The urban transportation professional faces great challenges in the mid-1980's. Recently, in a presentation to the South Carolina Division, I outlined and discussed seven major issues that face the urban transportation profession in the mid 1980's. These issues are the backbone of our goals for 1985 and today I would like to discuss one of those seven issues with you in detail.

First, let me outline the seven major issues as a context for my comments:

Issue 1—There is a tremendous backlog of improvement needs on existing roads in the USA.
Issue 2—Additional roadway capacity must be gained through major improvements rather than fix-up programs.
Issue 3—The growth of the suburbs is increasing at a much faster rate than growth of the central cities, creating unusual traffic problems.
Issue 4—Changes in the work ethic are drastically impacting travel patterns.
Issue 5—Mass transit alone cannot meet the increased travel demands of the future.
Issue 6—Funding sources are becoming more controversial and difficult to utilize.
Issue 7—Public attitudes toward transportation are changing.

Today, rather than tackle seven—which would be a formidable task indeed—let me concentrate on suburban growth with some comments on public attitudes.

Breaking that topic down, let us examine some of the specifics:
—Shifts in population to the suburbs have been occurring since World War II but major concentrations of office employment have remained in the central city until recently.
—While shopping centers have decentralized over the last 20 years, the travel generated by these centers tends to peak at a time which does not conflict with commuter travel; therefore, travel patterns
generally continued to be dominated by the radial movement to the central business district.

— Due to major increases in employment in the suburbs, travel patterns have dramatically changed.
— Mass transit service is difficult to adapt to the transportation needs of the suburban employment center.
— We are building a transportation plant that fits a commuter travel pattern that is rapidly changing; the traditional concentration of public investments on radial transportation improvements to the central city may not fit the transportation patterns of tomorrow.

SHIFTS IN DEVELOPMENT

The phenomenon of population growth in the suburbs is certainly nothing new. This trend has continued unabated since World War II and is likely to continue unless we have another oil crisis. It is projected that by 1990, the suburban population in the metropolitan areas will be 86 million or an increase in the share of total population from less than 30% to over 35% in 1990.

What is new is the shift of major employment centers to the suburbs. This new trend began with the development of regional shopping centers in the 50’s—usually at or near the intersection of a freeway and a major crosstown highway. The regional shopping center simply followed its market. Population growth and particularly regional shopping center development has served as a catalyst for other kinds of development—the office park, business parks and even regional headquarters for national corporations. See Figure 1.

Figure 1. College Park—Headquarters for College Life Insurance Company
Indianapolis, Indiana

Using my home town, Atlanta, as an example, figure 2 shows the pattern of subcenter development that is emerging today. A few statistics will illustrate my point. Downtown Atlanta has about 16 million square feet of private office space. Both Perimeter Center and Cumberland have
Figure 2. Patterns of Subcenter Development
Atlanta, Georgia

6-8 million with projections of 14-16 million square feet of office space by 1990. Thus, these subcenters will rival in size (not diversity of use) the CBD.

The decentralization of shopping created some traffic problems but those were generally concentrated around the site. Thus, the transportation engineer could suggest improvements such as road widening, im-
proved ramps to the freeway, signal systems and intersection improvements which would ameliorate the traffic problem generated by the regional shopping center. Besides, the peak traffic for the regional shopping center did not occur during the normal commuter peak—but at night and on Saturdays and Sundays.

The trend toward higher employment in the suburbs was well documented in the U.S. Census of 1980. Using Atlanta as an example, figure 3 shows commuter travel between central city and central city.
central city to suburb, suburb to central city, and suburb to suburb. This figure illustrates that between 1960 and 1980, central city to central city commuting decreased by 50%; central city to suburb increased by 170%; suburb to central city increased by 116%; and suburb to suburb increased by 264%. Trends in commuter travel is shown on figure 4.

With the addition of the major office developments, conditions have
changed dramatically! First, the peak hour traffic of office users occurs exactly when the peak commuter travel occurs since the office travel is essentially commuter travel. Secondly, the suburban subcenter has an extremely low transit ridership. This is understandable, since they are in low density areas, and their pattern of attraction is not radial like the CBD—meaning there are many crosstown or peripheral trips.

The magnitude of the trip generation is not small. Using Perimeter Center as an example again—in 1983 the area attracted 14,000 peak hour trips—and this is projected to go up to 26,000 trips by 1990 (See Figure 5.) These trips create their own radial pattern. The majority use the perimeter (I-285) to arrive at their destination.

This leads to my third point—traffic patterns on the major road network have dramatically changed. When the perimeter was built, it essentially ran through residential areas. The movements on the perimeter were primarily composed of through traffic—about 12,000 VPD (See Figure 6)—wishing to get from I-85 to I-75 or the reverse. There was, of course, a component of intra-metro area travel and some local travel, but this remained a minor element. Today, the commuter travel is staggering. In fact, today the travel along the segment of the perimeter between I-75 and I-85 is 150,000 VPD—which approaches that volume on the downtown connector. Delays are long and congestion is a daily occurrence. The perimeter has been widened from four to eight lanes and congestion still occurs.
Another change in travel patterns is the phenomenon of the reverse commute—persons traveling outward in the morning to work and inward in the evening. This greatly affects our ability to maximize capacity at signalized intersections by favoring heavy turning movements. Where the traffic engineer could allow a long green with a left turn arrow in the direction of predominant flow due to low opposing volumes,

Figure 6. 1970 and 1978 Traffic Volumes—Perimeter (I-285) in Atlanta
now the heavy reverse flow precludes this technique. In fact, in some areas the inbound flow in the evening peak hour exceeds the outbound flow during the same period.

Adding to this phenomenon is the density of development which is being allowed in suburban subcenters. In many areas the office subcenter initially developed at a floor area ratio (FAR) of 1:4; that is 1 sq ft of floor to 4 sq ft of land. For a typical office development that resulted in a daily generation of 150 vehicle trips per acre. Today, we are exposed to FARs of 1:1 or 2:1 which results in 600 to 1,200 vehicle trips per acre. I have heard of FARs as high as 5:1 being approved in Dallas and Houston which would result in a daily trip generation of 3,000 per acre. These densities bode ill for the transportation professional who is trying to plan a workable system of streets and roadways—but more importantly, they are having serious consequences for the traveling public. Figure 7 shows the impact of development on operating speed. With

![Figure 7. Development and Operating Speed](image)

regard to the changing commuter patterns, a joint research group with representatives from TRB, FHWA, ITE and AASHTO are researching the commuter information contained in the 1980 Census to determine the changes in commuter travel patterns.

What of mass transit? What is its role for these emerging subcenters? Traditionally, mass transit has focused on the CBD because, to be marginally viable, transit must draw upon a large audience. Even our MARTA system in Atlanta, when finished, will carry only 9% of the daily trips (or about 25% of the peak hour trips in radial corridors).
The major subcenters with employment approaching 30-40,000 persons is not yet at the threshold for a transit system which focuses on that particular area. Therefore, if transit is to be used to serve these areas, it must be restructured. One possibility is to combine the radially patterned transit system with a local feeder system for the area. For example, MARTA is now planning a line through Perimeter Center with feeder buses oriented to stations within Perimeter Center. Thus, the feeder buses will serve for local commuter trips as well as CBD commuter trips.

This still leaves the question of whether it will be patronized and where the money comes from to operate the routes. The question of use is a difficult one. The average employee in the subcenter is a high income worker who has a car available. He generally lives in a low density (1-2 dwelling units per acre) probably 5 to 10 mi. further out. This makes transit use more unlikely. Optimistically, I don’t believe transit will serve more than 5% to 10% of these commuters, leaving a majority of the travel to private vehicles.

Ridesharing and staggered hours are certainly a partial answer to the problem. Ridesharing programs are being implemented by major employers and are being used. Staggered hours are more difficult but are being implemented in an informal way by the use of flex-time.

Thus far I have concentrated on a presentation of the characteristics of the problem. What of the governmental response? I’m afraid to say that generally there hasn’t been much of an overall governmental response. The major emphasis for most states and cities continues to be on radial transportation improvements to the CPD. In Atlanta, the DOT is in the process of spending $1.5 billion on improvements—mostly to radial freeways. Most of these freeways are being widened from four to ten or 12 lanes with HOV lanes. All the interchanges are being rebuilt—some at extreme cost—the highest so far is $90 million. This emphasis on radial transportation is being done in addition to a $3 billion heavy rail system which also focuses on the CBD.

What of improvements around the major subcenters? First, there hasn’t been a lot of cooperative action and even less cooperative funding. Most of the initial improvements in the Perimeter Center area were done by developer funds with some county contract money. More recently the DOT has widened one road from two to four lanes divided and has extended a developer road for about 1/2 mi. to tie into a second interchange. The DOT also added a circular ramp to a key interchange as I-285 was improved.

Perhaps most distressing is the lack of action on the part of local government and, in fact, some reversal of action. Two links from the development, as shown on the master plan, were subsequently removed due to neighborhood pressure—concentrating traffic movements and, thereby increasing congestion. Another distressing action was the ap-
proval of rezonings of vacant lands in the immediate area at a FAR of 2:1 which was more than four times the density of those areas previously approved.

SUMMARY

The trends in development for the mid-1980’s in most medium to large urban areas is the development of subcenters which will rival the CBD in the generation of peak hour traffic. These subcenters are generally composed of a regional shopping center, office, and related commercial developments which will offer a full range of employment and consumer services to a major segment—100,000 or more population—of the community. What we have not done is recognize these subcenters for what they are. Major traffic generators which require and deserve the attention of local, state and private transportation planners.

Most of the transportation planning and implementation has been left to the developer—and this needs to be changed. As a minimum, local government needs to establish a transportation plan within which the improvements needed can be planned in a coordinated manner.