Census Data in Developing New Tools for Capital District Transportation Committee New Visions Process

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The Capital District Transportation Committee (CDTC) is the designated metropolitan planning organization (MPO) for the four counties that include the Albany-Schenectady-Troy (New York) Urbanized Area. In its three-year effort, New Visions, to produce its next regional transportation plan, CDTC has relied upon guidance from nine task forces of subject-specific stakeholders. Subjects such as land use impacts of transportation policy have taken center stage in the New Visions discussions and have required development or refinement of existing analytic procedures, each with its own data demands. In this work, census information has served a valuable role alongside other data sources in supporting new analytical capabilities. Among a wide range of census data applications, three analytical developments that employ census material warrant particular attention. First, to explore major transit investment possibilities, the CDTC staff developed and calibrated a sophisticated mode choice model in a short amount of time by combining available census demographic and journey-to-work information with Nationwide Personal Transportation Survey data, local household travel survey data, and transit on-board survey information. Second, to support examinations of alternative land use and transportation policies, the CDTC staff used time-series census data along with other information to develop and calibrate a land use pivot model. Third, to allow statistical comparison of community indicators among groups of communities (central cities, villages and small cities, inner suburbs, outer suburbs, rural areas), the CDTC staff packaged readily available census information with other information into a documentation of Community Quality of Life. These applications are representative of the value of census information in supporting the demands of innovative planning exercises.

The metropolitan area surrounding Albany, New York, is a multicentered region with low- and moderate-density development. The Metropolitan Statistical Area includes six counties and has a population of approximately 900,000. Four counties (Albany, Rensselaer, Saratoga, and Schenectady) contain nearly 90 percent of that population and provide a traditional metropolitan service boundary for the regional transit operator, Capital District Transportation Authority (CDTA); regional planning board, Capital District Regional Planning Commission (CDRPC); and regional transportation planning agency, Capital District Transportation Committee (CDTC). The CDTC is the designated metropolitan planning organization (MPO) for purposes of fulfilling federal transportation law.

CDTC's policy membership includes 18 local elected officials, including legislative and executive officials from each of the four counties and mayors of each of eight cities as well as rotating membership from towns and villages. The New York State Department of Transportation (NYSDOT), New York State Thruway Authority (NYSTA), CDTA, and CDRPC are also voting members of CDTC.

Urban development in the Capital District has its origins in the largely independent development of its four central cities—Albany, Troy, Schenectady, and Saratoga Springs. In the triangle formed by Albany, Troy, and Schenectady there was ample room between cities for suburban development through the 1960s and 1970s. Radial suburban development has been modest in all directions except to the north, along I-87 (the Adirondack Northway) into Saratoga County. Saratoga County has had one of the most rapid growth rates in New York over the past two decades.

CDTC has enjoyed a history of cooperative transportation planning and programming that has allowed it often to expand the envelope of MPO technical activities and policy influence. This history has included successful cooperative ventures with eight suburban towns in developing joint transportation and land use plans (of corridorwide or townwide scope), implementation of formula-based public and private highway financing mechanisms in key areas, broad acceptance of residential and arterial maximum traffic thresholds, and similar initiatives.

New Visions Process

In 1993, CDTC completed several years of regional systems planning by adopting a new regional transportation plan that set an ambitious highway, transit, and demand management agenda through the turn of the century. CDTC's major Transportation Improvement Program (TIP) effort that same year committed resources toward implementing priority elements of the new plan. However, it was recognized that these major accomplishments would not fully address the needs of the region, particularly if viewed from a 20- or 25-year perspective.

As a result, even before completing the 1993 plan, CDTC had anticipated the need to grapple with deeper and more fundamental questions and had launched a three-year effort to produce its next regional plan. The need for this extended effort is cited in the 1993 plan:

> While focused on year-2000 conditions, these actions [committed in the 1993 plan] do have a lasting effect. Year 2015 congestion is reduced by 33 percent in the year 2015 through the committed actions alone. However, the committed actions cannot be expected to be sufficient to meet the needs and desires of the Capital District for the next 25 years. Without further action, the number of critically congested corridors is expected to grow from the present 14 corridors to 24; transit ridership can be expected to drop nearly 20 percent from 1990 levels; fuel consumption and accident costs climb. (*1*)

The New Visions effort is designed for adequate time to be spent exploring major long-range region-shaping choices about regional and local land use policy, the role of transit and feasibility of fixed-guideway transit investment, principles for treating growing freeway congestion, and similar subjects—subjects that often receive minimal treatment because of the time pressures of immediate decisions.

The New Visions effort includes the use of nine separate task forces, each focusing on a specific subject: demographics, land use, and growth futures; transit futures; urban issues; arterial management; expressway management; bicycle and pedestrian travel; infrastructure renewal; special transportation needs; and goods movement and freight issues. Over 100 individuals from state and local government; transportation providers and user groups; and environmental, business, and community groups and universities have been engaged in task force work since June 1993.

Task forces have shared a common charge: first, to articulate current and null future conditions; second, to identify issues needing attention; and third, to suggest actions. Each task force has been required to address several overriding considerations in addition to the specific subject area. These considerations include land use (as well as environmental quality, equity, and resource allocation). Both local land use issues (community and site design) and regional land use issues (settlement patterns and urban revitalization) have received great attention in discussions and task force products. The congested-highway, low-density-development, single-occupant-vehicle future of the region has triggered many discussions.

A supporting effort has been a consultant-assisted examination of fixed-guideway transit options. The scope of this work has been to specifically examine the land use benefits of light rail or other transit investments; the scope acknowledges that the Capital District does not expect to grow into a region that warrants fixed transit investment on a traditional cost-benefit basis.

Use of Census Data in New Visions Process

The broad and deep New Visions agenda has placed increased burdens on the technical products of the CDTC staff. Subjects such as land use impacts of transportation policy have taken center stage in the New Visions discussions and have required development or refinement of existing technical procedures. The use of task forces to guide technical work led naturally to a heightened need for an adequate information base, performance measures, and analytical tools specific to each task force's area of interest.

For example, traditional measures of levels of service and congestion are viewed by the Arterial Management

Task Force as inadequate measures of the performance of the region's highway system. As a result, CDTC staff created new measures such as a "level of compatibility" for arterial–local access conflict and for residential-traffic conflict. Such new measures demanded new data—in this case, a thorough field survey of driveway spacing on the region's arterial system.

As a result, the New Visions work by the CDTC staff has included much in the way of development of analytical procedures, each with its own data demands. In this work, census information has served a valuable role alongside other data sources in supporting new analytical capabilities.

Examples of the New Visions use of readily available census information packaged, aggregated, or summarized by CDTC staff, CDRPC staff, or NYSDOT include use of

1. Population, household, and vehicle availability data from the 1990 census by census tract and block group for developing traffic analysis zone parameters to use in forecasting future travel activity.
2. Age cohort and mobility impairment measures from the 1990 census for forecasting future special transportation needs.
3. Journey-to-work tabulations by municipal groups by mode and vehicle occupancy from the 1990 census for identification of potential fixed-guideway transit markets. Municipal groups used by CDTC for presentation of journey-to-work information total 20, in contrast to approximately 74 cities, towns, and villages; 473 traffic analysis zones; and nearly 200 census tracts. The groups are assembled from traffic analysis zones and are synonymous with municipalities in most cases, but may include multiple municipalities in outlying zones and cover less than a complete municipality in the city of Albany.
4. Journey-to-work vehicle occupancy information from the 1990 census for fine-tuning freeway queueing simulation.
5. Information from the 1990 census on the incidence of households with no vehicles available to identify prime markets for bicycle and pedestrian accommodations.

In addition, three analytical developments relying on census information are worth describing in greater detail:

1. Use of 1990 census demographic information (aggregated by traffic analysis zone) and journey-to-work information by zone and mode for calibrating a new mode choice model;
2. Use of 1970, 1980, and 1990 census tract household information for calibration of a land use pivot model to test interrelationships between land use and transportation policy; and
3. Use of 1990 census information aggregated by municipality groups (central cities, villages and small cities, inner suburbs, outer suburbs, and rural areas) for discussions of "community quality of life."

In each of these applications, a key ingredient to successful use of census data is the integration of readily available census data with other data: household survey data, Nationwide Personal Transportation Survey (NPTS) data, transit on-board survey data, and other information. Census data alone cannot be expected to be sufficiently comprehensive to serve sophisticated analytical methods adequately.

Calibrating a New Mode Choice Model

Existing Model Structure

In the 1970s, CDTC and CDTA mutually agreed to not invest in updating the Capital District transit network coded in the New York State Department of Transportation's (NYSDOT's) mainframe travel simulation package. Full network modeling was viewed as unnecessary for consideration of easily reversible bus service actions. From that date to 1995, CDTC did not engage in system-level mode choice network simulation.

Mode choice modeling for specific corridors and commutersheds continued using other approaches in the 1980s. CDTC calibrated curves showing diversion of NYSDOT remote park-and-ride mode share to the Northway (I-87) express bus markets and used the curves to identify potential park-and-ride markets throughout the region (2–4). Each of these models used 1980 census journey-to-work information from the Urban Transportation Planning Package and included calibration against field counts of trip origins and destinations by bus.

In the late 1980s, NYSDOT reduced personnel support for its mainframe models and encouraged MPOs such as CDTC to assume the modeling responsibility. CDTC responded by calibrating a full-scale, 500-zone, 7,000-link traffic model in 1988 and 1989. This model, Systematic Travel Evaluation and Planning (STEP), uses commercial software, TMODEL2, as its framework. The STEP model's strengths lie in the ability to combine the features of TMODEL2 with CDTC staff-developed QuickBASIC programs and algorithms.

TMODEL2 is used as the core engine of the STEP model and provides the gravity model used in the trip distribution phase and the capacity-restrained minimum path algorithm used in the traffic assignment phase. In addition, TMODEL2's screen graphics editor is used for editing and display, and TMODEL2's plotting capabilities are used for report and presentation graphics.

CDTC's extensions to TMODEL2 have included the following:

- Vehicle trip generation algorithms derived from CDTC's household travel survey;
- Trip length distribution programs for calibration of the gravity model;
- User cost (time, operating cost, accident cost) postprocessors;
- MOBILE5A emissions postprocessor;
- Subarea windowing algorithms;
- "Excess" delay postprocessor;
- Municipality, jurisdiction, and corridor aggregation algorithms;
- Safety and bridge and pavement "life cycle" benefit algorithms; and
- Monetary cost algorithms to estimate effects of transportation externalities.

The STEP model is currently the traffic forecasting standard for planning and highway project development in the Capital District. Its traffic forecasts are used by NYSDOT, consultants, and municipalities in addition to serving CDTC's planning and programming functions. Transit usage is an implicit, rather than explicit, consideration in the model. The model produces estimates of vehicle trips using relationships that are sensitive to area type and expected transit usage. (Vehicle trips per employee in transit corridors are fewer than in rural areas, for example.) The vehicle trip model cannot examine the impact of explicit transit policy choices, however.

CDTC's New Visions effort increased the demands on the STEP model for consideration of broad-ranging transportation planning and investment principles. In the transit service arena, these include consideration of fixed-guideway investment.

Because of the irreversible nature of fixed-guideway investment, an appropriate system-level mode choice model is required. Such a model must be sensitive to route connectivity and coverage, differential travel time and cost by automobile and transit for particular trips, and the influence of household income and vehicle availability on mode choice. Ideally, a mode choice model would also be sensitive to urban design issues, pedestrian treatment, service frequency, parking policy, and other factors.

CDTC developed a sensitive mode choice model in a short amount of time by drawing on available data. The model was developed, calibrated, and applied in the fixed-guideways investigation within a matter of months by using the following:

1. A logit model construction in the public domain initially developed by Cambridge Systematics for application in the Washington, D.C., area;
2. Available census demographic information (population, number of workers, household size, vehicle availability, and income) aggregated by traffic analysis zone (this information was extracted electronically from 1990 CTPP files);
3. Available CTPP journey-to-work data by mode by municipality;
4. Average vehicle occupancy data from 1990 census journey-to-work information;
5. Published NPTS summaries of person trip generation (by both vehicle and nonvehicle modes) by income;
6. Capital District p.m. peak-hour person trip generation and vehicle trip generation by household type and vehicle trip distribution (from the 1983 CDTC household travel survey, as adjusted to 1995 conditions);
7. CDTA ridership counts by route;
8. CDTA 1988 on-board survey of ridership by gender, age, trip purpose, and income group;
9. CDTC's existing transit park-and-ride market algorithms;
10. Parking lot counts at all CDTA and private operator park-and-ride lots;
11. Parking lot counts at New York State Office of General Service (OGS) peripheral park-and-ride lots;
12. CDTC's 1987 survey of park-and-ride lot usage by income and vehicle availability;
13. CDTC's existing matrix (from a previous study) of the zonal origins and destinations requiring transfers in order to complete a transit trip;
14. Published information regarding the influence of pedestrian accommodations on vehicle trip generation from Portland, Oregon; and
15. CDTC's 1994–1995 field counts of p.m. peak-hour vehicle occupancy at screenlines and cordon lines.

Using this material, the new model was calibrated and applied without requiring any new data collection. The CTPP provided an integral and readily available data source to allow this effort to be both efficient and defensible.

The model that resulted is sensitive to a wide range of issues although it derives from the existing highway-oriented STEP model. It provides a credible basis for examining demand potential for fixed-guideway and other system-level transit actions and for identifying highway system benefits (reduced delay, operating cost, etc.). In the future, the model can be extended further through better interface with geographic information system (GIS) information about route characteristics, bus stop locations, and other data to provide a more refined route-specific analytic tool.

Census information, particularly journey-to-work information by mode at the municipal level, provided the primary reference points for calibration of the model's estimates of transit trips by origin and destination. Other information, including on-board surveys and park-and-ride lot counts, served as primary reference points for other calibration exercises. The combination of data allowed calibration of the model from multiple perspectives: Does it produce estimates of transit and carpool use that are reasonable from the perspectives of

- 1990 census journey-to-work transit origins and destinations?
- 1990 census journey-to-work mode choice by municipality?
- 1987 and 1988 surveys and 1990 census journey-to-work transit usage by income group?
- 1995 field surveys of park-and-ride lot usage by location?
- 1995 transit ridership values by route and corridor?
- 1990 census journey-to-work and 1995 field surveys of vehicle occupancy?

The form, equations, and calibration of CDTC's mode choice model are described in greater detail in CDTC's model documentation (5).

Application

The primary application of the new mode choice model has been in the arena of testing the effectiveness of fixed-guideway investments. The model was used by the Transit Futures Task Force to test a wide range of bus-in-mixed traffic, bus-on-exclusive lane, light rail, commuter rail, and automated-guideway transit systems. Because of the model's construction, applications included sensitivity to a wide range of factors including traffic congestion, highway and parking pricing, feeder bus and transfer efficiencies, and site design. Primarily, the model was used to identify priority corridors and estimate an order-of-magnitude system-level transit demand that would result from specific combinations of transit, land use, and pricing.

CDTC combined the mode choice model with a new land use pivot model (discussed in the next section) to determine the system-level benefits of combining an Albany-Schenectady fixed-guideway system with an urban reinvestment scenario.

The results of the exercises led the task force to cite four potential fixed-guideway applications for public review, along with estimates of their costs and benefits. Beyond the fixed-guideway findings, the application of the mode choice model led to a series of task force transit recommendations related to bus service redesign, transit and highway pricing, and transportation–land use integration. Without reliance upon available census and other secondary data, the CDTC staff could not have produced defensible measures of effectiveness within the timetable and budget of the New Visions process.

The products of the task force's work are documented elsewhere (6, p. 34; 7). Table 1 is a reproduction of Table 6.3 from the fixed-guideways report showing some of the products of the mode choice model applications.

Calibrating a Land Use Pivot Model

Purpose

In the area of land use, New Visions questions had the effect of extending CDTC's work from the community-level and corridor-level successes of its cooperative planning efforts with individual communities to more regional interactions. Specifically, the Demographics, Land Use and Growth Futures Task Force raised questions such as these:

- Would a major linear capacity expansion in the Northway (I-87) Corridor into Saratoga County encourage further development until the Northway was "filled up" again?
- Is it feasible to shape regional land use patterns given the home rule nature of land use decisions in New York and can transportation investment help shape patterns?
- What are the advantages and disadvantages of alternative settlement patterns from an efficiency standpoint?

Much of the task force's effort focused on broad concepts and principles, such as the desirability and feasibility of establishing an "urban service boundary." However, the task force and CDTC staff also saw a need to quantify at least some of the transportation–land use interrelationship.

As a result, the CDTC staff used a time series of census tract data and census-based traffic analysis zone data along with other available data covering the 1970–1990 period to calibrate a land use model to test the effect of alternative land use and transportation policies.

Form of the Model

The land use model developed by CDTC follows a standard construction similar to others in the Lowry-Garin family. As such, an abstract transportation accessibility serves as one component of the developmental attractiveness of a particular traffic analysis. Also, the model operates in such a way as to allocate employment and households to zones in a stepwise fashion, working from an externally established distribution of "basic" employment by zone.

TABLE 1 Comparison of Fixed-Guideway Applications with Reference Alternatives, 2015 (*6*)

	PM Peak Hour				Low	High	Annual	Daily		
	Vehicle Trips (x 1000)	Transit Trips (linked)	Mode Share (pct.)	Park & Ride users (remote)	Daily Transit Riders	Daily Transit Riders	HC Emissions (kg x 1000)	Excess Delay (veh hr)	Pct of Trips Accessible	Pct with Transit Advantage
Null (reduced freq)	255.0	4,990	1.7	610	46,000	-	4,200	35,335	13.7	0.6
Null (same frequency)	254.6	5,300	1.8	650	48,000	-	4,180		14.2	0.6
Null w/free fare	252.3	7,160	2.4	700	57,300	-	4,169	35,000	16.4	0.6
Best bus (feeder)	250.6	9,060	3.0	1,210	66,350	99,600	4,110	32,683	24.7	2.6
Fixed G'way Alt 1 (full)	248.0	12,700	4.3	1,880	84,400	123,200	4,020	29,746	34.5	11.1
Application 1 (LRT)	251.5	8,150	2.8	970	62,250	76,490	4,141	33,584	21.3	5.5
Application 1 (LRT) Urban Reinvest.	247.8	8,340	2.8	844	63,200	81,110	4,036	31,272	21.4	5.7
Application 2 (LRT)	252.0	7,623	2.6	1,725	59,615	71,654	4,154	34,317	22.2	5.6
Application 3 (LRT)	251.9	7,760	2.6	960	60,300	74,565	4,148	34,084	19.5	4.5
Application 4 (CR)	252.5	7,396	2.5	1,500	58,481	75,674	4,160	34,180	20.1	5.6
NOTES	1	2	3	4	5	6	7	8	9	10

Notes: Year 2015 trend land use with parking pricing unless otherwise noted.

1. Vehicle trips based on 298,300 PM peak hour person trips. Trend conditions do not reflect reduced trip making.
2. Transit trips as estimated through CDTC's mode choice model, based on frequency, directness and fares. Trend conditions do not reflect auto pricing changes. Transit trips include CDTA, OGS shuttle, and Upstate Transit usage.
3. Mode share is transit trips as percentage of total PM peak hour person trips.
4. Remote park and ride usage does not include peripheral OGS shuttle lot usage.
5. Low daily ridership extrapolated for service improvements at 48,000 + 5 times growth in PM peak hour ridership.
6. High daily ridership reflects effects of improved site design.
7. Hydrocarbon emissions are derived from MOBILE5A emissions model based on levels of vehicle travel, speed and congestion.
8. Excess delay values are derived from CDTC's STEP model and represent excess person hours in congestion.
9. Trips are accessible if trip can be made within a reasonable time, relative to the auto travel time (door to door).
10. Trips have a transit advantage if they can be made faster by transit than by auto (door to door).

The CDTC model differs from standard land use models in three respects:

1. It uses measures of developmental attractiveness for residential development by zone that are derived from a multivariate linear regression analysis of residential growth patterns in the Capital District between 1970 and 1990, as reflected in census household counts and historic CDRPC employment counts by zone. The statistical analysis identified four zonal characteristics that correlate well with incremental household growth by zone: the amount of additional units that can be accommodated on "developable" land at acceptable densities; the ratio of median price of owner-occupied housing in the zone to the regional median; the ratio of property taxes per $1,000 of full value assessment in the zone to the regional mean; and the number of households in the beginning year (the total potential number of new households that could be built in Zone *j* given the developable land remaining and expected dwelling unit density). [Developable land in Zone *j* excludes existing developed land and undevelopable land. Undevelopable land is defined from CDRPC's criteria (which exclude areas with steep slopes, prime agricultural land, park land or protected open space, water bodies, floodplains, and wetlands). In 1980 approximately 100,000 acres in the four counties were considered developable. The approximate dwelling unit density per gross acre of land that would be expected in Zone *j* was calculated by dividing the number of 1980 households by 1980 acres of residential land.]

2. It operates as a "marginal" model rather than an abstract equilibrium model. That is, the model fixes in place the majority of dwelling units and a large portion of existing employment. It uses the Lowry-type model formulation to allocate the location of only a portion of existing households and employment, along with all of the region's household and employment growth. (In contrast, an abstract equilibrium model frees up all residential locations and most employment locations for allocation by zone according to the model's formulation.)

3. It is calibrated to the CDRPC forecasts of households and employment for the year 2015. CDRPC develops its baseline forecasts using Bureau of Economic Analysis and New York State regional control totals and uses a shift-share process and local knowledge to allocate regional growth to municipalities and then to traffic analysis zones. The CDTC model begins with the assumption that the CDRPC forecasts are correct given that travel times remain constant from 1990 to 2015, relative property taxes and property values do not change, and the availability of public sewer and water infrastructure is consistent with existing and currently committed systems. A "calibration factor" is computed for each zone to ensure that the model, when applied to 1990 conditions to estimate 2015 conditions, produces the CDRPC forecasts of households and employment by zone under those assumptions. The calibration factor is derived from the ratio of CDRPC forecast household growth for the zone to the modeled household growth for the zone. The calibration factor is determined once, after all increments have been allocated for the 2015 period, assuming 1990 travel times, property taxes, property values, and developable land.

The CDTC land use model can therefore be best described as a "pivot model." It does not attempt to estimate overall regional control totals for households or employment nor does it attempt to develop a reasoned allocation of households and employment to traffic analysis zones. Rather, it uses changes to baseline assumptions of travel time, property values, property taxes, and the availability of sewer and water forecasts to estimate the resultant shifts in households and employment.

The form, equations, and calibration of CDTC's Land Use Pivot Model are described in greater detail in CDTC's model documentation (*8*).

Application

Because the CDRPC baseline household and employment forecasts by zone do not reflect the impact of increased congestion (particularly increased congestion on the Northway Corridor serving the growth area of the region), an initial examination involved using the calibrated model with expected year-2015 peak-hour travel times to reallocate the marginal amount of households and employment in a way that reflects the increasing congestion levels. This application resulted in a conclusion that unmitigated congestion in the Northway Corridor would result in a decrease of 1,300 (about 7 percent) in the expected growth in households in Saratoga County and a slight increase in employment formation in that county. This finding is consistent with that in the literature. Deakin (*9*, p. 342) contends that the "wide-ranging body of work suggests that, all other things being equal, transportation investments that lower the costs of travel should decentralize housing and centralize employment but at the same time stimulate countervailing pressures for housing near the employment center and for service employment near the housing. Conversely, worsening transportation services will favor decentralization of jobs but support higher densities of housing in more central locations, although the relationships are not a simple mirror image because of precedent conditions in the developed areas." The small scale of shift predicted by CDTC's pivot model to result from increased congestion is also consistent with Deakin's finding that land use models (*9*, p. 340) "show that transport variables are no more critical to location decisions than such factors as housing type, size and cost suitability; crime rates; and, for families with children, schools. Moreover, life-style and life-cycle variations have been found to be as important as (in some cases, much more important than) transportation as determinants of location and land use choices."

Use of the locally calibrated model in testing the impact of congestion on settlement patterns has steered task force discussions away from viewing congestion as a potentially significant land use policy.

A second use of the model was to test a "Southern Crescent Scenario," that is, a scenario of encouraging development in the southern part of the region through expanded water and sewer services and higher allowable suburban densities. This scenario was tested by modifying the developmental capability values of traffic analysis zones in those areas and allowing the land use pivot model to reallocate service employment and households. The result was an additional 4,000 households allocated to five southern towns with a diversion away from Saratoga County of 2,300 households. Variations on this scenario were also tested. The model allowed the task force to sense the order of magnitude influence that might result from this policy action.

A third use focuses on the intangibles captured by the calibration factor. Issues of perceived school quality, crime, social conflict, age of housing stock and infrastructure, and other factors are not captured explicitly in the model but are covered by the calibration factor for each zone. An urban reinvestment scenario was tested by removing the calibration factor, reflecting a successful urban reinvestment campaign that effectively eliminates a bias against urban locations. This application of the model shifted 9,000 jobs and a similar number of households to the region's cities. When combined by the Transit Futures Task Force into a scenario of high-quality transit service, the urban reinvestment scenario produced estimates of significantly decreased overall transportation costs in the region.

As with the mode choice model, the ready availability of census data (in this case, time-series data) allowed merger with other available data to fashion a defensible method of testing policy options in a short amount of time.

The products of the task force are contained in its report (*10*); as an example of the products of the land use model applications, Table 2 is reproduced from Table 4 in that report.

TABLE 2 Household and Employment Distribution Used in Urban Reinvestment Scenario (*10*, Table 4)

	CDRPC Numbers				Urban Reinvestment Scenario			
MCD Groups	**1990 HH**	**1990 EMP**	**2015 HH**	**2015 EMP**	**Forecast HH**	**Forecast EMP**	**HH Change**	**EMP Change**
Albany County	116026	216296	130596	239644	138556	244054	7960	4410
Rensselaer County	57612	44667	65413	50177	66717	49612	1304	-565
Saratoga County	66425	48437	87077	55990	78362	54371	-8715	-1619
Schenectady County	59181	61934	63961	70087	63410	67853	-551	-2234
All Locations	299244	371334	347047	415898	347045	415890	-2	-8
3 Central Cities	90832	171831	92767	182357	94222	189866	1455	7509
12 Inner Suburban Towns	102483	119549	126575	143349	129052	137120	2477	-6229
12 Outer Suburbs	33131	16283	44614	20760	41403	18461	-3211	-2299
Eight Cities	118202	201302	120975	213609	124781	222516	3806	8907
23 Rural Outlying Towns	23107	7030	30880	8024	26478	8182	-4402	158
22 Villages	22321	27170	24003	30156	25331	29611	1328	-545

1. The three central cities included above are Albany, Schenectady and Troy. The category "eight cities" includes these three central cities plus the five cities of Cohoes, Watervliet, Rensselaer, Mechanicville and Saratoga Springs. The inner suburban towns included are Bethlehem, Colonie, Guilderland, Brunswick, East Greenbush, North Greenbush, Clifton Park, Halfmoon, Waterford, Glenville, Niskayuna and Rotterdam. The outer suburban towns include Coeymans, New Scotland, Sand Lake, Schaghticoke, Schodack, Ballston, Charlton, Malta, Milton, Moreau, Stillwater, and Wilton.

2. The household and employment distribution for the Urban Reinvestment Scenario was developed by letting the CDTC Land Use Model run with year 2015 travel times, no calibration factors, and ensuring a CDRPC level of employment in the Town of Colonie by preloading 1990 levels.

Use of Census Data in Describing Community Quality of Life

Purpose

The text in this section is drawn largely from a CDTC report primarily authored by Younger (*11*). CDTC's New Visions task forces shared a common mission, which included contributing to and concurring with a list of core performance measures against which to test the effect of alternative policies and investments. Through several revisions of the draft list, CDTC's participants continually reinforced a belief that not all aspects of transportation can be reduced to measures of cost. Some aspects have more to do with equity and distributional effects (who is helped and who is hurt?) and others are more abstract (are we building a community of which we will be proud?).

The Urban Issues Task Force took on the task of defining the "Community Character Index" cited in the list of core measures. Each task force was also encouraged to identify supplemental performance measures specific to its subject. As a result, much of the CDTC staff and task force technical effort related to the Urban Issues Task Force involved assembling a wide range of measures that directly or indirectly describe the nature of different communities in the region.

Structure

The task force members determined early in their discussions that no single measure could fulfill the objective of a "Community Character Index." Instead, the task force members encouraged the staff to articulate a wide range of measures that describe community character. Further, the members agreed to summarize information by community group rather than for each municipality. Groups constructed by CDRPC were used by the task force: central cities (Albany, Schenectady, Troy), small cities and villages, inner suburbs, outer suburbs, and rural areas.

The task force report (*12*) does not presume that the transportation system alone determines community quality of life. Correspondingly, transportation-based strategies alone will not be sufficient to preserve and enhance existing quality of life in the future. This report focuses on the transportation system because it contributes to the regional transportation plan for the Capital District. The importance of transportation to quality of life is thus highlighted, but its role is as a contributor.

Developing the community quality of life measure was hampered by a lack of data—recent and historic data, data collected at an appropriate scale, data that speak to what quality of life is composed of. However, an examination of various socioeconomic factors, components of regional mobility, real estate, and road ownership patterns in conjunction with a "nonmeasurables" discussion paints a picture of the Capital District in the mid-1990s. Among the most readily available and useful information was that contained in census reports and the CTPP.

The resulting picture is one of a region with many assets—a compact growth pattern, a well-educated work force, and a relatively stable economy. Compared with many places, the Capital District currently enjoys a relatively high level of mobility, particularly by automobile. However, trend projections provide some important warning signals.

The measure of community quality of life is intended to gauge how the transportation system (in existing and alternative future scenarios) affects land use and other conditions within a defined community. Together with the amount of open space, dislocations of existing residences and businesses, and the land use–transportation compatibility index developed by the Arterial Corridor Management Task Force, the external effects of how the transportation system affects land use can be documented.

The measure of community quality of life developed by the Urban Issues Task Force is a discussion of a set of numbers rather than of a single number. It attempts to paint a picture of how transportation, and its interaction with land use, has influenced the quality of life at the community level. The absolute values of the components of the measure are less important than the direction and magnitude of change under trend conditions and different future scenarios.

However, much of what makes up community quality of life is not measured, or maybe even measurable. It was a struggle to define quantifiable components of such an illusive thing as quality of life for which defensible data had been collected at a relevant level of detail. Planners are only beginning to understand the impact of landscape and urban form on the psyche. The difference in "quality" felt on Main Street or in a neighborhood shopping district and a strip shopping mall is partially explained by street width, setbacks, location and amount of parking, proximity of residential neighborhoods, presence of trees, and general "pedestrian friendliness," but the difference is more complex than that. It has to do with the reassurance of stability that Main Street or the corner store provides, the social interactions it fosters, and the lifting of the spirit that a special place produces.

Level of Analysis

"Community" can be defined at many levels, including neighborhood and municipal, or by grouping similar areas, such as central cities, inner suburbs, outer suburbs, small cities and villages, and rural towns, as the CDRPC does in some of its analysis. Neighborhood-level analysis is not the appropriate scale to use for the regional transportation plan. The advantage of using the municipality as the unit of analysis is that individual differences are highlighted (the advent on certain routes of fixed guideways, for example, may not affect Troy's quality of life in the same way as Albany's). Disadvantages include the possibility of negative reaction by the public or press to the characterizations assigned. The advantage of grouping similar municipalities is that the debate can stay centered on a more generic level (impact of policies on urban areas versus rural areas in general). Disadvantages include the loss of a level of detail. Data are currently collected at the municipality level regardless of how the data are grouped. The Urban Issues Task Force opted to present community group-level analysis in its initial development of the community-quality-of-life measure.

This grouping was not its first choice, however. "Urban" areas in reality are less defined by municipal boundaries than by density and the availability of basic infrastructure and services. By this definition, there are areas within the city of Albany that are not "urban" and places in Colonie that are. Although the numbers that currently compose this measure are based on census data available at the level of census tract and traffic analysis zone, the tools to analyze and present the information at that level of detail are not ready for CDTC use. With the introduction of GIS and advanced mapping techniques, it is hoped that the next iteration of measurement of community quality of life will use a density–service provision definition of urban rather than the conventional grouping defaulted to here.

Application

"Abstract as it may be, the quality of life is one of the primary characteristics by which communities identify themselves" (*13*, p. 16). For the purpose of this exercise, community quality of life is a product of the activity levels in different arenas. The areas chosen are not all-inclusive. Availability of data played a large role in determining what specific factors are presented in this analysis. A lot of information on important components of quality of life is either not collected at all or not collected at a level of detail appropriate for this use. Time limitations forced the CDTC staff and task force to use existing data sources, and so the breadth of the presentation is correspondingly limited.

To make it easier to present the information, data are grouped into four subject areas: socioeconomic factors, mobility measures, real estate–land use indicators, and cultural and nonmeasurable components.

The specific data examined by municipality type under each category are as follows (those factors measured primarily through the use of census data or forecasts based on census data are shown in italics):

- Socioeconomic factors
  - —*Household characteristics, 1990*
  - —*Income levels of resident households, 1990*
  - —*Capital District population shifts, 1970-2010*
  - —*Capital District employment shifts, 1970-2010*
  - —*City/county ratio of population, 1950-1990*
  - —*City/county ratio of family income, 1950-1990*
  - —*Population by race, 1990*
  - —*Location of Capital District poverty populations, 1990*
  - —*Location of Capital District elderly populations, 1990*
  - —*Number and location of college-educated Capital District residents, 1990*
- Mobility measures
  - —Percent of jobs within 10 and 30 min, 1993, 2015 with TIP commitments
  - —Person trips accessible by transit, 1993, 2015 with TIP commitments
  - —*Journey to work by mode, 1990*
  - —*Worker destinations by mode, 1990*
  - —*Number of people who live and work in the same municipality, 1990*
  - —Vehicle-miles traveled, 1993, 2015 trend, 2015 with TIP commitments
  - —Vehicle-miles of delay, 1993, 2015 trend, 2015 with TIP commitments
  - —*Number of vehicles per household in the Capital District, 1990*
  - —*Location of mobility-limited populations in the Capital District, 1990*
- Real estate–land use indicators
  - —Property values, 1992
  - —*Median value of a single family home, 1990*
  - —Overall property tax rates per $1000 assessed valuation, 1993
  - —Building permits for new construction, 1994
  - —Permits for additions and alterations, 1994
  - —Capital District office market summary, fall 1994
  - —Retail activity, 1972, 1992
  - —Centerline road miles by ownership, 1993
- Cultural factors and nonmeasurables
  - —Cultural amenities
  - —Social interactions/privacy
  - —Service availability
  - —Diversity

The components measured to determine community quality of life in the report follow this general organization. The general trends that can be expected in each of these areas if present conditions persist are then discussed, with a focus on the role of transportation provision. A set of transportation-focused strategies to protect community quality of life is then presented. These strategies are based on a set of guiding planning and investment principles that make connections between economic health, quality of life, and transportation.

Although the community quality of life exercise differs significantly from the model-based application of census data described earlier for mode choice and land use models, the value of census data to this important policy discussion was no less critical. By combining available census information with other data, a picture of the unique and valuable characteristics of the different community groups was painted in an objective fashion. This led to broad discussions of "win-win" strategies that could help preserve the diversity of community types, reinforce strong community characteristics, and address community weaknesses. Census information contributes many vital aspects to this picture.

Table 3 from the community quality of life report gives an example of the material presented in the quality of life discussions.

Conclusions

The challenges of addressing serious planning issues raised in the context of a participatory planning process such as CDTC's New Visions center on timeliness. The commitment and patience of nontraditional participants such as shippers, neighborhood representatives, developers, and other stakeholders will last only as long as the professional staff appears to be responsive and timely with information. Further, the ability of professional staff to turn what might otherwise be a battle of unsubstantiated philosophies into an objective discussion hinges on the quality of analytical tools.

CDTC's New Visions process has been just such an undertaking. Not only have dozens of stakeholders been empowered to raise issues and explore options, but they have been supported by significant technical work by CDTC staff, much of which required new tools.

The ability of CDTC to respond to these challenges is rooted in its tradition of cooperative decision making and reliance upon objective information, in its capable and willing staff, and in the availability of adequate data to support new tools. Census information—both published data and CTPP data—serves an irreplaceable role alongside locally generated data in supporting the New Visions analytical tools. As documented in this paper, a new mode choice model, a new land use pivot model, and a new approach to examining community quality of

TABLE 3 Location of Capital District Poverty Populations, 1989 (*12*)

	Number At or Above the Poverty Level	Number Below the Poverty Level	% Below the Poverty Level
Central Cities	169,690	34,742	17.0%
Villages, Sm. Cities	109,222	10,806	9.0%
Inner Suburbs	257,377	9,022	3.4%
Outer Suburbs	87,237	4,054	4.4%
Rural Areas	61,207	4,701	7.1%
REGION TOTAL	684,733	63,325	8.5%

Source: 1990 Census, U.S. Department of Commerce – CDRPC Community Profiles.

life were possible in the short time permitted by the participatory New Visions process largely because census data were readily available.

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