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Atlanta Region Metropolitan Planning Study

INTRODUCTION

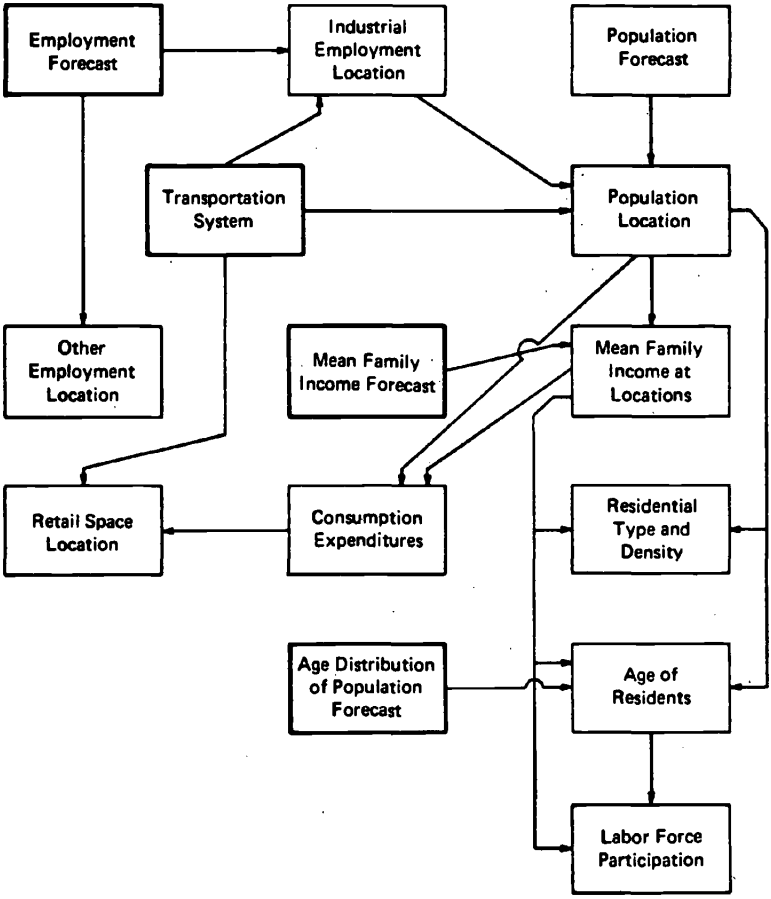
THE OBJECTIVE OF the Atlanta area study was to predict the demand for transportation in 1983 and, as an intermediate step, the land use for the area in the same year. The Atlanta model is not a mathematical model, but rather a series of steps employing judgments based on empirical analyses.[1] With models of this form, linkages and feedbacks are not always explicitly stated.

An overview of the Atlanta procedure is given in Figure 6. The model begins with the determination of areawide totals for employment, population, mean family income, and the age distribution of the population. The next step is the allocation of industrial employment within the area. Population is allocated to zones as a function of access to the projected employment locations. On the basis of the population locations and areawide mean family income, mean family income by zone is projected judgmentally.

The increment in the housing stock (types of residences) and changes in housing density are determined on the basis of the population allocation, mean family incomes by zone, and assumptions re-

[1] The papers describing the methodology used for the Atlanta study are vague in parts. Consultation with the principal researchers and the consultants to the project, Hammer, Greene, Siler, and Associates, indicates that the vagueness often corresponds to those places where judgmental methods were used the descriptions of which were too lengthy for inclusion in reports. A good deal of time has been used attempting to specify and state explicitly the nature of the judgmental steps.

Figure 6
Synthesized Flow Diagram for the
Atlanta Area Land-Use Model



garding the form of new housing construction. Then the age distribution of the population within each zone is determined.

Zonal labor force participation depends upon the age distribution of the population and the mean family income.

Using income and population distributions, the level of total consumption expenditures by zone is ascertained. The allocation of demand to a particular retail location depends on the transportation system and the spatial distribution of demand for retail purchases.

It is this combination of factors, along with several other assumptions, that determines the distribution of retail land use. After the land-use pattern of the area is determined, the transportation requirements of the new spatial form are derived, based on the physical characteristics of the area and the economic and demographic characteristics of its inhabitants.

Allocation by geographic subareas is accomplished in three steps: (1) allocation to intermediate areas composed of one or more census tracts; (2) allocation within the intermediate areas to the census tracts; and (3) allocation to the zones within each census tract. Three types of intermediate areas are defined: built-up areas consisting of those census tracts that are now fully developed and in which it is reasonable to expect a leveling-off or actual decline in population; rural areas consisting of those census tracts that, according to certain criteria, are not recommended for population growth; and expansion areas consisting of those census tracts that should be expected to receive the major impact of future population growth.

METHODOLOGY

Population and Employment Projections

Population projections are based on national projections made by the U.S. Bureau of the Census. It is assumed that the Atlanta area will continue to share in the nation's population growth at the same rate as during the 1950–60 period. Of the four census projections of national population, the one predicting the smallest increase is used. The age distribution of the population is also estimated on the basis of projected national distributions.

Employment levels in the Atlanta area are projected by using two methods, which yield very similar total employment projections. One method bases the projection on an analysis of past trends and estimates of the future potential of various industry groups, for the country and for the Atlanta area. The other method links employment to demographic projections. It predicts future employment by analyzing the sex and age profiles of the projected population and then estimating labor force participation, the resident labor force, unemployment, and multiple jobholders.

Allocation of Industrial Employment

The employment increment in each of thirteen industry groups is assigned to one of four types of employment location. These assign-

ments are based on an analysis of each group's location orientation. The four types of employment locations are central places, industrial districts and parks, population-linked areas, and special areas. Special areas include airports and hospitals; their employment is allocated exogenously. Separate routines are used to allocate those industry groups assumed to be attracted to the first three area types. The routine allocating employment attracted to population-linked areas is described in the retail land-use section of this report.

Employment in those industries attracted to central places and industrial districts and parks is allocated to subareas with an algorithm that ranks industry groups by their preferences, in the base year, for certain locational factors and subareas by their possession of these factors. Employment in each industry group is then allocated to those subareas that most closely satisfy the group's preferences. No method is specified for handling industrial trade-offs or bidding among groups.

Allocation of Population

The first step in the allocation of population is to assign population to built-up rural areas on the basis of current urban renewal plans, planned private projects, probable installation of utility services to outlying areas, and planning staff recommendations. The remaining population is assigned to expansion areas by means of the following formula:

$$p_i = P_t(A_iH_iK_i)/\sum_m(A_mH_mK_m)$$

where p_i is predicted population in tract i, P_t is predicted total population, A_m is accessibility by auto and transit to employment,[2] H_m is tract holding capacity, K_m is an adjustment factor.

Determination of Mean Family Income

The procedure used to estimate the 1983 mean family income by census zone begins by predicting the 1983 mean family income for the Atlanta area. The income prediction is derived from the projected national mean family income by assuming that Atlanta's family income

[2] Construction of an access index involved studying various maps to determine accessibility and the presence of various other desirable factors. A maximum value of access of 1.0 was given for the CBD, and values for all other areas used the CBD as a reference. This ranking system was clarified in a conversation with Margaret Breland, Chief of Research, Atlanta Regional Metropolitan Planning Commission, a participant in the study.

will increase slightly, relative to that of the United States. Next, an average for each county in the area is subjectively determined by comparing the 1961 and 1983 family distributions and the 1961 income distribution. Estimates of census tract income are based on the country averages and the socioeconomic characteristics of the population anticipated in the tract, taking into account housing age and quality, land use, racial occupancy, and other relevant factors. The zone incomes are computed by rating each zone within the tract relative to the tract average. The rating is based on anticipated development characteristics.

Housing and Residential Density

Population estimates and the mean family income in each zone, along with some assumptions about the future composition of the housing stock in the region, permit estimation of type of housing units and residential density in each zone. Analysis of data on the Atlanta housing market led to the assumptions that (1) the number of persons per housing unit would decline over the period; (2) housing units in multifamily structures would be about 35 per cent of all new residential construction over the period; (3) housing units in high-rise structures would be about 10 per cent of all new multifamily structures; (4) all new residential construction in the built-up area would be of the multifamily types; and (5) the trend toward a higher proportion of multifamily construction in suburban areas would continue.

The increment of housing units in each zone is obtained by comparing projected and base-year population, then adjusting the stock to meet the increased demand. The normal vacancy rate for new housing is assumed to be 3 per cent. Residential densities, supplied by local planning agencies, are applied to the housing inventory to calculate the increment in net residential acreage.

To review this procedure: Changes in demand are estimated from changes in population between 1961 and 1983 for each zone; the form of the new units is determined by assumptions regarding new construction; total housing stock is obtained by adjusting for average vacancy rates; and, finally, residential acreage for each zone is estimated.

Allocation of the Labor Force

An analysis of the 1961 labor force was undertaken to determine the effect of socioeconomic characteristics on labor force participation

rates. The factors tested include the age distribution, mean family income, and racial characteristics of the zones. The age distribution and mean family income were found to have a significant effect on participation rates. The procedure used to determine labor force participation takes account of these factors.

The distribution of the labor force to zones is accomplished in a two-step process. First, the spatial age distribution of the population is projected. Then, on the basis of the age distribution and mean family income for each zone, each zone's labor force is estimated.

The age distribution of the noninstitutional 1983 population for each zone is projected on the basis of assumptions about differential population gains among the counties. The four outer counties are assumed to receive more than proportional increases in the younger age groups. Fulton County is assumed to contain a larger proportion of people over eighteen years of age. A study of the 1961 age distribution in each tract zone yielded sixty-eight age distributions depending on income, race, and housing characteristics. The 1983 zonal age distributions are projected by matching forecast zone characteristics with the sixty-eight age distributions. The most significant change affecting the age distribution between 1961 and 1983 is the spread of multifamily housing to suburban zones.

Labor force participants in the fourteen–nineteen and twenty–sixty-four age groups are distributed to zones in proportion to each zone's share of metropolitan population in the same age classes. This age grouping is made to take account of the higher variance of the fourteen–nineteen-year-old group's participation rates. The sum of the labor force participants for each zone in these two age groups is then adjusted by an income factor. This yields an estimate of the number of labor force participants in each zone.

Retail Land Use

As a last step, the model forecasts space requirements for the retail trade sector and the allocation of this space in the area. Sales totals, instead of employment, are used to compute space requirements. Total area retail sales are estimated from the population and income projections. It is assumed that there will be no change in proportion of retail sales made to nonresidents of the area. The ratio of convenience goods to total expenditure is projected on the basis of the 1958–63 trend.

Retail sales are judgmentally distributed to the five counties within

the study area. It is assumed that the CBD's share of retail sales will decline, but that dollar sales will increase at a reasonable rate. Residual sales (i.e., those not allocated to the CBD) are allocated to the outlying counties on the basis of their purchasing power and existing and anticipated retail facilities.

The projected retail sales are converted to total space requirements. A space performance or need level is assigned to each major retail group in each county to estimate overall space additions.[3] The allocation of retail space to tracts and zones is made on a judgmental basis. Location of comparison-goods space involves subjectively locating major regional shopping centers and estimating their overall size. The remaining comparison-goods space is distributed to locations on the basis of major street placements. Convenience-goods store space is distributed on the basis of population changes and certain judgmental factors.

These projections of retail floor space are then converted into sales by tract and zone using sales-space ratios. These ratios are a function of store type—convenience or shopper—and are varied among the tracts in an unspecified manner.

OVERVIEW

Clearly it is questionable to view the distribution of population and the assignment of housing type as a sequential rather than a simultaneous process. It can be strongly argued that the two decisions are not independent. For example, a family might prefer to live considerably nearer to the city if it is to live in a multifamily dwelling.

The model does make some provision for increasing densities in built-up areas by assuming construction of only multifamily structures in these zones. It does not, by contrast, formally consider the effects of filtering and demolition on the housing stock.

In determining the location of industry, the Atlanta model considers the locational characteristics of all—rather than only the recently moving—firms. As will be discussed more extensively in Chapter 9, this method introduces biases that tend to perpetuate the historical locational pattern.

[3] The space performance level refers to the sales-land ratio, which depends on operational characteristics (i.e., the degree of self-service sales in the establishment) and other factors causing space to be more efficiently utilized. These were projected by the consultants to the projects.

Atlanta's heavy reliance on judgments also suggests possible difficulties. These judgments may result in forecasts of land use that are quite good, given present information. In a continuing planning program, however, it is very important to introduce new information over time. Without careful specification of the basis for judgment (a difficult and rarely accomplished task) it is not clear how new information can be introduced or properly used. The problem of incorporating new information is exacerbated as new personnel, unfamiliar with the informal judgment bases of the model, join the planning staff. In short, a more formal and more specified procedure would facilitate the incorporation of new people and new information into the planning process.