than 25 percent above the average vehicle occupancy rate set for all such trip on the region by November 1996.¹⁷ The WHEELS program includes an Ozone Pass Program that allows \$2.00 roundtrip rides on all NJ Transit buses, rail, and the Newark city subway on Ozone Action Days and Ozone Health Watch Days.¹⁸

Shared-Ride Taxi Program: Ozaukee County, Wisconsin

The Ozaukee County Shared-RideTaxi Program began as a transportation program for the elderly and disabled in the 1970's. In 1998, the program expanded to provide rides to all county residents regardless of age. Currently, there are 18 vehicles in the fleet including 4 ADA accessible vehicles. All but one vehicle is owned by the county, however a private contractor has a 5-year contract to run the services. Funding is secured from the state and federal governments.

The shared-ride program splits the county into six zones for fare purposes. Fares depend upon the number of zones traveled. For example, an adult traveling within one zone pays \$2.75 per trip and \$6.50 for four zones per trip. Seniors and students receive discounts. Frequent rider cards are also available for frequent users. Riders in wheelchairs that require door-to-door service may receive assistance at no extra charge.

The feedback on the program has been mainly positive. One Ozaukee County city questioned the need for such a program when they believed that "everyone had cars", but this proved not to be the case. However, the program does face some criticism. The hours of operation are mainly during the daytime hours, which leaves those seeking a ride after 6:00 p.m. without an option. Overall,

¹⁷ Katherine Hooper. "Innovative Suburb-to Suburb Transit Practices." Transit Cooperative Research Program. (Washington, D.C.: National Academy Press, 1995).

¹⁸ Greater Mercer Transportation Management Authority. [Http://www.gmtma.org/ozonepass.htm](http://www.gmtma.org/ozonepass.htm). December 2003.

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the Ozaukee County Shared-Ride Taxi Program is a good model of county-wide collaboration to provide an alternative mode of transportation.

Part Three: The 2050 Challenge

Suburban Obstacles and Challenges

Any transit system whether it is in the city or the suburbs must be competitive with a private automobile. The automobile with its convenience and perceived inexpensive cost is the biggest threat to the success of a transit system. It is doubtful that this perception will change by 2050, unless energy supplies are depleted or sweeping public policy is adopted that makes automobiles or gasoline cost prohibitive. As a result, transit planners must find ways to put transit on the same level as the private automobile.

Factors that should be addressed include:¹⁹

- Directness/Comparative Time Travel to Car
- Comfort and Service Quality
- Scheduling for Convenience
- Pricing (cost and simplicity of payment)

Flexibility and ease of travel must also be considered to optimize a low-density transit system. These factors include:

- Flexibility of Routes
- Guaranteed Ride Home
- Peak Time Demand
- Land Use Setbacks
- Using Transit-Oriented Development (TOD)
- Coverage (extensiveness of transit system)

¹⁹ Cervero (see note 4)

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Another possible way to create a successful low-density transit system is to focus on the traditionally transit dependent populations. Again, this includes the elderly, school-age children, disabled, and the poor.

Innovative Approaches

Present day suburban transit models present a variety of innovative ways to entice current automobile drivers to use the bus. As more suburban communities begin offering low-density transit options, it is expected that new innovative models will emerge. At this point, it is beneficial for transit planners to look to successful current transit models in order predict how low-density transit will operate in 2050.

Below is a list of innovative approaches to low-density transit.

- Smaller Vehicles
- Demand Responsive Services
- Flexible Routing as Opposed to Fixed Routes (Found In Urban Areas)
- Targeted Marketing to Traditional Transit Riders and New Transit Riders
- Partnership with Private Sector
- Involvement of Transit Planners in Land Use Decisions
- Transit Oriented Development

Recommended Model for Year 2050

A viable model for 2050 transit will consider the current landscape of low-density areas including land use, travel patterns, and resident preferences; and future changes in demographics, environmental policy, and energy supply. Based on the research and models of current low-density transit services, there are a six instrumental factors in creating an effective transit model.

1. Creation of Universal Transit-Oriented Development Guidelines

Transit-Oriented Development Guidelines will assist municipalities in the review of site plans. This is important because many current suburban developments are not compatible with transit. This means that entrances to buildings are set back behind parking lots or far from the road. TOD Guidelines can be used to ensure that these types of buildings are modified and result in transit-friendly developments. The most effective TOD guidelines will be adopted by all municipalities participating in transit services.

2. Federal/State Legislation Requiring Employers to Decrease a Percentage of Single Passenger Commute

This type of legislation will strongly encourage that employers participate in local transit services and may lead to private-public partnerships. Transit agencies need the assistance of private employers to ensure that transit services are offered effectively to area businesses. If transit services are not meeting the needs of employers, then there will not be strong

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participation. While there may be opposition to this type of legislation by employers, eventually employers will benefit by possibly reducing the size of parking lots, cleaner air quality, and an overall higher quality of life.

3. *Guaranteed Ride Home Program*

Schedules of employees may not be conducive to the fixed schedules of transit services. If transit participation is to increase, it is necessary to provide employees with a reliable way to get home in the event of a family emergency or deviation in normal working hours. A guaranteed ride home program is an essential component of a low-density, non-traditional transit service. Guaranteed ride home services may be delivered in the form of paratransit service or through taxi vouchers good for up to \$100 per year.

4. *Flexible Routing*

Flexible routing allows transit services to deviate from fixed routes. This means that routes serve areas based on riders' demands. This may be combined with Dial-A-Ride, which allows passengers to call prior to their trip to request certain destinations. Flexible routing may best serve residents when in combination with a simple fixed route. This means that flexible routes would pick up riders from areas not on the fixed route and transfer them to a fixed route stop.

5. *Peak Demand*

Peak demand service recognizes that riders demand services more at certain times of the day than others. By providing peak demand service, an agency is able to provide more frequent service and capacity at times when riders demand it. This means that during non-peak hours frequency and capacity is less, which saves the agency money in delivering service. However, most importantly, peak demand service ensures that the high demand for rides will be sufficiently met and will not leave riders waiting excessively for service or seats.

6. *Partnership with Private Sector*

Partnerships with the private sector ensure that the needs of employers and their employees is being met by the transit agency. There may also be opportunities for capital improvements projects in which the private company pays for part of the project. Partnerships result in benefits for both the private entity and the transit agency by improving transit service for the employees and customers of the private entity and increasing riders for the transit agency.

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For Further Reading

- 1) The Sierra Club: <http://www.sierraclub.org/>
- 2) PACE Bus: <http://www.pacebus.org>
- 3) "THE FIRST MEASURED CENTURY: An Illustrated Guide to Trends in America, 1900–2000." Theodore Caplow, Louis Hicks and Ben J. Wattenberg. <http://www.PBS.org>. November 2003.
- 4) Katherine Hooper. "Innovative Suburb-to Suburb Transit Practices." Transit Cooperative Research Program. (Washington, D.C.: National Academy Press, 1995). <http://gulliver.trb.org/publications/tcrp/tsyn14.pdf>
- 5) Robert Cervero. "Guidelines for Enhancing Mobility Using Public Transportation." Report 55: Transit Cooperative Research Program. (Washington, D.C., National Academy Press, 1999).
- 6) Greater Mercer Transportation Management Authority. <Http://www.gmtma.org/ozonepass.htm>. December 2003.
- 7) U.S. Census. Population Projections Program, Population Division, U.S. Census Bureau, Washington, D.C. 20233. www.census.gov
- 8) Ozaukee County Shared-Ride Taxi Program. <http://www.co.ozaukee.wi.us/Index.htm>