

**DRAFT**

**A Planning Template for Nonwork Travel and  
Transit-Oriented Development**

**Task 4 Report: Refined Template Design**

**March 2000**

**Review draft of 3/22/00**

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prepared for  
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## PROJECT OVERVIEW

This project seeks to improve the planning methodology for Transit-Oriented Development (TOD) by bringing into sharp focus the dynamics of the retail marketplace and nonwork travel demand.

Specifically, it will:

- Analyze the current state of understanding of nonwork travel demand in the context of retail market dynamics on a national level.
- Review the state of the art in transportation planning with respect to nonwork travel.
- Create a planning template for transportation and land use planners who are pursuing TOD.

The central Puget Sound region (Seattle-Tacoma-Bellevue-Everett metropolitan area) will be used as a case study for the development of the template. The nonwork travel environment of the region will be mapped and analyzed, and the findings generalized to other large metro regions. Of particular interest are “retail” activities that have flexible locations and that together generate more than half of all person trips: shopping for goods and services, eating out, entertainment, recreation, and other leisure pursuits.

The planning template will specify the major nonwork venues that should be mapped and spatially analyzed, the forces shaping urban retail form that need to be monitored, and the factors that will determine TOD regional (not just station-area) success.

**EXECUTIVE SUMMARY (omitted in this draft)**

## CHAPTER ONE

### INTRODUCTION -- SUMMARY OF WORK TO DATE

This report is the fourth in a series of working documents prepared for a research project carried out by Integrated Transport Research and Global Telematics -- two research firms based in Seattle, Washington -- for the Norman Y. Mineta International Institute for Surface Transportation Policy Studies at the College of Business, San Jose State University. The project seeks to improve urban regional transportation planning methodology by showing the way to a sharper focus on display and analysis of data describing nonwork activities and travel patterns.

Coverage in the first three reports is as follows:

**Report One, The Growing Importance of Nonwork Travel:** The first report summarized national trends for nonwork activities and travel patterns. We related the growth of nonwork travel to the changes that have occurred in the retail and consumer services marketplace, particularly in shopping for goods and services, eating out, and other leisure activities. We measured the travel impacts of these activities by aggregating four of the trip purposes in the Nationwide Personal Transportation Survey (NPTS): Shopping, Eating Out, Recreation, and Other Personal Business. In the NPTS of 1995, these four categories encompassed 54% of person trips. Report One also assesses the state of the art in the modeling of future nonwork travel behavior.

**Report Two, Preliminary Template Design:** In the second report we outlined the rail-TOD paradigm and the impetus for its widespread adoption. TOD refers to *transit-oriented development*, a land use configuration that promotes a high concentration of housing, stores, consumer services, and employment sites within walking distance of high-capacity transit stations, typically light rail stations. We reviewed the limited experience of TOD's effect on travel and land use patterns. We also summarized the growing critique of TOD's benefits compared to its costs as measured by changes in regional transportation systems performance and development patterns. We then proposed a new Nonwork Travel Improvement Planning Process (NWTIPP) that would provide additional guidance to metropolitan decision makers beyond the traditional transportation planning protocol that focuses on journey-to-work and four-step network modeling. Our NWTIPP is centered on aggregating diverse expert opinion, and is intended to cope realistically with considerable complexity in the present and with much uncertainty about the future.

**Report Three, Prototype Nonwork Database:** In the third report of the series, we created an example database of maps, tables, and commentary that would serve as a key input to the Nonwork Travel Improvement Planning Process sketched in the previous report. The central feature of this database (covering for purposes of illustration, the Seattle-Tacoma-Everett-Bremerton region in western Washington State) is a series of maps which cover key elements of the retail stores and consumer services that generate nonwork travel. Other parts of the database include information on residential and employment conditions, transportation system performance, land use planning status,

current planning tools now used in the region, and exogenous forces potentially shaping activities, land use, and travel.

These three reports, including executive summaries and extensive references, total 250 pages in length, and are available for access and review by readers of this fourth report at <http://www.globaltelematics.com/mineta/> [**Web access partially in place.**]

This fourth report documents the continued development of the Nonwork Travel Improvement Planning Process (NWTIPP). This product of our research is a "planning template," that is, a set of guidelines and elements that indicate how to plan transportation systems and services for non work trips, comprising the majority of all urban trips.

As described in the second report, US urban transportation planning as practiced by officially-designated Metropolitan Planning Organizations (MPOs) has lately responded to growing traffic volume (journey to work, as well as the nonwork trips) through justification and advocacy of Transit-Oriented Development, meaning dense, multiple-use commercial and residential development within a half-mile radius surrounding mass transit stations. However, non work trips are not as deeply considered as work trips (commuting) in the existing planning processes of MPOs. In contrast, our research is aimed at understanding nonwork trips. The NWTIPP comprehends, embraces, critiques, and supplements, but does not supplant, the existing process.

Our main reason for focusing on the nonwork trip is the volume of such trips relative to commuting and work-related trips. According to the 1995 Nationwide Personal Transportation Survey (NPTS), the number of trips that have what we call a retail consumer destination outnumbered trips having a workplace destination by over 3 to 1. Trips to stores, consumer services, restaurants, and recreation venues are of course far more varied and complex than journeys to work..

Work trips, including the commuting journey from home to work as well as work-related trips from the main place of work, constitute a significant minority share of travel, but that share is declining over time. Analysis of the NPTS shows that these commuting and work-related trip purposes constituted 27% of all vehicle trips in 1995, down from 31% in 1969 (Nelson and Niles 2000). At the same time, a large percentage of trips that begin or end at the workplace are linked to other trips that have retail or other nonwork stops. The 1995 NPTS shows that more than 60 percent of women and 46 percent of men made at least one stop on work-to-home tours (McGuckin and Murakami 1999).

The NWTIPP recognizes and responds to the complexity of the nonwork travel issue by moving away from the problematic application of travel forecast models to make long range estimates of the performance of transportation investments and land use strategies. We attempt to create a more robust understanding of consumer and industry dynamics and the travel patterns thereby generated. Urban transportation planning as now practiced emphasizes model-based trip-volume and mode-share forecasting, and efforts to change the forecast outcome through interventions such as mass transit investments and encouragement of transit-oriented development. We agree with those who think models can be used to promote systems which have been chosen on the basis of political criteria

(Wachs, 1988). The NWTIPP relegates the four-step modeling of MPOs to a supporting role in planning, rather than being a central element. The NWTIPP provides for analysis in qualitative terms as well as quantitative.

Our main tool in the NWTIPP is a process of reaching a consensus conclusion -- or where appropriate, an explicit divergence of opinion -- by diverse specialist experts on what is and what will likely be the future of consumerism and the market economy. The NWTIPP emphasizes "backcasting" -- bringing goals, resources to construct transportation infrastructure or pay for implementing other policies, effect change, reality of activity and movement, feasibility of changes, and public policy recommendations into alignment. The NWTIPP focuses on knowledge creation and dissemination. Building awareness of how the market works -- now sorely lacking among planners -- is even more important than generating action recommendations.

The NWTIPP emphasizes consideration of basic choices between public policy paradigms. Table 1-1 below illustrates how the recognition of a particular premise -- that government action can make a difference -- leads to the opportunity to choose among a variety of paradigms and strategies that may reduce automobility and its impacts. By paradigm we mean a vision of how society could work if certain premises about individual and organizational behavior hold true, and if certain policies are implemented. By strategy (or policy) we mean broad principles that guide action by government or the private sector, often in pursuit of one or more paradigms. Note that we take account of cost in classifying the strategies for a particular paradigm. The pursuit of one strategy may consume so many public dollars that the opportunity to pursue other strategies is lost because of insufficient resources. In short, every strategy carries with it an *opportunity cost*.

The paradigms and strategies listed in Table 1-1 are intended to serve only as examples. They appear to encompass the range currently under consideration. The NWTIPP may, in fact, identify others paradigms that are amenable to government actions. Indeed, the planning process may begin with a wholly different premise regarding the efficacy of government action vis-a-vis the power of the market in shaping land use and transportation patterns.

**Table 1-1 Policy Paradigm Choices and Strategies in Government Action that Address Growing Urban Automobile Usage**

Government Paradigms	Strategy Examples by Classified by Relative Cost			
	Higher cost	Moderate cost	Lower cost	Incremental
Improve or promote transit to increase its market share in the competition with cars	Rail construction  TOD at new transit stations	Bus rapid transit; park and ride lots	Increase frequency and quality of existing transit service	Subsidies and incentives for bus pass distribution, carpools, and vanpools
Change land use to stimulate more walking and transit use and constrain car use		TOD at existing transit centers	Generally encourage or require fewer parking spaces at new developments	Prohibit zoning that limits apartment development
Accommodate cars and other vehicles by increasing road capacity	Build new roads	Intelligent Transportation Systems (ITS) applications	Widening, intersection improvement and better signalization	Maintain existing roads to quality standards; build more only in proportion to population growth
Reduce pollution from cars to make their use less damaging	Buy back old, polluting vehicles	Promote the use of zero-emission vehicles	Annual emissions inspections	Spot detection and citation of polluting vehicles
Constrain automobility to reduce use of cars	Congestion pricing on existing highways	Tolls to finance new highways	Traffic calming	Raise taxes and fees on gasoline or cars
Preserve open space and sensitive lands	Extensive government land purchase	Moderate land purchase	Purchase of development rights	Require cluster development and dedicated open space
Promote bicycle use to reduce auto use	Build an extensive network of dedicated, covered bike lanes	Build bike lanes where feasible	Bicycle lockers at transit stations; bike racks on buses	Encourage employers to provide storage, showers for bike commuters
Shaded two cells together constitute the Rail-TOD paradigm				

## Results from a Literature Search

We have surveyed published literature to identify a range of academic and other institutional research on TOD and land use - transportation linkages. The results of our research, summarized in the following table and detailed in Appendix Two, reveal a number of justifications to create a planning process that looks at new paradigms in addition to TOD.

<b>Table 1-2 Summary of Major Issues Raised by TOD, Nonwork Activity, and Land Use-Travel Research (Details in Appendix Two)</b>	
<b>Issues</b>	<b>References</b>
Weakening linkage between land use and transportation because of metro-wide accessibility provided by existing roadway system and by communication technology.	Giuliano 1995 & 1999
Quality of transit system needed to support a regional TOD network may not be fiscally feasible.	Downs 1994
Net economic benefits may not result because few new transit riders are produced.	Gordon & Richardson 1997
Increased variety and choice in nonwork activities cannot easily be supported by neighborhood commercial areas.	Handy 1996b
Station area success may not be equivalent to regional success, i.e., dense and mixed-use development may not translate to regional congestion and air quality benefits.	Luscher 1995, Richmond 1998b
Radial rail systems do not serve many suburban commuters.	Downs 1992, Gordon & Richardson 1997
Bus TOD may be a more cost-effective choice than rail TOD.	Cervero 1998a
More pedestrian trips for nonwork purposes may be produced within a TOD but these trips may not substitute for auto travel.	Handy 1996a
Demand for TOD housing may reflect self-selection by current transit users.	Dueker 1999a&b, Crane 1998
Parking capacity at TOD centers and roadway capacity must be scaled to meet auto travel demand that assumes small or no effect of TOD.	Crane 1998
Neo-traditional buildings and street networks may not reduce auto travel.	Handy 1991, Boarnet & Sarmiento 1998, Crane 1998 & 1999
Governments may have goals for the development of TOD that differ from regional goals, including competition for tax revenues.	Ewing 1997, Boarnet & Crane 1997 & 1998, Cervero 1998b, Boarnet & Compin 1999
Several factors determine household work patterns that may not be compatible with transit trip or walk to work.	Bernick & Cervero 1996
TOD needs to be supported by politically difficult policies that dramatically alter the urban form and increase the price that drivers pay for externalities they create.	Bernick & Cervero 1996, Downs 1998, Giuliano 1999
Commercial market controls TOD development, and suburban TODs have not experienced large market demand.	Porter 1998

## **Responding to Change and Uncertainty**

Throughout this project we have continually emphasized the likely existence of unpredictable and even unknowable future developments that will have a dramatic influence on government efforts to cause change. Example of largely unanticipated developments in the present or recent past that have influenced activity patterns, housing and commercial locations, and thus transportation make a staggeringly long list, including:

- women and teenagers in the work force
- smaller household size
- a ten-year economic boom with price stability and low interest rates
- a long-term drop in the cost of operating an automobile
- the popularity of light trucks and sport utility vehicles
- big box and niche store retail
- consumer adoption of computers and the internet, and
- explosive growth in use of portable, wireless telephones.

At the same time, there has been and continues to be great durability and continuity in other aspects of society that affect mobility and location:

- the continuing popularity of cars and suburban living
- stability in tenures of employment
- constancy in the average length of the daily commute
- the adaptation and prosperity or at least survival of many central business districts despite the rise of the suburbs
- the evolution and adaptation of many shopping malls, and
- the continuity in the location of traditional institutions, like universities, libraries, and government centers.

Because of the uncertainties in what will change and what will stay the same in the decades ahead, we stress the importance of flexibility in the outcomes of planning processes, and urge very thoughtful attention to the issue of planning horizon. We note the legal requirement of MPOs to plan 30 years into the future, but we leave open the question of how far ahead the NWTIPP should set its planning horizon.

All of this said, we have gone to great effort to identify the areas of a number of technological and demographic trends that are likely to play out over the next few decades, including:

- dramatic increases in the power of computers and the internet
- more electronic commerce
- continuing growth of telecommuting
- continuing improvements in the quality and price-performance of automobiles

- uncertain lifestyle choices of the post World-War II Baby Boomers as they become senior citizens
- continuing immigration into the USA from other lands, with a melding of foreign cultures into the evolving culture that is continually created by those of us already here
- continuing voter resistance to levels of government revenue that are both sufficient to maintain existing transportation infrastructure and services, and simultaneously to implement new transportation services and infrastructure.

How planning should react to these uncertainties is a key question, one that we address in the NWTIPP by explicitly bringing in a number of types of experts and specialists who are not commonly seen in transportation planning.

The heart of the proposed process is interaction between a small core Planning Team and a diverse Expert Advisory Group that will carry out a focused environmental assessments and a public policy backcast using a structured Delphi opinion-gathering and feedback technique.

## CHAPTER TWO

### FURTHER CONSIDERATION OF THE DELPHI PROCESS

We first presented our case for use of a structured Delphi procedure in Report Number Two. Upon consideration of a range of opinion and analysis about the effectiveness of Delphi, we continue to believe that it is an efficient and effective way to consolidate and evaluate expert opinion. Weblor et al (1991) conclude that Delphi is particularly suited to problems that involve a mixture of scientific evidence and social values.

As described by Lang (1995) and Gupta (1996), the Delphi process attempts to optimize the use of group opinion while minimizing the adverse qualities of interacting groups. Basic features of Delphi are structured questioning, iteration of knowledge elicitation, resolution of differences, refined and controlled feedback, and anonymity of responses. Structured questioning is achieved through the use of questionnaires or ballots, to keep a clear focus on the study and enable the facilitator to control the process and channel it into a compact product. Iteration is the process by which the questionnaire is presented over a number of rounds to enable participants to reconsider their responses. Controlled feedback is achieved by transmitting back to the panel members the responses of the whole group as well as their own response for their reconsideration. Anonymity is achieved through the questionnaires ideally giving group members the freedom to express their opinions without feeling pressured by the wider group.

#### **Steps in the Delphi Process**

First, background information on the subject to be considered is provided to the Delphi participants to enable them to comment on the issues in question. Material to be considered is then synthesized by the process facilitator into a well-structured questionnaire or ballot and distributed to the participants.

Second, the expert participants respond to the questionnaire and thus begin to communicate points of agreement and disagreement, and illustrate convergence and divergence among the experts involved.

Then, the questionnaire is revised and distributed repeatedly, each time with the information from previous questionnaire responses that has been interpreted and reformulated by the process facilitators. The feedback can be supplemented with textual and statistical material, as well as the group members' responses. Members are invited to reconsider their response in light of how the others are responding. A participant is asked to justify his or her response if it is notably different from that offered by other in the group.

The process of expert submission and feedback is repeated until it finally reaches a level of consensus or at least stability around several points of view.

Finally, when no more is likely to be gained in the process of response and feedback, the facilitators prepare a final report, pulling the responses together, for the process beneficiaries as well as the expert participants themselves.

## **Revisions to the NWTIPP**

After reviewing several critical reviews of Delphi processes (Rowe 1991, Woudenberg 1991, Gupta 1996), we have incorporated several modifications to our proposed use of it in the NWTIPP:

Careful selection of experts: Delphi can be used to elicit opinions from anyone, and through the selection of biased or uninformed people, opinion could converge just about anywhere. "The effective selection of the panel not only maximizes the quality of the responses, but also gives the results of the study a credibility with the wider audience (Lang, 1995)." We are fundamentally concerned that existing MPO planning processes work off a too narrow base of expertise, particularly with respect to consumer and retail industry trends. Including a broad range of expertise is crucial for a useful NWTIPP.

Do not overemphasize consensus: Although the early emphasis of Delphi was on iteration until consensus is reached, more recent thinking is that "Delphi's goal is not to elicit a single answer or to arrive at a consensus, but simply to obtain as many high-quality responses and opinions as possible on a given issue(s) from a panel of experts to enhance decision making (Gupta and Clarke 1996)." We are framing the Delphi process as a tool for building an authoritative Knowledge Base that bears on nonwork travel issues and TOD in urban areas.

Mix meetings with questionnaire response: "Having a face-to-face meeting may provide a stimulus for discussion that could be beneficial to the study (Lang 1995)." Group meetings are fully-incorporated into a variation of Delphi known as Group Delphi (Webler et al, 1991). Despite the expense and extra effort required, we are in favor of an initial face-to-face meeting between the Delphi expert participants and the Planning Team. This provides a basis for mutual confidence and trust among the participants that will lead to more respect for results that are fed back to the participants in the structured questioning rounds later.

Remain humble about what Delphi reveals of the future: A well-respected telecommunications analyst, Joseph Pelton, led a Delphi process in 1979-80 to predict the future of telecommunications (Pelton, 1981). He bravely and freely admits in the write-up, "forecasts habitually turn out to be dead wrong," and then proceeds from the perspective of the year 2000 to illustrate this point again. Pelton writes 20 years ago, "Over 57 percent of respondents believed that around the year 2000 there would be a computer/telecommunications/video center in 25 percent of US homes. These electronic center would provide such services as entertainment, electronic shopping, education, research, computer access and, in perhaps some instances, telecommuting to work. This prediction seems quite optimistic, as compared to other responses." This assessment most certainly did not capture the year 2000 fact of 74 million US\_ internet web surfers scanning an entertainment, shopping, education, and research base that is growing at two million pages per day. Internet access through home computers is in about 45 percent of US homes as of December 2000 (Harris Interactive, 2000).

Use a web application as the communications media: Murray Turoff, co-author of a classic work on Delphi (Linstone and Turoff 1975) and a pioneer in the development computer-mediated communications has pointed the way to using computer networks to manage the interaction of participants in Delphi processes (Turoff and Hiltz 1995). We understand that there are low-cost, easy-to-use, off-the-shelf web application that would support a Delphi process, and we recommend using one.

## CHAPTER THREE

### REFINED TEMPLATE FOR THE NONWORK TRAVEL IMPROVEMENT PLANNING PROCESS

This chapter is a revision of the material describing the Nonwork Travel Improvement Planning Process that was originally presented in Report Number Two. The revision reflects new research-based insight gained since that report was written. Table 3-1 lists the key components of the NWTIPP.

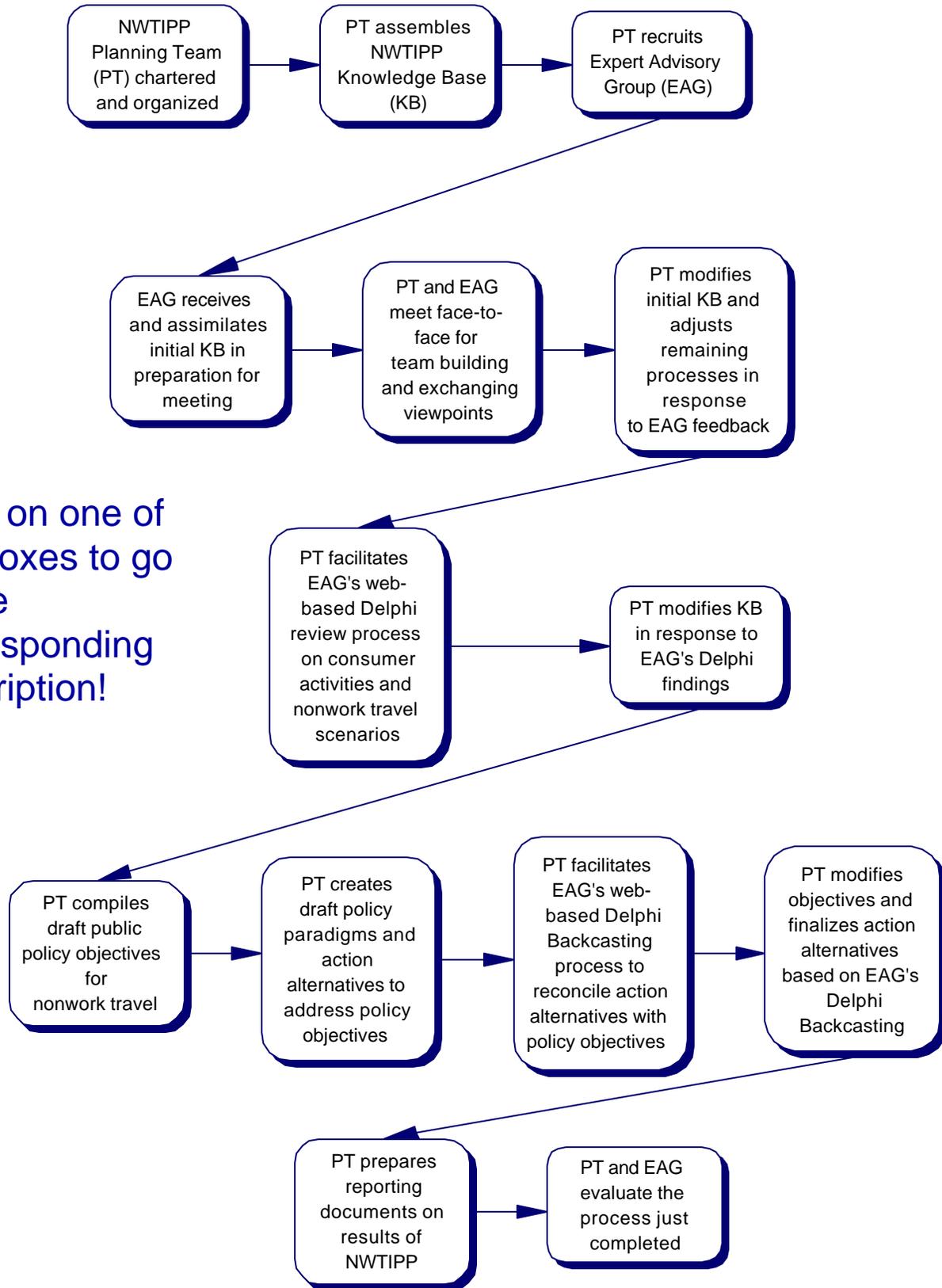
<b>Table 3-1 Components of the Nonwork Travel Improvement Planning Process</b>
Charter that establishes the sponsorship and mission of the NWTIPP.
Volunteer Expert Advisory Group that brings key knowledge and even wisdom to the improvement of transportation planning for urban nonwork travel
Compensated Professional Planning Team to carry out a knowledge acquisition and dissemination process and to facilitate the knowledge generation activities of the Expert Advisory Group
Knowledge Management Process that initiates, refines, expands, and disseminates a Knowledge Base
Initial Knowledge Base that includes the findings from this project, plus a region-specific database like the prototype presented in Report Number Three of this project, and that will expand throughout the project.
Delphi process for eliciting structured opinions and justifications for those opinions from the members of the Expert Advisory Group.

Since completing the preliminary NWTIPP Report Number Two, we have expanded the number of steps in the NWTIPP from ten to fourteen, now organized into five distinct phases, listed in Table 3-2 following:

<b>Table 3-2 Phases of the NWTIPP</b>
Process Initiation
Orientation of Expert Advisory Group
Consideration of consumer activities and nonwork travel scenarios
Development of public policy objectives and action alternatives
Process completion - evaluation and dissemination of results

A diagram of the entire NWTIPP is provided next in Figure 3-1:

**Figure 3-1 Flow Chart of Nonwork Travel Improvement Planning Process**



Click on one of the boxes to go to the corresponding description!

## **Detail on the Tasks of the NWTIPP**

### Phase 1: Process Initiation

#### Task 1-1: NWTIPP Planning Team chartered and organized

A first step is to establish legitimacy for carrying out the NWTIPP in a particular urban region. Every US metropolitan area in which the suggested NWTIPP would be relevant already has a Metropolitan Planning Organization (MPO) and an established process of transportation planning. The NWTIPP is not a replacement of the existing MPO metropolitan transportation planning process, and the NWTIPP does not attempt to meet all of the Federal requirements set in the ISTEA and TEA-21 legislation.

The basic requirement for proceeding with an NWTIPP is its chartering and the commitment of resources to compensate and otherwise support the professional Planning Team. The source of resources could be a government agency or legislative body, foundation, corporation, or individual.

Although not necessarily carried out by a government agency, we do recommend that the NWTIPP be carried out by or in association with an organization with standing in the community -- a community-minded civic leadership association such as an economic development council, a chamber of commerce, or a local chapter of the American Planning Association comes to mind. Still another option would be a faculty-student project within a university urban planning graduate school program.

We envision that the Planning Team (PT) would consist of at least one full-time project management professional as Team Leader and enough other personnel to equal one and one half additional Full Time Equivalent persons. We recommend that the Planning Team organize around the following full and part-time roles: research coordinator, student intern supervisor, liaison with MPO, public involvement coordinator, web master, and Expert Advisory Group coordinator. At least a few members of the Planning Team should have transportation planning experience.

Early on, the Planning Team needs to establish its budget, mission statement, and ground rules. A minimum reasonable resource level for the Project Team's effort would be approximately 6,000 person hours over a year long elapsed time. Some of these hours may be from volunteers, but this total does not include the preparation of review comments by the general public or other readers of project documents who emerge from the community. The total does include about 500 volunteer hours that would need to come from the Expert Advisory Group.

Because NWTIPP challenges established transportation planning processes, confidence and mutual trust must be high on the Planning Team. We recommend that time be taken for team-building exercises that establish productive interpersonal group dynamics.

## Task 1-2: Planning Team assembles NWTIPP Knowledge Base

The Planning Team should carry out its work in a framework of knowledge management. An organization of knowledge proposed and tested by Heide and Horrevoets (1996) provides a checklist of knowledge dimensions that need to be considered, as seen in Appendix One. The "knowledge map" they provide consists of four top-level categories:

- Substantive knowledge from various sources and along the conceptual dimensions of geographic scale, functional complexity, temporal scale, and institutional.
- Relationships, including types of actors and modalities of gaining knowledge, such as conferences and commissioned research.
- Applications, which refers to specific products of the project at particular geographic scales.
- Methods of research, information storage and retrieval, planning, dissemination, project organization, and of overall knowledge management itself.

The PT will be continually augmenting a Knowledge Base that is made available to the Expert Advisory Group and other interested parties. The conclusions of the EAG will be part of the KB also. We recommend presenting this KB as a well indexed, well summarized, cross-linked series of documents on the World Wide Web.

The KB would begin with an updated *review of academic research focused* on land use, transportation, and the TOD paradigm, as was begun by Nelson and Niles for the present project, shown in Appendix Two.

Another important part of the KB is a review of the *forces shaping the future of retail*. In this step, the Planning Team identifies market, technological, demographic, business, and social trends that are shaping development, activities, and movement in the present and in the foreseeable future. Areas of uncertainty should be compiled as part of this research.

The Planning Team should also include a general assessment of *present and future consumer activities*. These will be considered by the EAG in the Delphi process to come in Phase 3, intended to generate an elaborated view of the retail and consumer services industry in the region. The PT needs to compile information for the EAG that helps them to understand the activities and locations where consumers go to shop, eat out, recreate, and partake of culture, all of which constitute the cluster of activity we term "retail."

Understanding the present status of the region would be aided by having descriptive data on *present land use and land use trends underway*, including where residential, office, and retail/service facility growth is occurring.

The Planning Team should provide the EAG with a draft list of the *exogenous forces likely to be shaping the retail land use and activity in the region over the next five to ten years*. The items on the list should have weights assigned to indicate the relative importance of these trends, and also the degree to which local public policy can influence each trend in a constructive way.

As further preparation for the Delphi exercise, the Planning Team needs to compile available *information on how and why people travel now*: purposes, origin and destination pairs, modes, routes, and volumes; present public transportation services, including usage and capacity; the locations, time-duration, and causes of traffic congestion and related environmental impacts.

The current Metropolitan Transportation Plan developed by the MPO is a key input document for the NWTIPP. The Planning Team should understand and assess the MPO's transportation forecasts across their planning horizon, in particular, the MTP forecast for nonwork trips. There may be major capital investments in new road capacity or mass transit systems already programmed, and these need to be assessed by examining the claims made for their impacts by the MPO. For example, what is the nonwork mode share mix between private vehicle use and public transit?

Another useful input to the Planning Team is a "present commitments" land use map of the region in the MPO's planning horizon year prepared with input from the judgment of the MPO planners and of the planning departments in the local government jurisdictions of the region. The map would show projected zoning and built area within that zoning, and also the projected network of highways and arterial roads, transit centers, park-and-ride lots, intra-urban rail lines, train stations, and other transportation infrastructure.

Significant transportation-related actions to be taken by governments, large employers, and significant trip-attraction sites need to be assessed. For example, in Seattle, the Regional Transit Authority is introducing all-day express bus service between the major urban centers over the next few years. The imminent opening of a regional shopping mall would also be significant.

Finally, the Planning Team must prepare an overview of the available financial resources to pay for government implementation of transportation capital construction and services. Fortunately, such a financial overview is often readily available from the MPO with supporting documents from the pertinent units of local and state government.

All of the information described above should finally be rolled up by the Planning Team into a series of alternative, descriptive draft scenarios on the future of nonwork travel in the region.

We estimate that compiling an initial Knowledge Base with the elements described here is a task that would consume 5 to 10 person-months of effort. Every effort should be taken to use data already available through the MPO and other research and planning organizations in the region under study.

### Task 1-3: Planning Team recruits Expert Advisory Group

As a central feature of the NWTIPP, the Planning Team interacts with a specially-recruited, volunteer panel of experts we call the Expert Advisory Group (EAG). The EAG will carry out an initial review of the Knowledge Base at the beginning of their work, plus two Delphi exercises that assess and expand upon critical additions to the KB made by the PT.

We recommend that the EAG consist of at least fifteen persons with a range of diverse expertise that bears on an assessment of consumer activities and nonwork travel in the present and the future. Areas of useful expertise for this group are shown in Table 3-3.

<b>Table 3-3 Areas of Expertise for the Expert Advisory Group</b>
• Regional economics
• Sociology
• Retail store location planning
• Retail business strategy
• Consumer behavior
• Commercial real estate development
• Commercial real estate leasing
• Residential real estate development
• Electronic commerce
• Public transit
• Highway planning
• Intelligent Transportation Systems (ITS)
• Freight logistics
• Rideshare/vanpool promotion and coordination
• Local government lawmaking and regulation
• Urban land use planning
• Architecture
• Urban geography
• Environmental quality
• Real estate appraisal
• Statistics

Important qualifications of the EAG include commitment to voluntary public service either as individuals or as employees of an organization that is committed; available time and personal interest in participating in the NWTIPP; and access and skill for receiving and sending information through the Internet.

As part of maintaining a useful relationship with the general public that is affected by transportation planning, the PT should publish a list of the names and biographies of the members of the EAG.

## Phase 2: Orientation of Expert Advisory Group

Task 2-1: Expert Advisory Group receives and assimilates initial Knowledge Base in preparation for meeting

The EAG will be provided immediately with internet web access to the structured Knowledge Base, with their attention initially invited toward the mission of the NWTIPP, an overview of the process that is planned to be followed, and a baseline set of findings and conclusions from previous literature on consumer activities and nonwork travel. Over a period of a month or so, each member of the EAG would need to have a working familiarity with the full range of material in the initial KB as described in Task 2-1 earlier.

Task 2-2: Planning Team and Expert Advisory Group meet face-to-face for team building and exchanging viewpoints

In general, because of the use of a web-enabled Delphi process, the PT and the EAG do not need to do their work in a face-to-face fashion. However, we do recommend one early face-to-face meeting of the EAG and the Planning Team to gain a common understanding of the NWTIPP to motivate a high level of participation and to build mutual understanding and trust.

This meeting would be an important opportunity for the EAG members to learn about the Delphi process to be used, and to provide feedback on the initial Knowledge Base and on the planned Delphi activities over the coming months of activity. The face-to-face meeting should result in a common understanding by the EAG and Planning Team on the range and scope of the premises, paradigms, and strategies that the NWTIPP will encompass.

Task 2-3: Planning Team modifies initial Knowledge Base and adjusts remaining processes in response to Expert Advisory Group feedback

In response to information received during the face-to-face meeting between the EAG and the PT, the PT would in this step take steps to augment the KB with additional information requested by the EAG. The PT would also make adjustments in the planned Delphi processes to take into account suggestions made by the EAG members about those processes.

## Phase 3: Consideration of consumer activities and nonwork travel scenarios

Task 3-1: Planning Team facilitates Expert Advisory Group's web-based Delphi review process on consumer activities and nonwork travel scenarios

In this step, the Planning Team facilitates the Expert Advisory Group's Delphi review process on consumer activities and future nonwork travel scenarios. This facilitation requires providing the EAG with structured information on a series of options for these activities and scenarios that the members can validate, refine, qualify, extend, or endorse.

We envision that the PT can provide all necessary information for the Delphi process via computer-based documents delivered to EAG members via electronic mail or web access to the Internet, as sketched by Turoff and Hiltz (1995). Feedback from the EAG to the PT can also be collected through the Internet.

The EAG members would be encouraged to ask for additional information as they see fit from the Planning Team or anyone else. Information requested by one EAG member would be made available to all members.

Developing conclusions on important trends defining consumer activities over the next five to ten years in the region is the first desired result from the Delphi process to be exercised with the EAG. Under the guidance of the PT, over one to four iterations, the EAG would review, comment on, add to, and vote on a structured list of potential trends provided by the PT.

Simultaneously and in coordination with this review of trends, as a second component of the Delphi exercise, the EAG would review, comment on, add to, and vote on a number of scenarios on future regional nonwork trip-making for consumer activities, as prepared by the PT.

The scenarios prepared by the PT should reflect a comprehension and dissection of the MPOs existing central paradigm for transportation and land use. In many regions this is the rail-TOD paradigm, described earlier. The EAG should be encouraged to accept, revise, or extend the nonwork trip forecast in the Metropolitan Transportation Plan, which will reflect the chosen paradigm of the MPO.

Task 3-2: Planning Team modifies the Knowledge Base in response to the Expert Advisory Group's Delphi findings

After the EAG has reached its conclusions on consumer activities and nonwork travel scenarios, the PT will incorporate the results of the Delphi process into the KB.

Phase 4: Development of public policy objectives and action alternatives

Task 4-1: Planning Team compiles draft public policy objectives for nonwork travel

In this step, the Planning Team establishes draft public policy objectives for nonwork travel. This means defining the problem or problems that the government is capable of addressing in its transportation and land use policy, and how one would know the extent to which the problems are solved. Reduce the congestion caused by the growth of nonwork travel? Reduce air and water pollution from vehicular travel? Preserve and protect environmental values? Increase the quality of urban life, including opportunities for home ownership with desired amenities? The objectives may go beyond those in the MTP. To the degree possible, the PT should work with regional decision makers to understand and incorporate their views into the draft objectives.

The objective for nonwork travel may be the same as the objective for *all* travel in the region. It may be that the public policy objective for nonwork travel is related to land-use; freezing the number of major decentralized shopping destinations, for example. The objective should reflect what people as residents and as representatives of businesses and other organizations say they want in transportation performance and environmental quality, and what they show they are willing to act on and pay for: neighborhood traffic calming, access to transit services, one-way streets, bus-priority lanes, or free parking, for example.

The statement of the objectives that the NWTIPP can reasonably address also needs to specify how to measure these problems in a base year and in a defined out year, and how success in the resolution of these problems will be judged in the out year. As stated before, it is also important that financial budget limitations be recognized in the statement of objectives.

Task 4-2: Planning Team creates draft action alternatives to meet nonwork travel policy objectives

In this step, the Planning Team would formulate one or more paradigms and the associated policy packages that would potentially cause the region to achieve the draft objectives defined in the previous step. The output of this step is a draft list from the Planning Team of three to five effective and efficient policy packages intended to impact transportation performance in the out year for submission to the EAG. These alternatives should reflect an understanding of the existing institutional framework for planning and implementing changes in transportation and land use -- the institutional actors, plans, policies, strategies, and investments already in place. Each alternative must also include an estimate of the government and private sector resources necessary to implement.

Planners carrying out this NWTIPP template may want to include TOD as one of the alternative paradigms, but they should be free to design and choose whatever alternatives fit the circumstances of the region that is the focus.

Task 4-3: Planning Team facilitates Expert Advisory Group's web-based Delphi Backcasting process on objectives and action alternatives

In this critical portion of the NWTIPP, the focus for the Expert Advisory Group would be on judging the effectiveness and cost-effectiveness of different policy packages developed by the PT. By cost-effectiveness we mean consideration of what transportation performance or what amount of problem resolution is delivered for each dollar of cost. Cost-effectiveness may well have to be estimated, and different policy packages may offer different kinds of performance, so comparing packages may well be subjective.

However subjective, the EAG would be asked to rank the potential of each option for addressing the problems and issues defined, with cost as a consideration as well -- including opportunity cost of foregone options because of limited resources. The Delphi process should be aimed at reaching consensus on the policy package that will most likely be able to achieve success in meeting the intended cost-performance goal over the time frame of the NWTIPP. The EAG would be encouraged to suggest

changes to the packages, especially if consensus were not forthcoming. Under the Delphi protocol, suggested changes would be compiled by the PT and used as the basis of a revised set of packages to be ranked by the panelists.

The recommended policy package may end up being one suggested by the Planning Team, or it may be an alternative policy design. Under the backcasting protocol (Dreborg, 1996; Helmer, 1988) that is part of this step, the PT must be ready to accommodate an adjustment of the problem definition or at least of the public policy objectives associated with the definition, if the EAG is unable to find a set of policies and associated actions that is likely to solve the defined problem within a cost that is reasonable given available resources.

Even more fundamental than the serious possibility of revising policies and performance objectives, the EAG interaction on the research and forecasts developed by the Planning Team may lead to the generation of new scenarios that take into account previously unconsidered forces. This may lead to the revision or overthrow of a premise that is fundamental to a paradigm and all that follows from that paradigm in the way of policies and programs.

Realization that premises and the resulting paradigms are invalid naturally leads to creation of new paradigms, and correspondingly to a different set of policies and strategies. For example, in certain metropolitan areas the EAG may argue convincingly that governments are not sufficiently able to control patterns of development and travel to make a rail-TOD paradigm viable. In this case, new paradigms may include the acceptance of dispersed and decentralized growth supported by public policies and strategies that reduce travel impacts and increase environmental quality and urban livability.

Task 4-4: Planning Team modifies objectives and finalizes action alternatives based on Expert Advisory Group's Delphi Backcasting outcome

After two to three iterative rounds of Delphi consideration by the EAG that reaches consensus or at least a stable point of non-consensus, the PT would end the EAG process and add what was learned from their deliberations to the KB.

#### Phase 5: Process completion

Task 5-1: Planning Team prepares reporting documents on results of NWTIPP

If this template design works, a refined, winnowed package of policy initiatives results from the Delphi expert process. This work of the Planning Team and Expert Advisory Group should be packaged for presentation to the media, the MPO, government administrators, elected decision makers, the general public, and the civic leadership of the region.

The Team may also recommend further planning steps. Under the influence of what the EAG reports, the Planning Team may face the prospect of having to repeat and rework earlier steps to account for considerations brought to light by the interaction of the diverse experts. There may be a need for further

iterations of the objectives-paradigms-policies development. Alternatively or additionally, recommendations for action by the MPO may result.

Task 5-2: Planning Team and Expert Advisory Group evaluate the NWTIPP just completed

A final step in the NWTIPP is a reflective end-of-project evaluation of how the entire process functioned, with an emphasis on documenting and disseminating recommendations for the improvement of future planning rounds. A fundamental characteristic of the NWTIPP will be the probable need to revisit the process regularly as new knowledge is developed.

### **Final Word**

Mel Webber, professor emeritus of planning at UC-Berkeley, has observed and commented on American development patterns and the land use-transportation linkage for more than four decades, beginning with a claim that caught our eye as we began our research: "The spatial patterns of American settlements are going to be considerably more dispersed, varied, and space-consuming than they ever were in the past--whatever metropolitan planners or anyone else may try to do about it" (Webber 1963). He noted more recently, "It continues to amaze me that so much attention is directed to describing and prescribing geographic pattern, rather than to explaining and tracing its consequences" (Webber 1996).

We have tried to pick up on his point. Explaining and tracing the consequences of the dispersed, varied, and space-consuming geographic pattern for retail stores, restaurants, places of entertainment, and other consumer services is very much the focus of the planning process we have described.

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## APPENDIX ONE: ORGANIZATION OF KNOWLEDGE FOR SPATIAL PLANNING

<b>A. Substance</b>
(1) Disciplines
(a) Monodiscipline -- e.g., economics, sociology
(b) Multidiscipline -- various disciplines without interaction
(c) Transdiscipline -- relating various disciplines without feedback
(d) Interdiscipline -- cooperation and linkage between disciplines
(e) Extradiscipline -- practical experience
(2) Aspects, with complexity scale noted
(a) Geographic, small scale to large scale
(b) Functional, mono to multi
(c) Temporal, short term to long term
(d) Institutional, single task to complex mission
<b>B. Relationships</b>
(1) Actors
(a) Policy actors -- decision-makers, special interests
(b) Stakeholders -- citizens affected
(c) Research actors -- knowledge generators
(d) Practitioners -- knowledge users
(e) Brokers of knowledge or policy
(2) Modalities of knowledge acquisition
(a) Public domain -- literature
(b) Exchange -- workshops, conferences
(c) Prosumption -- cooperative research
(d) Market -- commissioned research
<b>C. Application</b>
(1) Spatial products -- at a scale level
(a) Scenarios            (e) Standards
(b) Concepts            (f) Zoning
(c) Considerations (g) Plans
(d) Designs            (h) Decisions
(2) Levels of scale -- with a product type
(a) Plot                (c) Settlement
(b) Location            (d) Region
<b>D. Methodological</b>
(1) Techniques
(a) Research -- available, obtainable, new
(b) Storage -- memory, paper, electronic
(c) Learning and teaching -- diffusion, assimilation
(d) Organization -- institution, project group
(e) Planning -- creation through prosumption in the planning process itself
(2) Dimensions -- strategy and assessment of knowledge management itself

Source: Heide, Henk Ter and Michel Horrevoets, "Knowledge Maps as Aids to Knowledge Management in Spatial Planning" *European Planning Studies*, Vol. 4, No 2, 1996, pp. 185-202.

## **APPENDIX TWO: FINDINGS OF RESEARCHERS INVOLVED IN STUDIES OF TOD, NONWORK ACTIVITY, AND THE LAND USE-TRANSPORTATION LINKAGE**

A small but select group of researchers has been actively testing various features of the TOD paradigm, and the dominant premise that government actions can significantly reshape urban form and travel patterns. We very briefly review and cite selected examples of their work. For the most part we let researchers speak for themselves, providing paraphrased quotes that appear to summarize key findings and conclusions. These papers touch on, to various degrees, important TOD issues which we summarize in the table that follows these comments on the work of each researcher. The researchers we found to have insight into TOD, nonwork activity, and the land use - transportation linkage are presented below in alphabetical order.

### **Marlon Boarnet**

Marlon Boarnet is associate professor, Urban Planning and Economics Departments, University of California at Irvine, and research associate of UC-Irvine's Institute of Transportation Studies. His interest is how local governments actually implement TOD. In a series of papers and a forthcoming book with Randall Crane, Boarnet addresses the financial and other objectives of local governments that can differ from regional planning goals.

Boarnet investigated the development of housing at 232 station-areas across Southern California, and compared the intensity of housing with that allowed under local zoning (Boarnet & Crane 1997). He found that municipalities behave as if they prefer to use rail transit stations for economic rather than residential development. There is a stronger trend toward commercial rather than residential zoning that is consistent across existing and proposed rail lines, whether in central or suburban communities.

"Residential development appears to be a secondary goal, at best. Left to their own devices, almost every city wants the train to bring people into town in the morning rather than send them elsewhere," in order to maximize the fiscal and economic benefits. Bernick suggests that this creates an imbalance in the form of an excessive number of employment and shopping 'destination' stations relative to the number of residential 'origin' stations. And he doesn't believe that California is unique. "The cross-jurisdictional economic competition that makes transit-based commercial development attractive in Southern California is also characteristic of many other urban areas. The tensions that prompt municipalities to think first of their own economic development have, if anything, grown stronger over time."

In a follow-up paper, Boarnet suggests that local fiscal concerns are evident in a broad range of planning activities beyond transit-oriented development (Boarnet & Crane 1998). "Anecdotal evidence suggests that local competition for regional shopping malls and big-box retailers is becoming increasingly intense. In the past, researchers have studied incentives for fiscal zoning focusing on attempts to increase the local property tax base. In California, and likely in other states also, fiscal pressures are increasingly

focusing on land uses that generate sales tax revenue. Fiscal competition now is over commercial uses, and the ramifications of these new fiscal pressures are not fully understood."

Boarnet undertook a more detailed study of TOD implementation in San Diego which has the oldest of the current generation of light rail lines (Boarnet & Compin 1999). He found, through detailed interviews with planning directors, that cities along rail routes, though sympathetic to regional rail planning objectives, have approached TOD from a perspective of local goals, opportunities, and constraints. "The lesson from San Diego County is that progress towards TOD goals is often incremental. TOD projects are the results of a number of local governments acting in their own interests, pursuing opportunities as they present themselves, and working within local constraints. The legacy of preexisting land uses (and rights-of-ways) is an important determinant of TOD implementation. Placing rail lines along high-growth corridors can be expensive, especially when those corridors do not have suitable existing rail rights-of-way. Whether TOD benefits, such as an increase in transit ridership, outweigh the cost of placing a line along a high growth corridor is open to question."

Boarnet and a coworker also modeled the effect of general neighborhood land use variables (extent of grid street pattern, population density and retail and service job concentrations) on nonwork automobile trips, using southern California travel diary data (Boarnet & Sarmiento 1998). None of the land-use variables were found to be significant either individually or jointly, which is consistent with the findings of Crane. Based on the results, they conclude that "we are not yet ready to make transport policy based on the link between nonwork travel and land-use patterns. The primary lesson to emerge from this study is that any link between land use and nonwork trip generation is a complicated one." The authors suggest that several issues need to be addressed in further research: New Urbanists designs are at a neighborhood scale, whereas nonwork trips cover much larger areas; the possibility that persons choose their residential location based in part on how they wish to travel; and the complexity of non work trips, i.e., trip chaining.

### **Robert Cervero**

Robert Cervero is professor, Department of City and Regional Planning, University of California at Berkeley. He and his coworkers have conducted many studies of the relationship between travel patterns and urban design features, both in the United States and abroad. Cervero has published extensively in transportation and planning journals, and has written several books on the topic of the land use and transportation problem.

Cervero's perspective is clearly one of support for a menu of government policies that can have some impact on urban form in ways that will reduce the effects of automobility. Yet he tempers his enthusiasm for these efforts with a pragmatic assessment of what has been experienced and can be expected in terms of actual outcomes.

Cervero comments on the concern expressed about light rail systems (1998a). "Proposals to build and extend fixed-guideway systems, especially light rail, in the United States have triggered a wrath of criticism. Even cities that show great promise, such as Portland, have come under attack, and with some

justification. The track record with new rail systems in the United States leaves a lot to be desired. Studies show that new-generation rail systems have failed to produce the ridership that was promised and ended up costing more than was forecast.”

“Although the reasons for transit’s poor showing over the years are many, the gross under pricing of automobile travel--especially along heavily trafficked corridors where transit is most needed--heads the list. An absence of coordinated and comprehensive planning, carried out on a regional scale, is also to blame. Putting a point-to-point rail system in a sea of spread-out, auto-oriented development is hardly a recipe for successful and sustainable transit. Quite simple, too often across America, transit and cityscapes have been way out of synch.”

Of course, transit investments that are out of kilter with how our cities and regions grow do nobody any good. Running trains and buses that fail to draw people out of drive-alone cars does little to relieve traffic congestion, conserve fuel, or reduce pollution. The best prescription for filling trains and buses, and winning over motorists to transit, is to find a harmonious fit between transit systems and the cities and suburbs they serve.”

Cervero also comments on bus rapid transit, debunking what he terms the myth that bus transit is incapable of shaping urban form and attracting high-rise development around stops. "Besides buses being stigmatized as a second-class form of conveyance, the conventional wisdom holds that buses repel development because of their negative-byproducts: diesel toxins that spew from tail pipes. Experiences around busway stops in Ottawa and Curitiba should put this myth to rest. In both cities, some of the priciest condominiums anchor sites adjacent to busway stops. Retail and office developers also flocked to busway corridors in both cities. Good quality service--whether vehicles are propelled by electricity or fossil fuels, or whether they roll on steel wheels or pneumatic tires-- will spawn compact development. It is the accessibility premium that attracts real estate development, not the type of transit equipment. In fact, compared to freeways and even rail corridors, busways produce relatively low ambient noise levels. Its inherent flexibility advantages and superior adaptability to spread-out patterns of development make bus transit-- especially when combined with dedicated busways--a potentially stronger shaper of growth patterns than rail transit in some settings.”

Cervero has also reviewed TOD in California which he has actively sought to promote through government policies (1998b). "Despite successes, the track record with TOD in California has not always been positive. Far more growth in the Bay Area has been auto-oriented than transit-oriented, despite BART's 25-year presence. A number of stations along Sacramento's light rail line have attracted big-box retail projects; despite repeated efforts by the Sacramento Regional Transit Authority to promote TOD, in the final analysis, the prospect of localities receiving large sums of sales tax revenues won out over regional concerns, like TOD."

In a separate study, Cervero and a co-author estimate that only about 9 percent of the residents from the three BART-served counties lived within a half mile of a BART station in 1990 (Bernick & Cervero 1996). And 1990 Census journey-to-work data indicate that only 18 percent of these station-area residents commuted by rail transit. Multiplying these two percentages, led them to conclude that fewer

than 2 percent of 1990 commute trips within the three counties were by station-area rail users. "Doubling the number of station-area rail users would have a pretty small impact on current commuting and environmental conditions in the Bay Area."

The two authors suggest that more than singular measures, such as transit-based housing are needed if outcomes are to be more than minimal. "Transit-oriented development matters when bundled together with other supportive policies." They call for fundamentally different settlement patterns and pricing arrangements for driving. "Putting more suburban jobs in office towers near rail instead of sprawling business parks would no doubt make these numbers more impressive. So would dramatically raising the price of fuel and parking (so that motorists pay for externalities they create, including time losses and air pollution)." Urban villages, they suggest "would tap the synergy of orienting the future growth of both ends of the commute trip--homes and workplaces--to rail, in addition to retail shops, restaurants, entertainment centers, and other urban uses. Land-use initiatives, like transit-supportive development, by themselves are clearly no panacea to today's congestion, air quality, and social equity problems."

### **Randall Crane**

Randall Crane is associate professor of urban planning, environmental analysis, and economics at the University of California, Irvine. He has done extensive modeling and empirical analysis of the possible influence of urban design factors on travel behavior, and has authored several papers and is co-authoring a book with Marlon Boarnet on the subject which is due to be published in September 2000.

We refer here to only two papers, in which he summarized the results of his work (Crane 1998, 1999). Crane's concern is that much of the analysis that purports to support the belief that changes in urban form can shape travel behavior is problematic. It does not, in his opinion, have a strong behavioral foundation. Crane has attempted to improve the research on TOD by isolating the separable influences of urban design on travel. "Individuals make choices based on their preferences for benefits obtained by travel and on the relative costs of making different trips and of taking different modes. Past empirical research about the influence of neighborhood design on travel has neglected the role of costs in choosing among trips and modes." Crane believes that individual design elements, such as grid street patterns, traffic calming features, and a concentration and greater mix of uses, may both increase and decrease car trips and VMT. Walking trips may be similarly affected. Crane cites the example of shopping. "People may shop more often if stores are nearby, and they may make so many shopping trips that they drive more miles."

Crane believes the net effect of urban design features on travel is uncertain at best, and that actual outcomes depend on specific details of implementation at each location, not on their intrinsic traffic-affecting properties. "There is no evidence that New Urbanist's designs influence travel behavior at the margin. They remain a wobbly foundation indeed for current transportation policy."

Crane comments thusly on previous research involving the effect of urban design on travel: "Any empirical work of this nature is problematic given the enormous complexity of the behavior to be

explained and the great difficulties of conceptualizing the interaction of travel and the physical character of the city."

### **Anthony Downs**

Downs is a senior fellow in the Economic Studies Program at the Brookings Institution (Washington, DC). He has analyzed and commented on the patterns and problems of American urban areas for more than three decades. His recent books include strategies to address traffic congestion and the renewal of large older central cities. He has also written on the problem of urban sprawl. Downs perspective is often conditioned by what he feels is politically possible and feasible in the American system.

Downs often uses simple spatial models to elucidate his points. He did so to estimate the effect on transit commute mode share of a major radial mass transit system serving the central city's employment center (Downs 1992). He concluded that "even an extensive rapid transit system serving many high-density housing clusters near their stops would carry only relatively few suburban commuters. The results would be minor in comparison to the economic and political efforts required to build and maintain the transit systems and create high-density clusters."

Downs subsequently extended this analysis by estimating the size of the TOD areas and rail transit system required to accommodate the population growth experienced by the average Metropolitan Statistical Area over one million in population in the decade of the 1980s (Downs 1994). He found that the system would have to be much larger than the actual systems in either the Washington, DC, or the San Francisco Bay metro areas, yet those areas have much larger total populations than the population used to calculate the model. "Realistically, it may not be feasible to accommodate all or even most urban growth in transit-oriented developments. The feasibility of applying them on a large scale is weakened by the high cost of building the rapid-transit links among them. However, Calthorpe's TODs should be viewed as building blocks that could be used to handle some significant part of growth in the range of visions except the unlimited low-density vision."

In a contribution to a multifaceted discussion of sprawl, Downs sounds a rather pessimistic note about government's ability to adopt tactics that effectively address the growth problems plaguing many metro areas (Downs 1998). "Effectively adopting any of these tactics, or certainly most of them, would require a strong region wide implementing body. Yet hardly any US metro areas have been willing to consider doing this. Nor is it certain that these tactics would overcome a region's growth related problems. For example, I am positive that traffic congestion will get worse almost everywhere, no matter what tactics anyone adopts. Until advocates of limited future sprawl can overcome the metropolitan majority's belief that the benefits of sprawl outweigh its social costs, they are not likely to notably reduce sprawl's dominance."

## **Kenneth Dueker**

Ken Dueker is professor of Urban Studies and Planning and director of the Transportation Studies Center, Portland State University. He directed the Center for Urban Studies at PSU from 1979 to 1998. His areas of research interest include transportation and land use interactions.

Dueker and his PSU colleagues have been closely monitoring the impacts of Portland's light rail transit system and its TOD strategy. Just as the State of Oregon has been a testing ground for strong growth controls, Portland is a laboratory for TOD. Its Eastside light rail line, the first in a planned metro-wide radial network focusing on downtown Portland, opened in 1986. Portland has gone to considerable lengths to encourage development that supports light rail.

Dueker has used data for the first 10 years of operation to research the impacts of the rail line on development patterns, choice of residential location, freeway traffic, and transit ridership (1999a). In a presentation at a 1999 conference (1999b), Dueker reported that "what we have found is that light rail alone has not been sufficient to change development patterns appreciably." He sees an apparent self-selection in housing location choice. People who are already prone to use transit are willing to relocate to areas accessible to light rail, but rail has not had an impact on traffic congestion. "What we're observing is that the peak period for highway traffic is widening, and that non-peak and weekend travel on light rail is where the growth in transit riders is occurring."

And Dueker has concerns about the transit component of Portland's TOD. "A lot of bus lines, including express bus lines, have been discontinued, and a lot of people have been forced onto light rail and to make transfers. Light rail in suburban service has problems. When you get 15 miles out, you're almost an hour by light rail to downtown, because it has to stop at every stop. I think that express bus service could do a better job for the suburban commute."

Dueker confirms that Portland's success at controlling growth is somewhat clouded by its proximity to Clark County in Washington State, which is a bedroom suburb just across the Columbia River (1999c). Clark County is the most rapidly growing county in Washington State, with an annual population growth rate that surpassed even the high range of forecast population. Its 1999 population accounted for approximately 25 percent of the Portland-Vancouver urbanized area.

## **Reid Ewing**

Reid Ewing is with the Surface Transportation Policy Project in Washington, DC. He formerly was associate professor, College of Engineering and Design at Florida International University. He has authored books on development practices and transportation and land use innovations, as well as research dealing with travel patterns in Florida communities and their land use relationships (Ewing, et al, 1994). Ewing wrote a lengthy paper from the "anti" sprawl perspective as counterpoint to a "pro" sprawl paper by Peter Gordon (Ewing 1997). We quote from that paper.

We include Ewing because he is a thoughtful proponent of strategies to minimize auto externalities. Ewing believes that sprawl, that he defines as suburban development lacking accessibility and open space, is not a natural response to market forces, but a product of subsidies and market imperfections. His solution is active planning as it is practiced "almost everywhere but the United States."

Ewing's analysis of Florida suburban communities found that regional accessibility, not land use density, is the most significant land use variable. In other words, land use patterns that recognize that density is not feasible but provide more services in closer proximity can reduce some auto trips. Ewing also recognizes that "as suburban areas grow, the central city becomes less and less accessible. At some point, emergence of other centers is beneficial." He favors "good" development over "bad." He cites Florida's best practices as an example of an initiative to upgrade the quality of development, "wherever" and "whenever" it should occur. Cluster development, which concentrates housing and commercial in walkable areas while preserving a large part of the land area as park or natural open space, is one approach.

### **Peter Gordon**

Peter Gordon is professor of planning and economics in the School of Urban Planning and Development and the Department of Economics, University of Southern California. Gordon, often together with his colleague Harry Richardson, has authored numerous research papers addressing the forces shaping the growth of major metro areas and associated travel patterns.

Gordon (& Richardson's) general premise is stated in the first sentence of his "pro" sprawl article: "The revolution in information processing and telecommunications is accelerating the growth and dispersion of both economic activities and population, possibly moving towards the point where 'geography is irrelevant'" (Gordon & Richardson 1997).

Gordon has a blunt opinion of high-capacity transit and TOD. "Low densities make high-capacity transit systems unattractive and therefore wasteful of all resources utilized, including energy. Because the spreading out of cities reduces markets for conventional public transit (especially fixed rail, which is spatially inflexible and usually oriented downtown, it should be no surprise that the US transit industry has been in decline for most of the 20th century. Massive subsidies have not helped. New federally assisted systems have not added to mass transit; instead, they have replaced flexible bus routes with costly fixed-routes to a few downtown areas, while the growth of jobs and population has been in the suburbs and in the smaller cities. At the same time transit fleets in general are under used, and the new systems have added to costs without attracting riders from cars." Citing Cervero and Downs, he says "it appears that 'Neo-traditional' neighborhoods do not make much of a difference."

### **Genevieve Giuliano**

Giuliano is professor and vice dean, School of Policy, Planning and Development, University of Southern California. She has investigated the land use and travel impacts produced by the high accessibility that modern roadway systems create, and the effectiveness of land use policy on reducing

congestion and the environmental costs of automobility. Giuliano has also contrasted the land use-transportation relationship in Europe and the United States.

Because of the federal highway program of the 1950's through the 1970's, Metro areas are marked by well-developed transportation systems, she observes (Giuliano 1995). "Even a large investment (such as a new freeway segment) will have only an incremental effect on accessibility. Moreover, the decentralized land use pattern of today's metro areas has reduced differences in accessibility among locations."

Giuliano observes that rail transit continues to have strong public support, in spite of "rather overwhelming evidence" that transit investment is not an efficient means for affecting land use patterns (1). She cites Los Angeles as the most extreme example of this view. "Planners expect this massive program (originally a \$78 billion rail-transit investment) to increase the proportion of commuters who use transit from 4.5 percent to 19 percent by the year 2010, through the generation of high-density and mixed-use development along transit lines. To test whether their expectations were reasonable, the regional planning agency sponsored a study using a transportation forecasting model to determine the effect of various land use scenarios on transit use. Results show that by relocating 75 percent of all forecast employment growth and 65 percent of all population growth in the 5-county region to transit-station areas, 7 to 10 percent of commuters would use transit. Study authors conclude that even if anticipated land use changes were to occur, travel patterns would not change very much, because the overall regional pattern of land use would not change very much."

Giuliano does not view land use policy as an effective means for reducing the environmental impacts associated with private vehicle use (Giuliano 1999). "Significantly less private vehicle use would require substantial increases in densities from existing levels and a reversal of development trends that have been in progress for many decades. I do not think such increases in density can be achieved, and increases in density that might be achieved would have at best very little effect on private vehicle travel. The trends in car use and decentralization are powerful (even in Europe where government land use controls are stronger and where tax and pricing policies favorable to car ownership and use are not present). They are supported by changing economic structure and rising affluence, and there is no reason to believe that fundamental shifts away from these trends will occur in the future. The greatest success in addressing automobile externalities has been realized by regulating the car, rather than the driver."

### **Susan Handy**

Handy is Assistant Professor of Community and Regional Planning, School of Architecture, University of Texas at Austin. Part of her research was done at the Institute of Transportation Studies, University of California at Berkeley.

Handy was the first researcher to question the suggestion by supporters of New Urbanism that traditional urban form (rectilinear street patterns, sidewalks, accessibility to transit service, and proximity to a mix of commercial establishments, including jobs) discourages automobile dependence

(Handy 1991). She points out that there is a tension between providing local services and regional transit links:

- The ability of residents to live and work in the same place is limited by numerous constraints, including the match between employee qualifications and employer needs, dual wage earner households, job security, etc.;
- The growing variety and complexity of lifestyles requires a number of services that can't be supported by a small neighborhood population;
- Residents may choose not to use local services if they have easy access to other areas, and if other factors that affect destination choice play a role. These include price, quality of service, habit, etc.; and
- Services evolve over time as the size and character of the population changes; what is sufficient to encourage use of local facilities now may be insufficient in the future.

In a series of papers (Handy 1992, 1996a, 1996b, 1996c), she addresses the effect of TOD design elements on mode choice, particularly pedestrian travel to nonwork destinations, in San Francisco Bay area and Austin neighborhoods. In the most traditional Austin neighborhood, 95% of residents live within walking distance of the neighborhood commercial center. She both surveyed and modeled the travel behavior of residents.

Handy finds that certain design aspects can encourage walking trips but the savings in travel from substitution for driving are likely to be small. For San Francisco: "The evidence does not support the popular belief that neo-traditional style development will help reduce levels of nonwork travel (Handy 1992)." For Austin: "The total savings in automobile travel appears to be on the order of 8 km per adult resident per month--a drop in the bucket when average driving per month is approximately 2000 km per household (Handy 1996a)."

Handy, based on further detailed analyses of the San Francisco neighborhoods, suggests that some land use policies may help provide alternatives to driving, but their effectiveness in reducing total travel will be at least partially offset by the range of choices available to residents of a metropolitan region (Handy 1996b). " A greater range of choice seems to be associated with greater trip frequency; a greater range of choice may induce some trips that would not have been made given more limited choices. And the greater the range of destinations visited, the longer the average trip, such each additional destination is farther away."

Handy suggests that the overall policy goal--namely that of reducing auto travel--toward which much of research on the link between urban form and travel behavior is directed, should be reconsidered (Handy 1996c). "Land-use policies are likely to have only a marginal impact on travel given the extent of existing development and the relatively small increment that new growth represents. Certainly it is important that

any development that occurs be designed appropriately so as to minimize the need for automobile travel, but other strategies to manage travel demand, such as pricing strategies, are also needed."

### **Richard W. Longstreth**

Longstreth is an architectural and urban historian whose interest is in understanding the forces shaping the modern metropolis. In a comprehensive study (Longstreth 1997), he has traced the development of retail shopping centers in Los Angeles in the 20th century, and how these centers, together with the rapid growth of private vehicles, shaped the land use and travel environment of the city.

His book is an observational and deductive work, relying on photographs, maps, and historical records found in newspapers and other documents. From this evidence, Longstreth sees relationships and patterns that lead him to draw several conclusions about the importance of retail in shaping Los Angeles and post-auto cities generally:

*...(M)ost historical studies of how the automobile has affected the landscape imply, at least, that the process was un- or even anti-urban, ultimately leading to decline and decay in the city. Such characterizations, however, ignore the inherently urban circumstances affecting change in the commercial sphere. Los Angeles reveals that the automobile was not an isolated cause but one of several factors that contributed to a recasting of metropolitan form rather than its destruction.*

*Just as Los Angeles is one of the major population, business, and cultural centers of the nation, so retail development is a key indicator of urban form and identity. No other single component of the city attracts so many people so frequently and for so many reasons. No other more frankly reveals current attitudes toward public assembly and decorum. No other so clearly reflects change both in market conditions and consumer taste. No other embodies more fully the unyielding impact of motor vehicles on the landscape.*

*At a time when "sprawl" is becoming a code word for urban ills, much as "congestion" and "overcrowding" were two generations ago, we need to be careful not to condemn in wholesale fashion the environment created in recent decades. My argument is not to defend all that has been developed in the recent past, nor is it against the strategies for change, but only that we should not repeat the mistake of previous generations who dismissed cities of the nineteenth and early twentieth centuries as wastelands. Only through understanding the modern metropolis can our choices for the future be informed, rational, and productive.*

## **Daniel Luscher**

Luscher is manager, economics and policy analysis, Acurex Environmental Corporation, Mountain View, CA. The paper summarized here is based on work done at the J. F. Kennedy School of Government, Cambridge, MA.

Luscher's work is unique because it directly addresses a central public concern: congestion. He estimated the congestion reduction benefits of TOD in the San Francisco Bay area using a simple spatial model (Luscher 1995). His analysis focused on residential development and did not directly address the role of TODs in altering commercial development patterns. Luscher found that, employing optimistic travel behavior modification assumptions, that redeveloping the area around most of the existing rail transit stations, coordinating similar development around feeder bus routes, and clustering one-fifth of the region's population in these areas would reduce vehicle miles traveled by 5 percent. The strategy would offset about three years of VMT growth.

Lusher concludes that TOD would not have a significant impact on the Bay Area's congestion problems but may have collateral benefits. "It is clear that TOD is inappropriate as the foundation of a congestion reduction strategy for the Bay Area. To the extent that TODs are a part of a larger scale rethinking of urban design, they are likely to have worthwhile non-transportation benefits, such as an enhanced sense of community and the preservation of open space on the suburban fringe."

## **Douglas Porter**

Porter is president of The Growth Management Institute, Chevy Chase, MD, and a planning and development consultant. He has written and edited books on growth management, and was the author of the Transit Cooperative Research program study of transit-focused development in 23 US cities and metro regions (Porter 1997, 1998). We excerpt and summarize here some of the conclusions he reached in the latter research.

Porter was interested in the effect of TOD-supportive policies on development around light and heavy rail station areas. He did not probe for actual transportation benefits. What he observed were actual patterns of development that, in some cases, were the result of governmental efforts over several decades. His analysis suggests that transportation and land use planners, who have expectations that TOD can reduce auto dependency, must recognize the realities of the real estate markets, public attitudes, and the nature of rail lines themselves. "Especially along light rail lines, development opportunities will be influenced by changes in the development industry and its primary markets, increasing deference to neighborhood groups regarding development impacts, and the generally lower intensity of use of suburban rail stations compared to stations along heavy rail lines. Unlike experience with heavy rail systems, non central business-district stations on light rail lines are more likely to attract relatively small, uncomplicated projects (Porter 1998)."

Porter found that the intensive development that has taken place has occurred mostly in central business districts and some midtown and inner suburban locations. "Except in older cities and downtown area,

development falls short of the density and design thresholds needed for generating significant transit ridership; transit-focused development still remains more a concept than a reality in most regions. The primacy of the automobile and the desire of most North Americans to live and work in low-density surroundings strongly dissuades market forces and governmental policies from producing densities and forms of development most supportive of transit."

### **Jonathan E. D. Richmond**

Jonathan Richmond is a fellow at the Taubman Center for State and Local Government, Kennedy School of Government, Harvard University. Richmond has extensively studied light rail systems built in the US since 1970. He recently published a review of the capital and operating costs, and the ridership levels, of these systems (Richmond 1998a). His findings correspond with earlier work by Pickrell who found that costs typically were underestimated and ridership was overestimated.

Richmond has also investigated the reasons rail systems are highly popular in spite of considerable evidence that they do not perform well (Richmond 1998b). This may be his most interesting and useful work for TOD planning. It is only possible to distill the essence of this work into a few selected quotes, since space limits a thorough review.

"Transportation as a problem is most basically understood as a static concept -- a derived demand. But transportation is part of a complex and dynamic system of elements that overlap and interact in a plethora of ways at a given point in time and whose interaction patterns shift over time in response to those interactions."

"The public-sector response to transportation problems has focused on transportation facilities and not the underlying problems."

"There are frequent references to the need for a 'balanced' transportation system. The idea of 'balance' is attractive because it simplifies complex ideas into a physically based metaphor."

"The train is seen as necessary part of a balanced system, excluding the possibility that rail service may not be appropriate for all cities. The vast per capita expenditures on the rail system take away opportunities for the more productive use of scarce resources."

"The artificially created 'urban village' does not reflect the richness of today's multifaceted and overlapping urban possibilities. Residents will remain attracted to exploiting the overlapping richness of the city with automobiles in ways that remain beyond the ready capabilities of public transport."

"The assumption that people will use local facilities in a village-like community setting and that they will cycle to the train station along dedicated landscaped cycle routes is easy to make if you do not appreciate the web of complex interactions for work, shopping, and leisure that automobility has created throughout the metropolis."

"Recognizing that transportation is inevitably tied in an intricate web of overlaps with all other urban functions and with the rich morass of human life complicates the planning task but makes it more likely to succeed."

"The successful transportation planner of the future must move from attempting to shape lifestyles in ways that cannot succeed in a democratic society to instead appreciate the many dimensions of how people have chosen to live and interact across space and how this relates to their aspirations for life in the future. And then accommodate their wishes in environmentally responsible ways. "

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