TEXAS TRANSPORTATION INSTITUTE

TEXAS HIGHWAY DEPARTMENT

COOPERATIVE RESEARCH

TRANSPORTATION PLANNING

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U. S. Department of Transportation
Federal Highway Administration
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TRANSPORTATION PLANNING

1. Dodds, James C. and Elenowitz, Leonard. PLANNING LEGISLATION, 1966-1967. AIP Journal (917 15th St. N.W., Washington, D.C. 20005), Vol. 34, No. 5, pp. 312-322, Sept. 1968. HR Abstracts, February 1969.

   This review continues the coverage of previous legislative reviews in 1964 and 1966. Major planning legislation, both state and federal, for the past two years is described under general categories. Significant new legislative developments are identified, and specific acts are cited. Among the highlights included are Section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, a wide variety of new state planning and urban development acts, and recent activities in the field of metropolitan councils of government.

2. Simonffy, Zoltan. THE TWO-LEVEL NO-WEAVE INTERCHANGE. Translated from Hungarian by R. Brain. Surveyor (40 Bowling Green Lane, London EC1), Vol. 132, No. 3979, pp. 43-44, 47+, Sept. 7, 1968. HR Abstracts, February 1969.

   The author examines the problems associated with "at-grade" junctions and those associated with weaving, and considers that the most satisfactory solution to the intersection problem is the insertion of grade-separated interchanges where weaving is eliminated. The relative merits of direct and indirect interchanges are briefly discussed and the author concludes that the indirect interchange is likely to prove the most satisfactory, particularly in view of the difficulties associatdd with spreading the individual highways to accommodate direct connection ramps. Four-leg right-angled intersections are analyzed in detail and a method of specifying right-turn connections for two-level, no-weave interchange patterns in symbolic terms developed. The author shows that there are only 17 basic forms of interchange satisfying his conditions for two-level no-weave interchanges and that these may be expanded into 82 patterns in 484 possible combinations which will satisfy the conditions for a no-weave right turn

3. Day, John B. TRENDS IN TRANSPORTATION RESEARCH. Battelle Technical Review (505 King Ave., Columbus, Ohio 43201) Vol. 17, No. 9-10, pp. 24-32, Sept./Oct. 1968. HR Abstracts, February 1969.

   The importance of urban transportation and the urgent need to improve or provide it are widely recognized, as evidenced by the increasing amount of research being conducted in this field. Viewing urban transportation as a total system, the authors have identified three major areas for research--equipment technology, operations methodology, and the part played by political and civic organizations in planning and establishing urban transportation systems. They discuss current research and conclude that well directed studies and analyses will result in improvements in each of the three areas.

4. Morlock, Edward K. and Bruck, H. W. DEFINING TRANSPORTATION OBJECTIVES: THE ROLE OF HIGH SPEED GROUND TRANSPORTATION. Transportation Research Forum, Papers from the 8th Annual Meeting, (Grant C. Vietsch, 163 E. Walton St., Chicago, Ill. 60611) pp. 361-378, 1967. HR Abstract,, February 1969.

The contribution of the analysis of high-speed ground transportation to the formulation of transportation objectives is twofold. Firstly, out of the development of a framework for analyzing the capabilities of different modal technologies arose a language which is useful in describing objectives. This language enables the precise statement of objectives at the transport system output level and enables us to relate objectives to both system and technology choices as well as to higher levels of objectives related to the environment. Secondly, it provides a basis for setting realistic objectives--realistic in terms of present capabilities and in terms of expected future capabilities.

5. CLEVELAND SHOWS THE WAY, AIRPORT EXTENSION WILL SOLVE JET AGE "PARADOX." Metropolitan (1155 Waukegan Rd., Glenview, Ill. 60025), Vol. 64, No. 5, pp. 20-24, Sept./Oct. 1968. HR Abstracts, February 1969.

The Cleveland Transit System is completing the 4-mile rapid transit extension from its West Park Station to Cleveland Hopkins International Airport. Running time to the airport from downtown Cleveland, the hub of the rapid transit line, will be 20 minutes. In comparison, the trip by car takes about an hour in rush hours. The "Airporters," the first rapid transit cars designed specifically for passenger service between a metropolitan airport and the downtown business district, are built of stainless steel and are capable of traveling up to 60 mph. The seats are wider than in the present CTS rapid transit cars and are spaced further apart for added passenger comfort. Each car is equipped with two luggage racks to accommodate the airport traveler. The trip from the airport to downtown Cleveland will cost 35 cents.

6. McIntosh, P. T. and Martin, B. V. USE OF THE COMPUTER IN TRANSPORTATION PLANNING. Journal of the Institution of Highway Engineers (Pergamon Press, 4401 21st St., Long Island City, New York 11101), Vol. 15, No. 8, pp. 25-31, Aug. 1968. HR Abstracts, January 1969.

The paper relates the development of transportation planning procedures to the evolution of computer technology. The effect of computer characteristics on the procedures adopted in transportation studies is identified. The principal steps in a transportation planning model are described with particular emphasis on the computer procedures most commonly used. Some of the difficulties encountered, typical running times and core storage requirements are also mentioned. Recent developments bridging the gap between planning and design are described with particular reference to work in the Greater London Council. It is suggested that the impending reorganization of public transport and future changes in the structure of local government will probably lead to more sophisticated planning, design and operation of transport systems, which may, in turn, lead to greater emphasis on advanced models and modern computer facilities.

7. Hodgen, R. and Watson, M. A RAPID METHOD FOR THE SYNTHESIS OF URBAN TRAFFIC. Traffic Engineering and Control (34-40 Ludgate Hill, London EC4), Vol. 10, No. 4, pp. 169-173, Aug. 1968. HR Abstracts, January 1969.

There is a need for a method of estimating future travel patterns which would be intermediate between an intuitive and largely unquantified assessment and the full precision of a complete prediction at a level adequate for the detailed study of individual transportation proposals. To meet this need a program known as SYNTH has been developed, which will synthesize a complete urban

travel pattern from relatively simple input data at a level of zoning which, although coarse, is adequate to evaluate the overall transportation implications of different urban forms. There are three basic stages in the method. The first is the estimation of the number of trips produced by or attracted to each zone. The second is the distribution of the trips produced by each zone to the zones of attraction. The third is the estimation of how many of these zone-to-zone trips will be made by private and how many by public transport. The method had to be based upon a simple and straightforward statistical input since a basic object was to reduce the work involved in the production of these statistics to manageable proportions. The parameters to be used are, therefore, restricted to population and employment as a measure of land development, and to car ownership and a level of service index for public transport as a measure of the availablity of transport.

7. Tuemmler, Fred W. A GUIDE FOR URBAN PLANNING--CHAP. IV. COMMERCIAL LAND PLANNING. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 94, No. UP1, Proc. Paper 6086, pp. 31-64, Aug. 1968. HR Abstracts, January 1969.

Commercial land planning is closely identified with the business of merchandising. This highly competitive field is constantly searching for better methods of bringing together potential customers and the goods or services offered to them. It is shown that carefully devised zoning regulations provide a means of effectuating the plans for commercial land use. Sign ordinances are also needed when regulatory measures are not part of the zoning ordinance. The urban renewal plan also provides a positive means of carrying out plans for commercial land use. Building codes, although intended primarily to control structural aspects of development, also contribute to the overall objective of creating and maintaining sound community development, whether it be related to commercial or other types of land use. But in the final analysis, functionally efficient, attractive commercial areas are the product of imaginative design fortified by the desire of the community to build and maintain the kind of place that it wants to present to the world.

8. Bierman, George R. and Hain, John L. THE AUTOMATIC HIGHWAY. Mechanical Engineering (345 E. 47th St., New York N.Y. 10017), Vol. 90, No. 7, pp. 18-21, July 1968. HR Abstracts, January 1969.

In planning for mass transit in the urban-suburban workplace-residence environment of the future, it seems apparent that means must be developed which will provide incorporation of the privately owned vehicle into the system. The overall concept is that of a control system integrated with a reasonably priced right-of-way. Individual vehicles are accepted into the system at predetermined points, completely controlled by the system until arrival at a preselected destination, and returned to local control upon departure from the system right-of-way. Certain features of vehicle design will have to be standardized and their quality, both in manufacture and maintenance, closely controlled in order to achieve the required operational control within the mass-transit system. Control of those vehicle features, which constitute the interface between vehicle and mass-transit roadway, should be retained at the highest governmental level affected by the location and operation of the UHMT (Urban Highway Mass-Transit). Ways of linking the cars to the control system of the highway are

presented. The operations (entrance to highway, rejection of unfit cars, spacing and speed on highway and return to uncontrolled areas) are discussed. The suggestion is made that one terminal of the exit ramps might lead to automated parking areas where the car could be stored for the day and from which it would be retrieved (automatically) at night.

9. THE SKOKIE SWIFT, A STUDY IN URBAN RAPID TRANSIT. Chicago Area Transportation Study (136 N. Franklin St., Chicago, Ill. 60606), July 1968. 110 pp. HR Abstracts, January 1969.

The report is a summary of the Chicago Area Transportation Study's role in the Chicago Transit Authority-Village of Skokie Mass Transit Demonstration Project sponsored by the U.S. Department of Housing the Urban Development. The project extended CTA rail rapid transit service along the facilities of the North Shore Line, an electrified commuter railroad which abandoned service in 1963. This report concludes that, with the inception of Skokie Swift Service, overall transit ridership in the Skokie area increased markedly during the course of the demonstration project and that this increase was absorbed almost wholly by the Skokie Swift, the bus lines in the area showing ridership figures which remained relatively constant or declined when Swift service began. Analysis of surveys conducted for this study indicated that diversion of Loop-bound trips, where the Skokie Swift has its strongest competitive advantage, is made mainly from other rapid transit modes, along with suburban railroads and buses, with only a small number being diverted from automobile trips. Furthermore, this diversion of automobile trips has not noticeably or measureably reduced traffic on the expressways linking the Skokie area with the city of Chicago, according to traffic count data collected and analyzed by CATA.

10. UPTOWN TO DOWNTOWN IN 1980. SRI Journal (Stanford Research Institute, Menlo Park, Calif. 94025), No. 21, pp. 4-13, Aug. 1968. HR Abstracts, January 1969.

To a large extent the present transportation muddle is a result of fragmentation. Automobiles, buses, subways and trains are not considered a part of one system but as competing components. Five different families of complementary systems have been proposed. These concepts are evaluated. For high-volume short-distance activities in the downtown areas, moving sidewalks would suffice. For the longer, but still urban trips, small cars on a public rental system (Public Automobile System or PAS) would serve. These would be rented to accredited drivers. For nondrivers, Dial-A-Bus service would be available. For longer trips, a network of guided highways, employing specially built automobiles which would travel at speeds up to 70 mph between stations selected by occupants, would be developed. Fast Transit Link (FTL) would connect cities along corridors. This would carry 20 to 80 passengers, depending on the size, at speeds up to 250 mph.

11. Whitlock, W. M. and Cleary, E. F. PLANNING GROUND TRANSPORTATION FACILITIES FOR AIRPORTS. Wilbur Smith and Associates. Presented at the Highway Research Board meeting, January 1969.

Growth in air travel and expected changes in air travel characteristics brought about by the introduction of larger aircraft and improved operating techniques make it necessary to adequately plan ground transportation for new

and expanded airports. Field studies at selected major airports in the United States have established inter-relationships between enplaning passengers and requirements for vehicles serving airport functions and users.

Trends are presented of the historical experience in passenger and goods movements by air to complement and to quantify the magnitude of the problem of planning for continued increases in air movements. Obvious correlations are summarized between such planning parameters as comparisons of annual and daily passengers with total inbound and outbound vehicles, parking characteristics, and relationships of available and projected curb frontage requirements with enplaning and deplaning passengers. Use of projections of enplaning passengers for major airport hubs prepared by the Federal Aviation Administration have also been utilized to project parking space requirements and to determine magnitudes of the ground transportation problem which appears imminent, assuming extensive projections of air patronage become a reality.

Finally, a summary is presented highlighting expected travel characteristic changes which will be apparent in the future. Additional broad considerations are further suggested for improving airport utility and ground transportation systems.

12. Hoel, Lester A. EVALUATING ALTERNATIVE STRATEGIES FOR CENTRAL CITY DISTRIBUTION Carnegie-Mellon University. Presented at the Highway Research Board meeting, January 1969.

Central city distribution is an essential element in the hierarchy of a regional transportation network. It is the total system that the user views, and consequently both collection and distribution systems require separate evaluation.

A central city distributor system can be composed of technologies including pedestrian ways, bus systems on existing streets, or mechanized loops on exclusive rights-of-way. The distributor system technology is influenced by the nature and configuration of the regional system. If the regional system penetrates the core area, then both delivery and distribution must be accomplished within one set of criteria. If two or more technologies are considered, then a greater variety of alternatives is possible, since the regional system is freed of its role as a CBD distributor and the distributor system is freed of the restraints dictated by the location of the regional lines. The selection of alternative strategies is based on a variety of factors including facility cost, level of service, environment, and community impact.

Travel time, including waiting, walking, station dwell, transfer, and riding, is utilized in this study to evaluate a variety of single-technology and small-vehicle systems developed for the Pittsburgh central business district. The model developed calculates all appropriate paths between each cordon point and the zone centroid for a convenience (minimum time) rule and for an accessibility (minimum walk) rule.

Single-technology systems show little difference in travel time for either criterion, whereas values computed for small-vehicle systems change considerably. Total trip time for the single-technology system was 8.46 minutes, with 63.9 percent traveling 9 minutes or longer, and 6.88 minutes for the small-vehicle system, with 37.7 percent traveling 9 minutes or longer. However, only 21 to 33 percent must transfer on the single-technology system, whereas from 42 to 88 percent transfer on the small-vehicle system.

While final choice of systems depends on a variety of economic, political,

and environmental factors, it would appear that small-vehicle systems for central city distribution present a viable alternative for systems design.

13. Deen, Thomas B. and James, Donald H. RELATIVE COSTS OF BUS AND RAIL TRANSIT SYSTEMS. Alan M. Voorhees and Associates. Presented at the Highway Research Board meeting, January 1969.

There is a growing need for information on the relative costs of bus and rail systems for providing rapid transit service. Rapid transit is here defined as transit operating on its own exclusive right-of-way. The first step in comparing bus and rail costs is to analyze the various methods suggested for operating busway systems. This was done by comparing the relative service and costs associated with four separate operating patterns. The sensitivity of the conclusions was tested to determine the effect of line length, passenger traffic patterns, feeder bus route length, station spacing, and other variables. It appears that no particular operating method is inherently superior to all others. Any one method may be superior in a particular instance, depending on the operating environments and conditions that must be met. The bus-rail cost comparison can then be viewed with assurance that the analysis was not distorted by the method of bus operation selected.

Hypothetical bus and rail systems were described so that each provided identical services. Relative costs for providing the service vary depending on line length, proportion of the line requiring subways, and passenger loadings. Sensitivity of costs to rising wage rates and variable interest rates was also examined.

Rail systems can demonstrate cost superiority where peak hour passenger volumes exceeding 12,000 must be carried and/or where more than 20 percent of the system requires subways. At volumes of 4,000 peak hour passengers, and where no subways are required, buses show cost superiority.

14. Bellomo, Salvatore J. and Provost, Steven C. TOWARD AN EVALUATION OF SUBAREA TRANSPORTATION SYSTEMS. Alan M. Voorhees and Associates. Presented at the Highway Research Board meeting, January 1969.

Urban transportation planning must be directed toward the achievement of broad social, economic, political, and organizational goals of the community and region. In the traditional approach to transportation plan development, subarea plans are prepared after the regional plan has been established. However, experience has shown that many times the subarea planning results in alternatives that are in direct conflict with the regional system elements. Often this conflict is not realized until the planning for the regional system is beyond the revision stage or at least has advanced to a point where changes result in costly delays and "second best" solutions.

It is the viewpoint of the authors that subarea planning must be carried out as an integral part of the regional system planning so that both subarea and regional goals can be achieved concurrently. The paper discusses the application of this approach for the evaluation of alternative transportation systems for subareas. The planning process framework is identified and emphasis is placed on the multi-mode transportation measures and criteria that can be used in the evaluation. Case examples are used to illustrate how the suggested approach can be used.

15. Cassel, Arno. A RESOURCE ALLOCATION MODEL FOR TRANSPORTATION PLANNING. The Franklin Institute Research Laboratories. Presented at the Highway Research Board meeting, January 1969.

This paper describes the methodology used in development of an interim master plan for transportation in Pennsylvania to 1975. The rationale for development of this plan is based on a three-step approach: determination of goals for transportation development in the Commonwealth and identification of alternative projects and programs to meet these goals, evaluation of alternative projects and programs under different assumptions about goal values and budget levels, and selection of those projects and programs for the interim master plan that were most beneficial in terms of goal satisfaction and could be purchased within a specified budget level.

The most important feature of this methodology is a computerized resource allocation model for evaluating and selecting projects on the basis of multiple criteria in terms of their anticipated costs and benefits. This model has been specifically developed by The Franklin Institute Research Laboratories for evaluating subjectively determined program benefits to meet a set of weighted goals subject to overall cost constraint. The evaluation technique required an estimation for each proposed project of the out-of-pocket investment cost of the state and the anticipated benefits in each of nine categories. These estimates were then manipulated using three goal-making assumptions in combination with two assumptions about the budget available for new projects. Those projects that were selected under all assumptions about goal values and budget levels were included as the "highest priority projects" and those projects that were rarely or never selected under any assumptions about goal values or budget levels were considered.as "lowest priority projects."

Although this methodology has limitations associated with the arbitrary ranking of benefits and estimating of costs under conditions of less than adequate knowledge, it provides a systematic framework for evaluating and selecting projects, compared with using intuitive judgments. Despite these limitations, the approach outlined will be useful for transportation planning until more sophisticated methodology becomes available.

16. Manheim, Marvin L. SEARCH AND CHOICE IN TRANSPORT SYSTEMS PLANNING. Massachusetts Institute of Technology. Presented at the Highway Research Board meeting, Jan. 1969.

It has become clear that transportation is not a question of hardware alone, but of social and political choice. At its core, transportation is a technological problem in that the available alternatives are constrained by the present state of technology. But the real issues are not the alternative technologies, but their ramifications--how each alternative transportation system affects differently the various segments of a society.

Search, as used in the title of this paper, is this problem: Given a statement of goals, can we design a transportation system that seems reasonably likely to achieve these goals? Choice is the converse problem: Given several alternative transportation systems, can we determine which is the preferred alternative? This paper will focus on the processes of search and choice--how alternatives are generated and, more particularly, the interactions between search and choice.

17. Leisch, Jack E. GEOMETRY OF TRANSPORTATION SYSTEMS IN FUTURE DEVELOPMENT OF METROPOLITAN AREAS. De Leuw, Cather and Company of Canada Limited. Presented at the Highway Research Board meeting, January 1969.

It is expected that 85 percent or more of the population will reside in urban areas by the turn of the century and it is mandatory that transportation networks in metropolitan regions be established and the land for them reserved now in order to serve the travel requirements in the future. This cannot be effectively accomplished on the basis of current practice. This paper develops a concept of permanent transportation corridors and network configurations which allow for long-range planning. It indicates that as optimum network of major transportation facilities, initially spaced at 4 to 6 miles, and eventually spaced at 2 to 3 miles in built-up areas, can function into the future at reasonable levels of service for any predicted rates of population growth, urban area expansion, and increasing travel demand. The concept provides for major transportation corridors which form the framework for all urban development. The corridors are established at sufficient width and appropriate spacing so that they are (a) capable of accommodating travel generated by likely future population densities and allow for balanced transportation service, (b) adaptable to design or redesign to carry a freeway, a rapid transit facility, or a combination of the two, and (c) capable of conversion in the future to meet the design requirements of new technological developments. The application of this concept could resolve the urban planning dilemma which seems insurmountable.

18. Wendt, Paul F. THE USE OF LAND DEVELOPMENT SIMULATION MODELS IN TRANSPORTATION PLANNING. University of California. Presented at the Highway Research Board meeting, January 1969.

The Bay Area Simulation of BASS Model is a large complex of computer models that has as its goal forecasting future growth within the San Francisco Bay Area. The BASS Model is composed of three distinct submodels. The first of these is the employment and population projection submodel, which forecasts employment by 21 categories and population totals for the Bay Area over the period from 1970 to the year 2020. The results or the output of this submodel are fed into the two other submodels, which allocate projected employment, population, housing, and land development among 777 subareas of the region.

The time required to travel from one place of employment to alternate places of residence is a key determinant of estimated future land use and development in the BASS Model. These estimates are made through the use of a time-distance matrix assumedly portraying the time required to travel from the center of any one of the 777 tracts to each of the other tracts in the 13-county Bay Area.

The influence of public policy variables is reflected primarily in the assumptions concerning the usable supply of land and the transportation facilities that will be made available. It has been assumed that current freeway plans approved by the State Division of Highways will be completed on schedule and that the first stage of BART will be completed by 1970 and the second stage by 1980.

BASS III employment, population and land use forecasts for the 13 northern California counties have been used by the San Francisco Bay-Delta Water Quality Control Program in its long-term planning for these areas. The model is presently being run under the designation BASS IV to test the probable impact of a

proposed open-space program for the nine Bay Area Counties. Plans are under discussion for the application of the BASS Model to transportation planning for selected counties in the Bay Area.

19. Bruggeman, J. M. SENSITIVITY TO VARIOUS PARAMETERS OF A DEMAND-SCHEDULED BUS SYSTEM COMPUTER SIMULATION MODEL. Northwestern University. Presented at the Highway Research Board meeting, January 1969.

A computer simulation model has been developed that simulates a demand-schedule bus system offering door-to-door service. Sensitivity analyses were performed on some of the parameters in the model. The parameters studied were link travel time maximum pickup time, shape of serviced area, frequency of calls, bus capacity, and length of trips. The outputs considered sensitive to a change in these parameters were cost of operation per passenger mile, waiting time to be picked up, passenger travel time on the system, and the total time required to make a trip.

In general it was found that, as the link travel time increased, the cost per passenger mile rose sharply, the waiting time was relatively constant, the travel time moderately increased, and the total time required to complete a trip also increased moderately. As the maximum pickup time increased, the cost per passenger mile decreased, with the waiting, travel, and total time increasing linearly. The shape of the geographical area served did not influence the waiting, travel, and total time as might be expected.

As the demand for service increased, the waiting time remained relatively constant, and the travel time and total time had only a slight increase and then leveled off. The cost per passenger mile decreased significantly up to approximately 175 calls per hour and then began to level off. Of course, the total operating cost of the system increased with an increase in demand for service. An increase in bus capacity had little effect on the waiting, travel, and total time. However, there was a slight decrease in cost per passenger mile with an increase in bus capacity. When trip length of a small magnitude (1 to 4 blocks) was excluded from being served, the cost per passenger mile decreased somewhat. The waiting time remained relatively constant, while the travel and total time had a slight increase.

20. Morris, Robert L. TRANSPORTATION PLANNING FOR NEW TOWNS. Alan M. Voorhees and Associates. Presented at the Highway Research Board meeting, January 1969.

The development of new towns is a growing phenomenon. These self-contained communities offer the transportation planners an opportunity to build on the basic research carried out in urban areas in recent years. Employment opportunities juxtaposed with residential development, while conforming to accepted site planning concepts, can reduce trip lengths. This is particularly true in the larger new towns. Street standards related to function can optimize construction costs and minimize the negative effects of noise and induced commercial development on residential areas. In spite of generally moderate intensity of land use, the cluster development concept can make good quality mass transit operations feasible. Exclusive rights-of-way, with more direct linkages than can be provided by automobile, assure good transit service at relatively low cost. Parking can be designed according to realistic demands for space as functions of land use and characteristics of the residents. Good site planning can permit joint use of parking facilities.

21. Ferreri, Michael G. DEVELOPMENT OF A TRANSIT COST ALLOCATION FORMULA. Simpson and Curtin, Philadelphia, Pa. Presented at the Highway Research Board meeting, January 1969.

The operating cost accounts of the Metropolitan Cade County Transit Authority are analyzed to develop a cost allocation formula of general application to any bus operating company. Standard cost account items were allocated among four major elements which affect expenses: vehicle costs, vehicle-miles, peak vehicle needs and passenger revenue. Further study determined the relative loss in accuracy flowing from the elimination of two of these variable In total, three formulas are devised and evaluated. The first uses all four allocators, the second eliminates peak vehicle needs and the third uses only vehicle-miles and vehicle-hours.

22. Kuhn, Tillo E. ENGINEERING-ECONOMIC SYSTEMS ANALYSIS FOR TRANSPORTATION PLANNING: THE UNDP/IBRD PROJECT IN DAHOMEY, WEST AFRICA. York University, Canada. Presented at the Highway Research Board meeting, January 1969.

This paper reports on significant methodological advances achieved by the Dahomey Land Transport Study, recently carried out by a Canadian group under the auspices of the United Nations Development Program and the World Bank. The study represents a rather unique combination of research philosophies and engineering-economic concepts, which might be described as a live and very successful example of systems analysis.

The central logic of the Dahomey Study is the accomplishment of desirable future transport tasks at minimum true costs to society. There is complete integration between transport planning per se, and socioeconomic developments, especially in the crucial agricultural sector, to the target year 1980. A novel multi-purpose geocoding system, simultaneously an area and a point identification device, serves broad socio-economic and very precise engineering analyses equally well. Using a number language of complex road and rail network configurations as well as of multitudes of freight and passenger flows through present or proposed transport systems. The Dahomey Study, in retrospect, may well be regarded as a new prototype, an important milestone in the perfection of engineering-economic systems analysis tolls for transport planning and development work.

23. Fenton, Barton W. A TRAFFIC SIGNAL DATA MANAGEMENT SYSTEM FOR URBAN TRANSPORTATION PLANNING. Franklin County Regional Planning Commission. Presented at the Highway Research Board meeting, January 1969.

This paper is a summary of research and development conducted by the Transportation Section of the Franklin County Regional Planning Commission directed toward the design and completion of a data management system for traffic signals. In performing one of its major functions, urban transportation planning, the Commission has need of current traffic signal data to determine link service volumes for network traffic assignments, to analyze problem intersections, and to assist in the development of TOPICS programs for municipalities within the study region.

The design of this data management system is predicated on the utilizatior of a System/360-Model 30 digital computer for data manipulation, data storage, and for the printing of permanent output records. Descriptions of the phasing,

timing, hardware, and location of each traffic signal are coded in symbol form and key-punched as input data cards. A system program converts these symbols to recognizable form and generates the printed output record. Procedures for updating are included in the system.

The end result is that all 850 traffic signals in Franklin County are described in the system by jurisdiction (municipality or township). Each agency will receive updated copies of the printed output record for such uses as the planning of routine maintenance programs, the planning and programming of capital improvement projects designed to update each traffic signal to national standards, and the development of signal timing and phasing revisions to improve traffic flow. The output record will also serve as a communication device between the planning agency and the municipalities.

24. Seifert, William S. INVESTING IN THE FUTURE OF TRANSPORTATION. Harvard Business Review (Harvard Graduate School of Business Administration, Boston, Mass 02163), Vol. 46, No. 4, pp. 4-6, 8+, July/Aug. 1968. HR Abstracts, Nov. 1968.

Public demand is growing for more and better transportation. Economic history teaches that this demand will be met. Will it be met by private enterprise--or by government? If private enterprise is to do the job, it must undertake far more aggressive efforts than it has to date. There must be collaboration among companies, and between companies and government, to study the need and to plan steps to meet it. In particular, imaginative financing arrangements must be worked out.

25. Levin, David R. THE JOINT USE CONCEPT AND URBAN FREEWAY DEVELOPMENT. Apprais al Journal (155 E. Superior St., Chicago, Ill. 60611), Vol. 36, No. 3, pp. 408-413, July 1968. HR Abstracts, November 1968.

The U.S. Bureau of Public Roads has initiated a program to accompany the construction of urban freeways which may help cities solve some of their problems. Application of the joint use concept can stimulate local programs through which the city can build parks, playgrounds, and better housing in conjunction with planned freeway improvement. The examples discussed have involved substandard housing and blighted or marginal industrial areas which have been replaced with high-rise apartments. The concept is equally applicable, however, to areas suitable for low-density luxury residences, industria parks, offices and stores, schools, public buildings, parking--an unlimited number of uses. The highway official is seeking to expand the area of his competence and interest, and to respond to the tenor of the times with new and bold solutions to urban problems. The joint use concept can materially assist the nation in these directions. There must be effective dialogue among highwa officials, engineers, planners, architects, landscape architects, and others who have a legitimate concern with our cities and their transportation goals.

26. Gaul, David Q. IS RAIL RAPID TRANSIT RIGHT FOR MEDIUM SIZE AMERICAN CITIES? Metropolitan (1133 Waukegan Rd., Glenview, Ill. 60025), Vol. 64, No. 4, pp. 11-17, July/Aug. 1968. HR Abstracts, November 1968.

Recognizing the need for rapid transit as a "grade-separated, private right-of-way" form of urban transportation, the next step is undertaking a program for determining the mass transportation needs of the metropolitan area

Various proposals, including Teletrans, StaRR Car, and similar systems, have been suggested as a substitute for the more conventional forms of rapid transit Many transit engineers have been searching for a less expensive form of rapid transit for medium-density operations. The Transit Expressway has been developed in an attempt to meet this concept. Another rapid transit proposal would be the use of buses operating over surface streets in the outlying areas and making use of a grade-separated private right-of-way in congested areas. These private rights-of-way have been proposed for the median strip of expressways or along abandoned railroad rights-of-way. A variation of the bus-rapid transit proposal is the use of a bus which could operate both in normal street operation and over a conventional railroad track. The type of vehicle to be used on a rapid transit system is purely an engineering and operation question. Decisions of this type must be made on the basis of a through analysis of the present and future transportation demands.

27. Walton, L. Ellis and Kuthy, William G. A CONCEPTUALIZED UPDATING SYSTEM FOR A CONTINUING TRANSPORTATION PLANNING PROGRAM. Virginia Highway Research Council (Charlottesville, Va. 22904), June 1968. 35 pp. HR Abstracts, October 1968.

This publication outlines procedures which could be utilized to formulate and assess alternative methods of conducting a transportation study. Selected characteristics of the transportation planning process are enumerated as are some points of potential error in data collection and assumption formulation. A schematic framework for the conduct of a continuing transportation study is developed as is a system of annual observations utilizing electronic data processing equipment.

28. Hansen, Norman B. INFLUENCE OF TRANSPORTATION ON THE QUALITY OF THE URBAN ENVIRONMENT. Abstracts of Presentations at 20th Street and Highway Conference and 11th Public Works Conference, held at Stockton, Calif., Jan 31-Feb 3, 1968, pp. 25-26. Institute of Transportation and Traffic Engineering (Univ., of California, Berkeley, Calif. 94720). HR Abstracts, October 1968.

A total urban transportation system has many parts and many functions. Properly planned, it will make the urban environment more attractive, strengthen the downtown center, widen the range of employment opportunities for urban residents, assist in guiding and stabilizing land-use patterns, and improve regional accessibility for the movement of people and goods in both peak and off-peak travel hours. The components of the urban plan are frequently oversimplified in the beginning planning courses, as "people," areas of "people activities," and "paths." The term "paths" includes the space devoted to all forms of transportation and communications, such as streets, highways, freeways, airports, mass transportation facilities, seaports and sea lanes, and pedestrian walks and malls. Most conflicts between paths and people occur because the paths are superimposed on the urban environment. Rarely, if ever, are they the basis of the design for urban form. The concept of planning cities, highways and the environment together is relatively new. The techniques are just being developed for including highway and transportation planning in the comprehensive planning for overall urban needs.

29. SPECIAL ISSUE ON TRANSPORTATION. Proceedings of the IEEE (Institute of Electrical and Electronics Engineers, Inc. 345 E. 47th St., New York, N.Y. 10017),

Vol. 56, No. 1, April 1968. Entire issue. HR Abstracts, October 1968.

The purpose of this issue is to present a unified overview of transportation and to serve as a coherent introduction to the subject for engineers. The first section presents the socio-politico-economic treatment of the transportation needs of the world in the year 2000. Secondly, the system engineering aspects of our transportation needs are considered; recent experience with several broad transportation studies are given; a view of some specific technical areas which have broad significance in transportation is shown. Finally, specific systems and components are considered; new forms of automation, various aspects of highway traffic control and modern rail transit systems are described.

30. Wohl, M. A NOT SO COMMON VIEW OF THE GROUND TRANSPORTATION PROBLEM. RAND Corporation (Reports Dept, 1700 Main St., Santa Monica, Calif. 90406), P-3736. Nov. 1967. 26 pp. $1.00. Selected RAND Abstracts, Vol. 6, No. 1, p. 23, Jan.-Mar. 1968. HR Abstracts, September 1968.

This paper suggests that the ground transportation problem, the portion of the trip package during which the traveler is not actually airborne, is capable of significant improvement if the interaction of the multiple socio-economic factors affecting it are considered and that the responsibility for this study and analysis is properly the burden of the air industry. Available data support the theory that a multiport complex served by V/STOL type aircraft (for trips up to 800 miles) would be a more practical and satisfactory solution to present and future problems of airport access, inner-terminal delays, and aircraft queueing delays than rapid-transit systems between central airports and downtown centers.

31. Walters, Alan A. A DEVELOPMENT MODEL OF TRANSPORT. American Economic Review (Curtis Reed Plaza, Menasha, Wis. 54952), Vol. 58, No. 2, pp. 360-377, May 1968. HR Abstracts, September 1968.

One of the best examples of the macroeconomic approach to transport planning is the Harvard model for Columbia. In this model the transport sector is related, through a system of equations, to all other sectors of the economy. This enables one to optimize transport investment between modes and sectors. The Harvard model is the most "complete" model for making transport decisions. Unfortunately, like most intersectoral models it requires a lot of data to put it to work. What is required is some model that provides a rule of thumb similar to that of the engineers but that does take into account the development effects of transport investments. In this paper a model is suggested that may be considered a possible candidate for this role. The model was developed originally for the analysis of the effect of different methods of charging for the use of the highways and the basic account of this model reflects the author's interest in the quantitative effects of various forms of motor taxation. It has been obvious from the beginning of the research that the model could also serve as a (partial) development model for transport investment--and in particular road investment. The strength--and the weakness--of the model is its simplicity. It is important to stress that this model is presented not as an orthodoxy which should be applied to all road development projects. It is hoped merely that it will be an interesting and useful way of approaching the problem of measuring the effects of road improvement on development.

32. Blessing, William E. COORDINATED DATA SYSTEM FOR HIGHWAY PLANNING. Bureau of Public Roads, Federal Highway Administration, U.S. Department of Transportation (Washington, D.C. 20590), Highway Planning Tech. Rept. No. 7, May 1968. 21 pp. HR Abstracts, September 1968.

A review of highway planning electronic data processing in 43 state highway departments during the past year and a half has been conducted. This review showed that, in many of the planning activities, improvements could be made in the manner in which computers are being used. Since the processing of planning data generally involves a need for a large input and output of record; this restriction caused considerable difficulty to planning people using those computers. Many states now have computers, or are getting computers, with the potential to handle practically all planning processing needs, but planning people are still trying to use the equipment in the same way they did with older, less versatile computer systems. This report describes a system that should result in more efficient use of computers to process planning data. The system will require the development of a large number of computer programs. A large number of programs undoubtedly would be useful even without a coordinated data system, but would not provide the efficiency in the collection, storage, and use of data.

33. THE FREEWAY IN THE CITY, PRINCIPLES OF PLANNING AND DESIGN. A Report to the Secretary, U.S. Department of Transportation, by the Urban Advisors to the Federal Highway Administrator. U.S. Government Printing Office (Washington D.C. 20402), May 1968. 141 pp. $3.00. HR Abstracts, August 1968.

The Urban Advisors to the Federal Highway Administrator, a multi-disciplinary group of planners, architects, and engineers, have analyzed the problems of the cities-freeway relationship and made some recommendations which can substantially improve the performance, appearance and acceptance of urban freeways. They present the various faces of the city: the people, the houses, the commercial areas and the residential areas, and show how they may be woven together. The urban Highway must not only function physically, as a path for vehicular movement, it must also contribute to the total city environment.

34. URBAN MASS TRANSPORTATION IN PERSPECTIVE. Tax Foundation, Inc. (50 Rockefeller Plaza, New York, N.Y. 10020). 1968. 48 pp. $1.50. HR Abstracts, August 1968.

The congestion and inefficiency of many urban transit systems in recent years have evoked public and private concern for the revitalization of mass transportation. This study provides perspective on the extent and nature of the Federal role in mass transit problems of cities. The study surveys efforts to find answers to problems that have plagued the transit industry and indicates some alternatives, both Federal and non-Federal, which might provide a viable transit program.

35. Pignataro, Louis J. URBAN TRANSPORTATION TECHNIQUES. High Speed Ground Transportation Journal (Box 4824, Duke Station, Durham, N.C. 27706), Vol. 2, No. 2, pp. 246-259, May 1968. HR Abstracts, August 1968.

A short introductory statement of the urban transportation problem is made. Various urban transportation components, including roadway networks and mass transportation facilities, are reviewed. Methods to improve capacit of roadways are briefly presented. The importance of directing more attention to accelerating further development of public transportation is stressed and some of the more promising advances in mass transportation are discussed.

36. Ruiter, Earl R. ICES TRANSET 1, TRANSPORTATION NETWORK ANALYSIS. ENGINEERING USERS' MANUAL. Massachusetts Institute of Technology, Transportation Systems Division (Cambridge, Mass.), Research Report R68-10. 1st ed. March 1968, var. p. HR Abstracts, August 1968.

ICES TRANSET 1 is a processor of transportation network information. It is designed to provide computerized techniques which will aid the engineer in solving transportation engineering problems. The transportation engineer-user is provided with flexible and convenient methods for predicting and analyzing the flows occurring in transportation networks. The processor can be used as an aid in conducting many portions of the transportation planning process. The processor is made up of a language, a set of processing routine and a set of information files. The TRANSET (for TRANSportation NETwork Analysis) language is designed for the analysis of typical transportation net works representing highways or mass transportation facilities. The TRANSET processor provides two related types of capabilities. First, transportation planning problem-solving capabilities are provided. Minimum path trees can be computed and interzonal trips can be assigned. Second, and of equal impor tance, transportation information files can be maintained. Large transportation network descriptions and large interzonal trip matrices can be read and edited, stored in permanent secondary storage files, modified as desired, use as input to the network analysis procedures, and summarized into reports useful to the transportation engineer.

37. AIR TRANSPORTATION 1975 AND BEYOND: A SYSTEMS APPROACH. Report of the Transportation Workshop, 1967. Bernard A. Schriever and William W. Seifert, Co-Chairman. M.I.T. Press (Cambridge, Mass.), 1968. 516 pp. $20.00. HR Abstracts August 1968.

In June 1967, a group of air transportation experts from industry, government, and the academic community were asked to join the Transportation Workshop, and ad hoc group whose general purpose was to make a systems-orient ed study of the national air transportation system and its interfacing modes, with special emphasis on the future. Cognizance of the impending crisis in air transportation motivated the participants. The air transportation syste cuts across many facets of life, affecting individuals, local areas, and the Federal Government in ways which make it almost useless to study it piecemeal Consequently, this workshop was organized to look at the entire air transportation system. The work was organized by means of panels which included the following: Socioeconomics panel; air vehicle technology and trends panel; air traffic control panel; airports and terminals panel; and finally mixed-mode airport collection and distribution panel. The workshop made some specific evaluations of what must be done to solve the air transportation problem;

these are presented as recommendations. In a word, the workshop made a first attempt at a systems analysis of air transportation.

38. McCaffrey, Richard and Hong, Hyoungkey. ANALYSIS OF A FREEWAY BUS TRANSIT SYSTEM. Journal of the Highway Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 94, No. HW1, Proc. Paper 5976, pp. 33-42, June 1968. HR Abstracts, Aug 1968.

As a partial attempt to relieve urban traffic congestion, a limited freeway bus transit system has been operating in the Milwaukee metropolitan area. A study of this operation indicates: the system can be initiated at extremely low cost and operated at a profit; the present system has been growing rapidly in popularity and passenger usage; the selection of external terminal points may be made on the basis of the housing densities, parking requirements, and geographical locations; passenger pick-up loops through the external residential areas are helpful in selling the system to prospective users; a quick and yet thorough distribution loop through the CBD with no need of further transferring satisfies the passengers' needs, and there are several personal characteristics of the passengers that may be used in determining the required service level for the operation.

39. CONFERENCE ON NEW APPROACHES TO URBAN TRANSPORTATION, NOVEMBER 1967. U.S. Dept. of Housing and Urban Development (Washington, D.C. 20410), 1968. 104 pp. HR Abstracts, July 1968.

The Conference on New Approaches to Urban Transportation, held in Washington in late 1967, presented papers on some of the Mass Transportation Demonstration projects sponsored by HUD. The emphasis is on new methods, rather than a simple revival of the old. New technologies are discussed, the needs of transportation for those who do not have cars, the effect of transit on the development of cities and their suburbs are presented, and possible solutions are suggested.

40. TRANSPORTATION: THE 1970'S, CONFERENCE PROCEEDINGS. Sponsored by the Upper Great Plains Transportation Institute, North Dakota State University (Fargo, N.D. 58102), Jan. 1968. 125 pp. $2.00. HR Abstracts, July 1968.

The general objectives of the conference were to bring together personnel who are vitally involved in the transportation system of the United States and look forward to transportation in the next decade. Four basic approaches appeared dominant throughout the conference: a vital concern for the rapid technological changes taking place in the total transportation system; the techniques and philosophy of pricing transportation services; the role of regulation in maintaining the interests of the public and the carriers; the impact on the transportation system as an industry and as a vital function in the production and marketing of goods. Papers covering highway transportation public regulatory bodies, transportation pricing and the effect of technological improvements on all modes of travel were presented.

41. Stuart, Darwin G. PLANNING FOR PEDESTRIANS. American Institute of Planners Journal (917 15th St. N.W., Washington, D.C. 20005), Vol. 34, No. 1, pp. 37-41, Jan. 1968. HR Abstracts, May 1968.

Among the transport modes available for urban movement, walking is the slowest and most limited in range, but offers the most route flexibility. In terms of the total movement of persons and goods, its importance within the urban transportation scheme is minor. It is important to recognize that when vehicles reach their destinations, the terminal pedestrian movements of their passengers are crucial in accomplishing the actual purpose of the vehicular trip. Facilities provided for pedestrian movements can be analyzed from thre interrelated perspectives: as land uses which demand threading among the coordinated pattern of other urban land uses; as transportation links which, in general, must complement the terminal facilities of other transport modes; and as both viewing stations for, and integral components of, urban design compositions. Adequate techniques of quantitative analysis for pedestrian planning have not been developed. A key problem here appears to be that the capacity of pedestrian ways represents a particularly elusive concept. As a result of the difficulty in indentifying pedestrian route capacities, the demand for pedestrian rights-of-way has also received inadequate quantitative attention. It seems likely that equations for the movement between various types of pedestrian generators, adjusted for differences in their size and the distance between them, might be established and relied upon for forecasting purposes.

42. Maga, John A. VEHICULAR POLLUTION EFFECTS IN URBAN DEVELOPMENT. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 93, No. UP4, Proc. Paper 5684, pp. 231-241, Dec. 1967. HR Abstracts, April 1968.

Large quantities of air contaminants are emitted from motor vehicles. Air pollution problems resulting from motor vehicles are described and the factors which bring about the problems are discussed. Also discussed is the relationship of traffic to concentrations of pollutants in urban areas. Thes are opportunities for minimizing motor-vehicle created air pollution and the exposure of the public to high concentrations of contaminants through highway design and urban planning.

43. Barkan, Benedict G. LATEST METHODS OF DETERMINING URBAN HIGHWAY ROUTES. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 93, No. UP4, Proc. Paper 5680, pp. 5-18, Dec. 1967. HR Abstracts, April 1968.

Though the overall principles of urban area route location are generall sound, inadequate weight frequently has been given to the less tangible and intangible factors involved. As an aid to policy makers, rating methods have recently been applied in several urban areas to evaluate the impact of alternate urban freeway routes on community, social and aesthetic values. Increasing consideration is being given to multi-mode transportation corridors, covered (and semi-covered) freeways, air rights development over and under ne freeways, and highway planning in close coordination with urban renewal. The is a rapidly growing awareness of urban highway aesthetics, including consideration of both the view from the road and the view of the road. These emerging concepts will require new approaches including an interdisciplinary effor in the fields of urban highway planning and design. It is important to recognize that urban highways must help to enhance rather than destroy the urban setting.

44. Homburger, Wolfgang S., ed. URBAN MASS TRANSIT PLANNING. Institute of Transportation and Traffic Engineering, Univ. of Calif. (1301 S. 46th St., Richmond, Calif. 94804), Course Notes, 1967. 212 pp. $6.00. HR Abstracts, April 1968.

In the fall of 1966 a short course on "Urban Mass Transit Planning" was developed by the Polytechnic Institute of Brooklyn. The course was presented both by the Institute and by the Institute of Transportation and Traffic Engineering and University of California Extension, in Asilomar, Calif. A set of course notes was written. The original notes were expanded and revised to provide background material, particularly for use in graduate courses and extension conferences. The course covered such topics as: urban growth, characteristics of mass transit systems, modal split and the results of mass transportation demonstration projects. The topics are illustrated by case studies. Two appendices cover an analysis of different forms of rapid transit and a bibliography.

45. Schlager, Kenneth J. LAND-USE PLANNING DESIGN MODELS. Journal of the Highway Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 93, No. HW2, Proc. Paper 5603, pp. 135-142, Nov. 1967. HR Abstracts, March 1968.

Mathematical models are being applied extensively in urban and regional planning. A variety of applications ranging from economic forecasting to traffic assignment for highway networks are in evidence. However, the primary function in the planning process, plan design, has received only scant attention. The critical nature of the plan design function in its focal role in the urban planning sequence indicates the need for a mathematical model for urban design. The requirements of an urban plan design model are delineated. A conceptual framework for an urban design model that seems to comply with these requirements is discussed.

46. THE AIRPORT TRAINS ARE ON THE WAY. Railway Age (30 Church St., New York, N.Y. 10007), Vol. 163, No. 14, pp. 16-19, Oct. 2, 1967. HR Abstracts, March 1968.

Increasingly, rapid transit is talked of as a traffic-free means of reaching metropolitan airports, accessible today mainly over congested highways. The 4-mile Cleveland Transit System extension to Cleveland Hopkins Airport will open more than a year from now. Los Angeles, Philadelphia, New Orleans, and Denver are studying proposals to link rail terminals downtown with outlying airports. The Port of New York Authority is examining potential of a road-rail vehicle capable of taking travelers from midtown Manhattan to Kennedy Airport; the Metropolitan Commuter Transportation Authority is considering 100-mph trains over the Long Island Rail Road to bring air travelers from Calverton to New York, 70 miles away. Boston's Revere Beach transit line has a stop near Logan Airport, with bus transfer service. In Europe, Brussels is linked to its airport by a commuter railway and London to one of its two airports the same way. For the other London airport, two schemes were advanced for bringing British Railways and London Transport Trains from downtown.

47. Wolf, Robert A. METROTRAIN-2000. A STUDY OF FUTURE CONCEPTS IN METROPOLITAN TRANSPORTATION FOR THE YEAR 2000. Cornell Aeronautical Laboratory, Inc. (Buffalo, N.Y. 14221), CAL No. 150, Oct. 1967. var. paged. HR Abstracts, March 1968.

Major transportation modes selected as most likely to win out over other transportation systems in the time period include: an advanced form of intercity highway with 100-mph cruising capability for a special class of automobiles driven by specially licensed drivers; the Urbmobile electric-car system which merges the flexibility and privacy of the automobile with the high capacity and speed of rail-rapid transit; advanced forms of compound helicopters for short-range travel from city center to city center; air-cushion vehicles for the marine high-speed intercity transport role; the Aquamotel ship to accommodate automobiles and their passengers for leisurely over-night trips between cities. The study points to the importance of a balanced transportation system utilizing alternative travel modes meeting at mode interchange terminals. It also suggests an auto-less core for central business districts on the assumption that most city cores will be largely rebuilt in the coming 25 to 50 years.

48. Bauladon, Gabriel. TRANSPORT. Science Journal (Dorset House, Stamford St. London SE1), Vol. 3, No. 10, pp. 93-99, Oct. 1967. HR Abstracts, March 1968.

A literature survey suggests transport systems could change radically by the end of the century, with belt transporters for short distances, 800 km/h tubes for medium distances, and Mach 10 aircraft for long distances. But the most important innovation may be government legislation forcing transport systems into harmony with their environment. As soon as traffic level justifies it, a whole category of assisted pedestrian systems will be put into use even for shorter distances. For big cities there might be the continuous underground train. This new system will be noiseless, automatic, and non-stop. Most ground level traffic will be represented by small electric cars, cubic in shape. They will be propelled by high-speed electric motors running at 35,000 rpm using alternating current without brushes or commutators. The car will remain the only means of transport available at one's home. The increase in numbers will have been so phenomenal that it will have become necessary to regulate its use, first in towns in the early 1980's and then on all motorways (by 1985?) which will become electronically controlled. The main competitor of road freight transport will not be the train but vehicles totally enclosed within a tightly fitting "tube." Railway speed will have practically doubled in ten years. Mechanical improvements will make it possible gradually to increase train speed to 400 km/h by about 1985. Ships will be divided into two types: first, there will be the almost conventional giant transporters for low value goods (ores, petrol, and grain). They will be operated by nuclear energy. Goods of higher value will be transported by container ships, completely different from those of today. These will be extremely rapid air cushion vehicles. The hypersonic 650 passenger plane flying at Mach 6 and propelled by scramjet (supersonic combustion ramjet), the study of which has already begun, will be available about 1985.

49. Marks, Norman G. DESIGN OF EXPERIMENTAL AERIAL TRANSIT STRUCTURE. Journal of the Structural Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 93, No. ST5, Proc. Paper 5519, pp. 323-342, Oct. 1967. HR Abstracts, March 1968.

The experimental mass transit expressway developed, constructed, tested, and evaluated in South Park near Pittsburgh, Pa., is part of a new concept for much-needed urban mass transportation. The test track supported on steel stringers and columns is 9,360 ft long and requires approximately 2,300 tons of ASTM A36 Steel. The stringers were designed and fabricated to follow the many horizontal and vertical curves, grades, and superelevations purposely built into the system. The structure forms a test loop and carries electrically powered, computer-controlled, lightweight transit cars which may operate through a given point at 2-min intervals. The cars are automatically steered by a continuous steel I-beam located midway between the two track stringers. The steel structure is supported at each column on single 5- or 6-ft diameter reinforced concrete caissons drilled at least 10 ft into rock. An electronic computer was used in the development of the geometry and structural designs.

50. Miller, Ronald E. AN OPTIMIZATION MODE FOR TRANSPORTATION PLANNING. Transportation Research (Pergamon Press, 44-01 21st St., Long Island City, N.Y. 11101), Vol. 1, No. 3, pp. 271-286, Nov. 1967. HR Abstracts, March 1968.

This paper presents one possible linear programming approach to the problems of transportation equipment assignment or scheduling over a specific geographic network. Such a framework is relevant in evaluating alternative plans for regional or even national transportation development. The example of an air network is used; direct operating costs are minimized, subject to constraints relating to equipment balance at each node, equipment availability, by type, throughout the system, and passenger demand for specific routes. Results for a specific problem are presented; this includes both primal and dual variables and measures for both the entire system as well as specific routes or nodes. In addition, the sensitivity of the programming results to variations in certain data inputs (passenger demand forecasts in the present case) is examined. Thus a measure of the importance of forecasting error, which is certain to be present in any planning analysis, is obtained.

51. Haar, Charles M. TRANSPORTATION AND ECONOMIC OPPORTUNITY. Traffic Quarterly (Eno Foundation for Highway Traffic Control, Saugatuck, Conn.), Vol. 21, No. 4, pp. 521-526, Oct. 1967. HR Abstracts, March 1968.

Transportation in an urban environment cannot be regarded solely in terms of its overall capacity to move so many people at some given rate. In a highly differentiated and diffused urban society it becomes vital to the economic and social welfare of individuals. It determines the nature and variety of opportunities available in jobs, housing, recreation, shopping, and entertainment. Present systems do not provide adequately for many in need of its services: it is creating a new "minority" in this country of those who do not drive: the young, the old, the poor, and the handicapped. The systems also militate against those industries dependent on unskilled labor, for in the absence of transit services, the low-income residents of the ghettos cannot reach the potential employers, Demonstration bus lines from poverty areas to industrial parks are a possible answer. Reduction in the cost of public transportation is another.

52. BETTER USE OF TOWN ROADS. THE REPORT OF A STUDY OF THE MEANS OF RESTRAINT OF TRAFFIC ON URBAN ROADS. Great Britain Ministry of Transport, 1967, 50 pp. Available from British Information Center, 845 Third Ave., New York, N.Y. 10022. $1.50 approx. HR Abstracts, February 1968.

This report considers methods of deliberately limiting the amount of traffic in towns in order to bring about a better relationship between the amount of road space available and the vehicles that want to use it. There are also other important considerations. To make better use of roads in towns, we need to improve our public transport, which means creating traffic conditions that help rather than hinder bus operations. There is no shortage of ideas for limiting the amount of traffic in towns. As this report shows, most of them have serious shortcomings An early conclusion from this study was that direct road pricing seemed the most promising long-term approach to controlling the use of urban roads. It is not certain that road pricing can offer a solution; it will in any case not be an immediate one. This report points to the value of controlling parking as a means of coping with congestion.

53. STUDY OF TERMINAL TRANSFER FACILITIES IN CONJUNCTION WITH URBAN FREEWAYS. De Leuw, Cather and Company for Minnesota Department of Highways (165 West Wacker Drive, Chicago, Ill. 60601), June 1967. 58 pp. Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. PB 175 759. $3.00. HR Abstracts, January 1968.

This study reveals that a terminal-transfer facility could be constructed using air rights over an expressway. The structure could be designed to serve both "park 'n' ride" and "kiss 'n' ride" users, downtown shuttle bus or rail rapid transit operations, local buses, long distance buses, and possibly a highway department's freeway maintenance and patrol activities. Accommodations of rail rapid transit vehicles would require modifications in the design; only buses were comtemplated. Access from and exit to freeway lanes could be so designed as to relieve congestion in the section of the freeway served. Attractive shuttle bus service with close headways could be maintained during peak hours. In major transportation corridors, rail rapid transit to the central business district should be considered.

The study postulated transfer terminals in intermediate areas sufficiently close to downtown districts to intercept a large number of potential users yet far enough removed to avoid areas of serious traffic congestion.

54. Kohl, John C. TRENDS IN TRANSPORTATION. Urban Land (1200 18th St., N.W., Wash. D.C. 20036), Vol. 26, No. 7, pp. 23-31, July/Aug. 1967. HR Abstracts, Jan. 1968.

Transportation, despite continual allusions to it as "a system," is for all practical purposes an array of loosely and imperfectly related services which are variously employed to move ourselves and our goods as the myriad activities of an affluent society impel us. To be meaningful, a general discussion of transportation must treat its particular modes--highway, rail, water, air and pipeline--rather than its composite whole. Highway transportation, the most pervasive mode of transportation because it is employed directly and indirectly by all of us, includes the countlessly varied movements over the highways, roadways and streets of our countryside, cities, towns, and villages. Transit is an inclusive term which encompasses the rubber-tired as well as the steel-wheeled

vehicle. Modern railroading has stretched its domain to take on the motor vehicle and is now changing its horizons rapidly to shed any image it may have had as a decadent branch of the transportation industry. Water transportation services are specialized and are used only indirectly and unknowingly by the vast majority of people. As in the case with other modes of transportation, air offers no clear pattern for the future. Its great strides in long-distance jet operations have tended to obscure progress in some other aspects, and to generate problems, particularly at airports, that may slow down expansion in the immediate future. Although the pipeline is a venerable mode of transportation, recent developments in tunneling afford it a possible, most promising future and have stimulated a great deal of imaginative technical effort to produce ultra-high-speed systems for the movement of goods and people.

55. Stuart, Darwin G. MULTIPLE-PURPOSE FREEWAY LAND DEVELOPMENT. Barton-Aschman Associates, Chicago. Presented at the Highway Research Board meeting, January 1968.

Because of the disrupting environmental effects of freeways within urban areas, multiple-purpose freeway land development merits serious consideration as a part of future freeway planning. Air rights developments are able to overcome the barrier-like character of freeways, and provide for a continuity among surrounding land uses. Freeway land within interchange areas, including air rights over ramps and ramp interior land parcels, is appropriate for multiple uses requiring high accessibility. Exclusive transit lanes with stations, bus stop turnouts, and interchange area parking facilities are related transportation facilities which may be located on freeway land. A major stumbling block for multiple-purpose developments is the need for adjacent land in addition to normal freeway rights-of-way. One solution is to assign the acquisition to both highway rights-of-way and required adjacent parcels to another public agency. The local renewal agency could play an important role here, and a coordinated land acquisition program among all public agencies appears desirable. Legal requirements that freeway land must serve highway purposes have severely limited the multiple-purpose development of land not involving air rights, especially within interchange areas. A joint development program of freeway corridor land acquisition (at some points well in excess of normal right-of-way widths), conducted by an appropriate public agency or agencies, is recommended.

56. Deutschman, Harold D. INCOME AND RELATED TRANSPORTATION AND LAND-USE PLANNING IMPLICATIONS. Tri-State Transportation Commission. Presented at the Highway Research Board meeting, January 1968.

This paper reports on analytical and descriptive procedures to measure the effect of household income on such variables as (a) auto ownership, (b) housing market (household demand for home ownership), (c) auto and transit trip generation, and (d) time and distance separation of residence and worksite. The data source for this study is the home interview results from the Tri-State Transportation Commission describing the New York Metropolitan Area.

Methodology is presented to indicate the sensitivity of household income to the above variables. Four different assumptions of the future distribution of household income are presented, analogous to the "states of the world" used in the decision theory of operations research. These assumptions of a future income forecast and distribution include a uniform increase of income for each income

class, low-income groups gaining at a higher rate of increase than the other groups, and middle income or high income gaining at a higher rate of increase. For each assumption, the associated demand in home ownership and auto ownership is compared.

For transit trip ridership and total trip-making, a simulation technique is employed to yield the incremental change of trip-making due to incremental changes in auto ownership (presumably caused by changes in the household income structure).

Results, show that transit trip generation drops as much as 30-35 percent in high residential densities (100,000 or more persons per square mile) when an auto becomes available to a previously auto-less household (autos being used as a proxy variable for income). In middle-high densities, this decrease is on the order of 10-20 percent, while in moderate densities (10,000-40,000 pers/sq mi), the drop in transit trip-making is hardly noticeable (a decrease of 5-10 percent). Transit trip-making is relatively unaffected by the addition of a second auto to the household. Also, an average uniform increase in real income of 2 percent demand, for which current construction patterns will have to be modified. A conservative estimate of household income increases will yield an average auto ownership rate per household of over one auto per family by 1985 (in the New York Metropolitan Area). The low-income group of $0-5000 is most sensitive to changes in auto ownership with an incremental change in income.

It is hoped that the analyses and discussion presented serve as a starting point for needed revisions and additions of data collection procedures pertaining to household income (as cross-classified with other variables) as well as a continued development of procedures to systematically measure income for its varied effects on transportation and land-use planning.

57. Fleet, Christopher R. and Robertson, Sydney R. TRIP GENERATION IN THE TRANSPORTATION PLANNING PROCESS. Bureau of Public Roads. Presented at the Highway Research Board Meeting, January, 1968.

This paper discusses the implication of efficient data utilization in the trip generation phase of the transportation planning process. Two aspects are considered. The first is the manner in which standard statistical methodology may be applied to provide the analyst with more "data insight" than is usually available. Trip generation procedures are quite sensitive to the quality and adequacy of the data used in the analysis and the implications of this should carry considerable weight during the development of estimating procedures in the base year.

Second, because the trip generation phase supplies the vital link to human behavior, it is important that special emphasis to placed on "continuing" trip generation analysis. Several emerging concepts and procedures are discussed that offer means of staying abreast of changes in the demand for travel. Conclusions are drawn, both for traditional transportation studies and continuing analysis, concerning the use of standard home interview data and the efficiency of alternative methods using these data.

58. Jefferies, Wilbur R. SIMPLIFIED TECHNIQUES FOR DEVELOPING TRANSPORTATION PLANS-TRIP GENERATION IN SMALL URBAN AREAS. Southwestern Pennsylvania Regional Planning Commission. Presented at the Highway Research Board meeting, Jan. 1968.

The object of this research was to investigate simplified techniques for developing transportation plans in the smaller urban areas and to investigate, in detail, the socioeconomic characteristics of trip makers which affect home-based vehicle work trip generation. The investigation of simplified techniques for developing transportation plans in the smaller urban areas indicated that they were feasible using the gravity model but that determining trip generation was the key to accurately applying the gravity model in smaller urban areas.

Home-based vehicle work trip production was investigated in six small urban areas. It was found that a log-log relationship existed between automobile ownership and trip generation and that the trip generation equations developed in this research satisfactorily explained the relationship. Further investigation indicated that it was feasible to develop a single equation which could be used satisfactorily to determine home-based vehicle work trip production in any of the six urban areas. The equation explained the variation between urban areas as a function of dwelling unit density, residential density, and percent of the urban area in residential land use.

59. Aupan, Jeffrey M. MODE CHOICE: IMPLICATIONS FOR PLANNING. Peat, Marwick, Livingston and Company, New York, N.Y. Presented at the Highway Research Board meeting, January 1968.

In order to appraise land-use and transportation plans for the future, analyses were made using U.S. Census journey-to-work survey data to develop distribution and modal split models for work trips in the New York region. Gravity distribution models were developed for each of three income groups. By use of multiple-regression techniques, an equation was derived relating walk-to-work trips to measures of a zone's self-containment, and another equation splitting work tripsbetween transit and auto modes. It was found that the percent of transit trips for an origin-destination pair was dependent on employment density at the work end of the trip, residential density at the home end of the trip, availability of adequate rail service between origin and destination, relative times of the auto and transit modes, the cost of tolls, and the cost of parking. Analyses of the root-mean-square error, geographical and transportation biases. and sensitivity to changes in the variables showed the equation to be a reasonable forecasting tool.

For each of three income levels, modal split equations were derived, including all of the variables named above. Comparisons were made of the parameters of the three stratified equations and it was found that as the income levels rose, the significance of transportation-related variables increased and the significance of land-use variables decreased. Analyses of the stratified equations showed them to be reasonable forecasting tools. Sensitivities were examined for the assumption of a radically different distribution of income levels, and it was found that the sensitivities as well as predictive values would change appreciably. It was concluded that only if income level distribution was not changing radically would the unstratified equation be adequate for modal split forecasts.

The model calibration process required no data collection beyond that provided by the Census. Future refinements have been suggested, particularly the use of a second point in time, and also a recognition of the dynamic nature of our social structure.

60. Smith, Wilbur S. TRANSPORTATION PLANNING. MANUAL ON URBAN PLANNING, CHAPTER VII. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York, N. Y. 10017), Vol. 93, No. UP2, Proc. Paper 5265, pp. 93-143, June 1967. HR Abstracts, November 1967.

Formulating and testing a major urban transportation plan is a continuing process requiring a coordinated approach by many professional disciplines. Travel projections for the design year result from comprehensive data collection surveys, analyses of tabulated results, use of mathematical projection models, and forecasts of population and socioeconomic characteristics of the study area. Planning for various classes of roadways, mass transportation, and terminals requires the testing of several alternative configurations. Decisions as to the proper amount of capacity by the several modes of travel in response to the probable modal split of total travel potential must be made individually for each urban area. The final plans must also recognize the potentials for joint development of travel corridors by both arteries and structures, environmental and cultural needs of the residents, and convenience and safety for the user. Successful implementation of the recommended plan requires policy actions, continuing review, periodic updating, and positive, cooperative action by the sponsoring agencies.

61. Riley, Russell H. THE GENERAL PLANNING PROCESS, MANUAL OR URBAN PLANNING, CHAPTER II. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 93, No. UP2, Proc. Paper 5263, pp. 11-26, June 1967. HR Abstracts, November 1967.

The second chapter of the Manual on Urban Planning lists major elements that should be included in a comprehensive plan for an urban area, and cites the persons and agencies that should participate in the planning program. The comprehensive plan should be a general guide, although regulatory phases such as zoning, housing standards, etc., must necessarily be more specific. Elements to be considered in the plan are: character and economy of the area; population; land use, transportation facilities; community facilities, such as schools, parks, and public buildings; and housing and urban renewal. Different types of urban renewal programs currently under way are described. The various regulatory measures that will affect the comprehensive plan are listed, and its relationship to other planning programs is considered.

62. Schnore, Leo F. and Fagin, Henry. URBAN RESEARCH AND POLICY PLANNING. Sage Publications, Inc. (275 S. Beverly Drive, Beverly Hills, Calif.), Urban Affairs Annual Reviews, Vol. 1, 1967. 638 pp. $20.00. HR Abstracts, November 1967.

Two closely interwoven subjects, urban research and policy planning, form the basis for this book, which is the first in a series to be published as Annuals. Part 1, which focuses on urban research as such, is organized around the academic disciplines. There are essays covering social science, political science, economics, urban history and urban geography. Part 2, addressed to policy planning, cuts across the disciplines to discuss action-oriented research on planning policies, transportation problems, or urban development. Since this is the first of the projected series, the essays are historical in content, covering developments since World War II. Suggestions for further reading are given in a bibliography.

63. Cohen, Ernest B. AN URBAN TRANSIT LABORATORY. (paper available from authors at General Electric Company, P.O. Box 8555, Philadelphia, Pa.). Bulletin of the Operations Research Society of America, Vol. 15, Supplement 1, pp. B-74, B-75, Spring 1967. HR Abstracts, November 1967.

This trio of papers presents a plan for long-range comprehensive experiments in urban transportation. The plan is based on gradual redevelopment of an existing area with minimum removal or new construction of buildings. A public transportation system would serve as a test bed for vehicle and guideway engineering experiments and for new operating concepts. The most crucial result of the experiments would be clarification of social need by analyzing public reaction. The experimental program is discussed in terms of a specific implementation in suburban Philadelphia. The land-use experiment attempts to closely integrate a transit line into a community structure. Besides being conveneient for local trips, the line will connect with two major suburban shopping centers, and with high-speed rail lines to central Philadelphia. As an experimental control, half the route would merely run down the median strip of an existing major street. The same right-of-way is expected to serve as test bed for several generations of vehicles and operating concepts.

64. TRANSPORTATION--PREDICATIVE PROCEDURES. Technical Report No. 9, State Resource Planning Program, Michigan Department of Commerce (208 E. Michigan Ave., Lansing, Mich. 48913), Dec. 1966. 4 vols. HR Abstracts, August 1967.

In connection with the objectives of the State Resource Planning Program, an extensive study of transportation, both public and private, was undertaken by Michigan. To try to reduce the duplication of planning efforts of different departments, representatives of Administration, Conservation, Highway, and Economic Expansion Departments were asked to take part. The report covers travel by air, water and highways. Pipelines and rail transportation were not treated in great depth through lack of personnel to cover these fields adequately. A summary presents the findings. The other three volumes contain reports of the Aeronautics Commission, the Department of State Highways and the Waterways Division of the Department of Commerce.

65. Lessieu, Eugene J. BUS TERMINAL PLANNING AND DESIGN. Proceedings of the 35th Annual Meeting of the Institute of Traffic Engineers (Suite 506, 1725 DeSales St., N.W., Washington, D.C. 20036), pp. 140-149, 1965. (received Feb. 1967). HR Abstracts, August 1967.

Bus transportation, both local and inter-city, is the most widely used form of mass transit. Planning the facilities for bus operation, therefore, becomes of the greatest importance. Where the terminal is located, how it complements other forms of transportation, and its effect on the peripheral traffic all need consideration. Using the Port Authority Bus Terminal in New York as an example, the author discusses these problems in detail.

66. Hutchinson, B. G. PLANNING URBAN TRANSPORTATION SYSTEMS. Third Conference of the Australian Road Research Board (40 Denmark St., Kew E-4, Victoria, Australia), Preprint Paper 238, 1966. 42 pp. HR Abstracts, May 1967.

This paper formulates the concept of a generalized planning framework which can be used as a basis for structuring a large class of planning and design problems. The phases of this framework are defined and their interrelationships established. The role of transportation planning in the total urban planning process is discussed, and recent developments in formal land-use models are

reviewed. Existing knowledge on the functional planning of urban transportation systems is reviewed in terms of the generalized planning framework, and the major gaps in this knowledge are pointed out. The planning process described is more comprehensive than that traditionally used in metropolitan transportation studies. The manner in which it is structured provides a basis for the incorportaton of new information on any aspect of the planning process without revising the complete planning process.

67. TRANSPORTATION AND PARKING FOR TOMORROW'S CITIES. Wilbur Smith and Associates (495 Orange St., New Haven, Conn. 06504), 1966. 393 pp. HR Abstracts, May 1967.

This study of the relative roles of automobiles and public transport within the modern metropolis extends the pilot investigations contained in "Future Highways and Urban Growth" (1969) and complements "Parking in the City Center" (1965). It examines the premises and methods employed in planning transportation systems for the nation's metropolitan areas. Although primarily concerned with understanding the functions of transport in the modern urban environment, it is also aware of the continuing evolution of transport technology. It recognizes that future transportation systems must be regional and multipurpose in scope; relate to interregional and national networks; include individual and mass modes in appropriate combination; and reflect the structure, economy, function, and individuality of the urban regions they serve.

68. Baldizzone, Armando Garcia. URBAN TRANSPORTATION SYSTEMS AND STANDARDS FOR THEIR OPERATION. Province of Buenos Aires, Office of Highways (Division of Libraries and Publications, La Plata, Argentina), Publication No. 63, Sept. 1966. 45 pp. (In Spanish). HR Abstracts, April 1967.

Urban transportation, which is composed of several integrated elements, can, if properly planned and managed, contribute greatly to the attractiveness of a city. Expressways, collector streets, arterial roads and local streets, all have their place. They must be combined with mass transit and provisions for pedestrians. Future developments must be considered. Long-range planning should provide for expansion of any or all of the different parts. Standards of service must be established. Two possible criteria for such standards are the efficiency and speed with which the traffic moves and the number of accidents which occur.

69. Lea, N. D. URBAN TRANSPORTATION DEVELOPMENTS IN ELEVEN CANADIAN METROPOLITAN AREAS. Canadian Good Roads Association, Transportation Planning Committee (270 MacLaren St., Ottawa 4, Canada), Sept. 1966. 90 pp. HR Abstracts, April 1967.

Eleven Canadian cities, representing typical demographic characteristics, density variations, and geographical distribution were studied for transportation facilities and preferences of the population. The report contains maps showing population densities, traffic volumes, existing mass transit systems, and proposed facilities. Comparisons are drawn between the cities. This report may be used to evaluate various solutions to urban transportation problems; to estimate the levels of expenditures necessary to provide transportation services for urban areas of given population; and to demonstrate the evolving relationship between urban characteristics and road transportation.

70. Pell, Claiborne. MEGALOPOLIS UNBOUND: THE SUPERCITY AND THE TRANSPORTATION OF TOMORROW. Frederick A. Praeger (111 Fourth Ave., New York, N.Y. 10003), 1966. 233 pp. $5.95. HR Abstracts, March 1967.

Although it is often efficient and comfortable, American transportation is subject to disorganization by the weather, accidents, and congestion. The roads and highways are overcrowded and the rail transportation is old and outmoded. Additional highways are not the entire solution. America needs a balanced system of highways, modern railroads, and air travel to unsnarl the mounting congestion, particularly in the Northesst Corridor. Senator Pell makes a number of suggestions for the solution of the problem.

In the future, new high-speed ground vehicles, utilizing the latest jet age technology, can make the wheel-on-rail concept old fashioned as they move through pneumatic tubes at three hundred miles an hour, suspended on a film of compressed air, along routes taking them on or under the surface of the ground.

71. TOWN AND TRAFFIC--YESTERDAY, TODAY, TOMORROW. Expert Committee, Town Traffic Section, International Exhibition of Transport and Communications, Munich, 1965 (Harbeke-Verlag, Knorrstrasse 85, Munich 13, Germany). 1966. 210 pp. & illus. (No price available). HR Abstracts, March 1967.

The Association of German Town Administrators invited all German towns with more than 100,000 inhabitants to participate in an exhibit on Town and Traffic for the First International Exhibition of Transport and Communications held in Munich in 1965. This book is the outgrowth of the exhibit. Printed in German, French, and English, it depicts the growth of traffic in towns through the centuries. It shows what some of the cities are doing today to control it and suggests what they will do in the future. It discusses the causes of traffic congestion and the solutions being tried in other countries as well as in Germany. The common denominator of all the solutions is the tremendous cost of trying to combine men and machines. Few towns can afford this expense themselves, and the problem of financing adequate development remains to be solved.

72. TERMINAL PLANNING FOR FUTURE HIGHWAYS. Committee on Terminals, Hithwyy Division. Journal of the Highway Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 92, No. HW2, Proc. Paper 4944, pp. 61-74, Oct. 1966. HR Abstracts, March 1967.

The Committee on Terminals recognizing the scarcity of information concerning terminals on which future planning of highways should be based, surveys current (1966) projects and outlines major trends. The key points emphasized include providing parking directly in major commercial and residential buildings, improved design of parking space, and other terminal requirements in real estate complexes. The development of transportation centers, with appropriate ancillary facilities, at modal interchange points is described. Although the report stresses automobile terminal requirements, the committee believes that no one vehicle can adequately serve all urban travel needs. Bus service and rail rapid transit systems must complement the automobile. Projects described include Century City in West Los Angeles, Macy's-Queens Department Store, Chicago's municipal parking program, and New York's Midtown Bus Terminal.

73. Bicknell, Robert and Malcolm, D. G. PROGRAM DESIGN FOR INTEGRATED TRANSPORTATION PLANNING AND DEVELOPMENT. (Management Technology Inc., 1900 L St., N.W., Wash. D. C.), Bulletin of the Operations Research Society of America, Vol. 14, Supp. 1, p. B73, Spring 1966. (Abstract of a paper presented at the 29th National Meeting, May 1966). HR Abstracts, March 1967.

Federal programs in development of transportation facilities require comprehensive regional planning before individual project approval. Both the Federal Highway Act of 1962 and the Mass Transportation Act of 1964 require the establishment of effective regional planning authorities to engage in comprehensive, continuous, and cooperative planning. Improvement in planning is both an analytical as well as a political problem, requiring both new planning techniques and new organizations for obtaining political agreement. Research opportunities exist in both the program design and program execution phases of such comprehensive planning efforts. This paper describes the concept of program design applied to transportation planning. The work done in the National Capital Region, mainly during 1965, relating to the preparation of program designs for transportation planning and, later, for comprehensive planning and development of the region, is reviewed. Improvement of planning, both in scope and technique as well as in relation to professional staffing, is discussed. The vital importance of building an adequate communication channel between planners and elected decision makers is stressed. The development of planning, programing, budgeting, and action systems for transportation development is discussed, including the unfolding opportunities for operations research, system analysis, information and analytical system design, and involvement of elected officials as well as the citizens. While dealing specifically with the National Capital Region, the paper stresses similar circumstances and opportunities existing in the majority of metropolitan areas of the world.

74. Bruck, H. W. and Crow, Robert T. EVALUATION PROCEDURES FOR REGIONAL TRANSPORTATION PLANNING: THE NORTHEAST CORRIDOR TRANSPORTATION PROJECT. (U.S. Dept. of Commerce, Washington, D.C.), Bulletin of the Operations Research Society of America, Vol. 14, Supp. 1, p. B112, Spring 1966. (Abstract of a paper presented at the 29th National Meeting, May 1966). HR Abstracts, March 1967.

Evaluation of alternative planning proposals for a large, highly urbanized region such as the Northeastern seaboard of the United States raises a series of questions that go beyond the scope of benefit-cost procedures previously used for transportation planning. The problem is to improve existing techniques and to develop new ones appropriate to the examination of new transportation facilities, including new technologies, and the consequences of such facilities for regional development. The problem of devision adequate and complete evaluation techniques is further complicated by the significance at the regional level of a host of legal and policy questions. Among these are the effect of regulation on pricing in the transportation industry and the social and system benefits and costs of subsidies to some modes of transportation. Many costs and benefits relevant to regional transportation system evaluation are qualitative and difficult to compare. Thus, evaluation in terms of tangible characteristics subject to scalar measures will have to be supplemented by other techniques in such areas as urban form and environment.

75. Jefferies, Wilbur R. and Carter, Everett C. SIMPLIFIED TECHNIQUES FOR DEVELOPING TRANSPORTATION PLANS: TRIP GENERATION IN SMALL URBAN AREAS. Engineering Experiment Station, West Virginia Univ. (Morgantown, W. Va.), Tech. Bull. 84 Dec. 1966. 103 pp. HR Abstracts, July 1967.

The investigation of simplified techniques for developing transportation plans in smaller urban areas indicated that they were feasible using the gravity model but that determining trip generation was the key to applying the gravity model accurately in smaller urban areas. Home-based vehicle work trip production was investigated in six small urban areas. It was found that a log-log relationship existed between automobile ownership and trip generation and that the trip generation equations developed in this research satisfactorily explained the relationship.

Further investigation indicated that it was feasible to develop a single equation which could be used satisfactorily to determine home-based vehicle work trip production in any of the six urban areas. The equation explained the variation between urban areas as a function of dwelling unit density, residential density, and percent of the urban area in residential land use.

76. TRAFFIC PLANNING FOR SMALLER TOWNS. The National Institute for Physical Planning and Construction Rssearch, Ireland (4 Kildare St., Dublin, Ireland), 1966. 35 pp. HR Abstracts, July 1967.

The majority of planning surveys and traffic forecasting is directed towards solving the problems of large urban areas. Little work has been done on the problems of very small towns. While this report is concerned primarily with the problems found in Ireland, the methodology is applicable to small towns everywhere. A short reading list is appended.

77. Ballard, Cordelle K. TRANSPORTATION DEPENDENTS. Traffic Quarterly (Eno Foundation for Traffic Control, Saugatuck, Conn.), Vol. 21, No. 1, pp. 83-90, Jan. 1967. HR Abstracts, July 1967.

The "forgotten man" in the transportation planning picture is the elderly person who has lost his mobility. As the number of old people grows, so will the number of people who do not, or who can not, drive cars. These people will need transportation of some sort. Many of them will use buses. A few will be able to afford private taxies but there will be many who can do neither. Some form of jitney or semi-private transportation will be needed for those who have lost their agility. Community efforts might provide "taxi" service for those going to markets (heavy bundles to be carried), doctors' offices (necessity to be on time), or stations (baggage to be taken). Such a jitney service could be financed either as a cooperative venture or by funds obtained from governmental sources.

78. COORDINATED BUS-RAIL SERVICE: ROCKLAND COUNTY, WESTCHESTER COUNTY, NEW YORK CITY. FINAL REPORT ON THE MASS TRANSPORTATION DEMONSTRATION PROJECT. Tri-Saate Transportation Commission (100 Church St., New York, N.Y. 10007), Jan. 1967. 41 pp. HR Abstracts, July 1967.

The assertion has frequently been made that suburban rail patronage could be improved if feeder bus service from outlying areas could be coordinated with

the schedules of a rail service. To test this concept in the Tri-State Region a mass transportation demonstration project was designed to determine whether such coordination of two modes of travel would indeed attract substantial journey-to-work and off-peak traffic when several alternatives are available.

Substantial traffic was attracted to the project bus service. Patronage grew steadily throughout the first year of the demonstration. Later patronage trend was downward, with rather substantial declines resulting from the service modifications in December and March. Riders were attracted to the project service primarily from the private automobile.

Traffic on the demonstration route was specialized. It tended to flow in unidirectional peaks, reflecting the typical journey-to-work pattern. This specialty of travel left much unused bus space and consequently, presented financial problems to the economics of the operation.

79. Johnson, James A. THE PLANNING AND ECONOMICS OF HIGH-SPEED TRANSPORTATION FOR A REGION UNDER RAPID URBANIZATION. High Speed Ground Transportation Journal (Box 4824, Durham, N.C.), Vol. 1, No. 1, pp. 32-45, Jan. 1967. HR Abstracts, July 1967.

An attempt has been made to construct decision rules for policy makers to use in determing the optimal form and level of transportation services to be supplied. The criterion underlying these decision rules is that the resources of the economy should be allocated in a manner that will best satisfy the wants of individuals. To formulate the decision rules, theoretical cost and value concepts for transportation services were developed. The decision rule regarding the use of a given model of transportation is that the benefits or value of the service must be at least as great as the costs involved in supplying it. Once it has been decided to use a given form of transportation, the level of service should be set where the value of the last unit is equal to the cost of supplying it.

80. TRANSPORTATION FOR SUPER-REGIONS. Metropolitan (1155 Waukegan Rd., Glenview, Ill. 60025), Vol. 63, No. 1, pp. 20-22, Jan.-Feb. 1967. HR Abstracts, July 1967.

Complete fusion between cities or metropolitan areas may take generations or may never fully mature, yet their formation, loosely or strongly, into a megalopolitan structure may be an accomplished fact relatively early in their modern evolution. The transportation, land-use economic and social implications of these emerging patterns are most significant even in their earliest progress. The concept presented is essentially one of super-regional rapid transit. It may also be considered as that of a highly modern railroad of the future. Involved are schedule and top speeds double the highest now planned for the newer rapid transit systems and much higher than presently attained by railroads anywhere in the world.

In corridors, super-express service would be closely synchronized with complementary limited express trains operating more frequently on most route sections at scheduled speeds, including stops, of 80 mph and more. They would make all of the super-express stops, additional intermediate stops at other cities served en route, and at major access points to metropolitan suburbs. Super-regional rapid transit would also be closely integrated with the expanding local metropolitan rapid system, and with certain long-distance and suburban railroad services, all of which would act as important feeders to it.

81. Garrison, W. L. and Marble, D. F. A PROLEGOMENON TO THE FORECASTING OF TRANSPORTATION DEVELOPMENT. U.S. Army Aviation Material Laboratories (Fort Eustis, Va.), Technical Rept. 65-35. Aug. 1965. 124 pp. Available from Clearinghouse for Federal Scientific and Technical Information (Springfield, Va.), AD 621514. $4.00. HR Abstracts, February 1967.

The analysis begins with a review of the problem of forecasting transportation requirements. Several idiosyncratic models are examined and their properties specified. The forecasting of transportation stocks and commodity flows is discussed. Models of the demand for transportation services are implemented with empirical data. Graph theory as an interpretative frame of reference is introduced, and the analysis moves to a detailed examination of network structure. Inter- and intra-nation network structures are compared. Codified route and commodity networks are factor analyzed, and fundamental structures are isolated. An attempt is made to simulate the morphological characteristics of transportation networks. Simulations of the Northern Ireland railway network are undertaken using nearest neighbor methods. Finally, the problems of planning and forecasting are reviewed in the light of the foregoing analyses. Criteria and objectives are discussed. An overall evaluation of available planning and forecasting capabilities is presented.

82. Paterson, Robert W. FORECASTING TECHNIQUES FOR DETERMINING THE POTENTIAL DEMAND FOR HIGHWAYS. Research Center, School of Business and Public Administration, University of Missouri (Columbia, Mo.), 1966. 128 pp. $3.00. HR Abstracts, February 1967.

An analysis of techniques used in projecting demographic and traffic quantities which are generally used as the basis for establishing the demand for highways forms the framework of the study. Selected cases on forecasting methods from representative studies illustrate the techniques used to obtain estimates of future demand. In addition, where possible, forecasts are compared with actual quantities to provide an indication of their accuracy.

Although most forecasts are a result of a combination of statistical processes and judgment, there is an increasing interest among forecasters in mathematical processes. Much of the work being done in this area is still in a developmental state, and there are very few studies available which explicitly employ operational mathematical models. However, it has been possible to include some examples of the work in mathematical analysis in this volume. A comprehensive bibliography of studies incorporating the theories, principles, techniques, methods, and evaluations of forecasts was prepared as a primary step in this study and is included.

83. Branch, Melville C. TRANSPORTATION DEVELOPMENTS, CITIES AND PLANNING. American Society of Planning Officials (1313 E. 60th St., Chicago, Ill. 60637), 1965. 29 pp. $5.00. HR Abstracts, February 1967.

Among the most far-reaching consequences of the technological revolution of the past hundred years have been those in transportation. New means of carrying people and goods have vastly changed modern industrial society and environment. Approximately 80 million automotive vehicles in the United States and 20,000 Americans in the air throughout an average day are but two better known illustrations of how transportation developments are profoundly affecting

our present and shaping the future. This paper discusses the prospects for newer forms of transportation and possible changes in the means and methods of established forms, with particular reference to potential effects on the form, functioning, and planning of larger cities. The intent is to formulate a framework of judgment relevant for city planning as it exists today and as it will likely develop in the intermediate future. Rather than the easier path of imaginery and theoretical speculation, this approach calls for the predictive restraint necessayy when cities are viewed comprehensively and their planning realistically. Even a brief review emphasizes the many different forms of transportation to be considered and the variety of related research and development under way.

34. Gakenheimer, Ralph A. PLANNING, TRANSPORTATION, AND THE SMALL CITY. Appraisal Journal (36 So. Wabash Ave., Chicago, Ill. 60603), Vol. 34, No. 1, pp. 83-92, Jan. 1966. February 1967.

Urban planners and transportation engineers are aware that patterns of land use and systems of circulation in cities are closely related, and a change in one is reflected by changes in the other. Therefore, comprehensive planning is the first step in achieving good transportation. Planning is a continuing process and must include all the interdependent components of the urban complex. In small cities this is particularly true, both because a single change is of greater magnitude than in a large city and because there is less economic leeway for mistakes. In the past, transportation planning has been thought of more in terms of service, whereas urban redevelopment has been thought of in terms of guidance. It is becoming evident that these two approaches are closer in identity than previously realized and that both must be integrated to produce a viable, creative future for small cities. As more and more studies of transportation and highway economic impact are completed, the small city will have a wealth of guidelines to follow. With the increasing Federal aid, the financial problems of good planning are being reduced.

35. Burns, Wilfred. THE RELATIONSHIP BETWEEN TOWN AND TRAFFIC PLANNING. The Surveyor (40 Bowling Green Lane, London EC1), Vol. 127, No. 3855, pp. 59-63, April 23, 1966. HR Abstracts, January 1967.

This paper presents a relationship between town planning and transportation planning. After discussing the problems of parking and one-way streets, the author suggests that a different approach may be necessary. Simply building streets to allow an increase in vehicular traffic defeats the purpose of urban renewal by creating situations in which pedestrians cannot and will not risk their lives. Using a section of London as an example, it is pointed out that the increase in traffic, the breakdown of the housing regulations, and the influx of a migrant population is destroying what used to be a good residential area. Recommendations for creating "environmental units" are made. These units would be essentially small, self-contained subsections of the greater metropolis with adequate mass transit ties to the central city.

36. Wynn, F. Houston. SOME CONSIDERATIONS IN APPRAISING BUS TRANSIT POTENTIALS. Wilbur Smith and Associates. Presented at the HRB meeting, Jan. 1967.

In undertaking to estimate the possible use for public transit in "middle-sized" urban areas of 250,000 to one million population, an attempt has been made to establish a "ceiling" on trip-making potentials of urban residents.

Persons who possess a car, and who are without dependents who have no cars (in other words, "car-saturated" households), are assumed to perform an "optimum" amount of travel. Such persons constitute a very small fraction of the whole urban population--probably about 5 percent of the residents in most middle-sized areas. Trip making by the remainder of the population is inhibited or constrained to some degree by lack of a personal car, or by the need to serve persons who lack cars. Despite this, the number of urban trips generated by area residents would be increased by only about 45 percent if everyone was able to perform trips at the rate of persons from car-saturated households.

Trip-generation rates for car-saturated households vary with household income. If every urban resident made trips at the rate of the car-saturated population in the highest income brackets, there would be an area-side increase in travel of approximately 60 percent. Thus it appears that urban residents, in spite of travel constraints which apply in one form or another to nearly everyone, are able to achieve a large proportion of their maximum travel desire under existing conditions.

About half of the urban population over five years of age is not eligible to drive. Another large fraction (one-fifth to one-third) are eligible to drive but must share a car with another driver. Most of the remainder have exclusive use of a car but have non-driving dependents who limit their freedom of action. There are large potentials among the non-drivers and the chauffeured passengers for patronage of a suitable form of public transport. The next phase of the study will seek to define criteria for public transport forms which can successfully tap this market.

87. Dueker, Kenneth J. APPLICATION OF INFORMATION SYSTEM CONCEPTS TO TRANSPORTATION PLANNING. University of Wisconsin. Presented at the Highway Research Board meeting, January 1967.

The needs of transportation planning make specialized demands on information systems concepts and technology. These needs require a means of responding to unforeseeable data demands. Essential to accommodating unforeseeable demands are (a) generalized data handling capability, and (b) data organized in an intermediate form. The generalized data handling capability enables manipulation of data, and data organized in intermediate form enables manipulation to specific formats or reports. Both elements are essential to provide for the needs of transportation planning.

88. Hill, Morris. A METHOD FOR THE EVALUATION OF TRANSPORTATION PLANS. University of North Carolina, Chapel Hill. Presented at the Highway Research Board meeting, January 1967.

The paper questions the efficacy of traditional cost-benefit analysis for the evaluation of transportation plans designed to serve a broad set of objectives. Cost-benefit analysis was designed for the evaluation of plans in terms of a single objective--economic efficiency. An alternative method of evaluation, known as goal achievement analysis, is proposed and described. Plans are examined in terms of the entire set of objectives in a single system. Goals are defined operationally and goal achievement is measured in units which are relevant to the particular objectives. The relative effectiveness of alternative plans in achieving the set of desired objectives is determined by applying a weighting system to objectives and to the subgroups, sectors, locations and activities affected.

A set of possible objectives of transportation plans is then posited, including user objectives relating to accessibility, accident reduction, and comfort and convenience; community objectives relating to historic site preservation, open space conservation, and community stability; economic objectives relating to project, system and fiscal efficiency, and income distribution; environmental objectives relating to air pollution, noise, and aesthetic effects. Each objective is defined, and measures are proposed for three objectives (accident reduction, community stability and reduction of air pollution) which would enable the treatment of these objectives in the goals achievement matrix.

89. Balkus, Kozman. TRANSPORTATION IMPLICATIONS OF ALTERNATIVE SKETCH PLANS. Tri-State Transportation Commission, New York. Presented at the Highway Research Board meeting, January 1967.

Six sketch plans prepared by the planning division for a region of 30 million population were evaluated for transportation implications. The aim was to gain insight into the form of transportation network which, according to the present means of travel, would correspond to each development sketch. The study also compares the resource commitments required for the several plans.

Of the planning variables employed to construct the sketch plan alternatives, the distribution of population densities served as the measure of variation among the alternative plans. Trip generation and segregation by transportation modes were estimated on the basis of the prevailing patterns in this and other regions. Travel costs for this analysis were adapted from other studies.

Results indicate the relative growth of mans transit and auto modes of travel in terms of the 1960 volumes, and also provide an indication as to how the variation in travel might influence the resource allocation between the two modes of transportation.

The sketches indicate a pronounced variation in the utilization of auto and mass transit modes. This variation appears to be one of the most important issues requiring reconciliation with other urbanization problems in weighing future development policies. Different forms of travel in the six development schemes also imply different policy orientation toward housing, parking ,distribution of jobs, and other development programs.

Sketch plans represent development concepts, and the objective of this undertaking is to open vistas for speculation on the course of future urbanization trends. This analysis provides the first approximation of transportation implications for the analyzed development schemes. It also suggests the succeeding steps that could be taken to narrow the gap between sketch plan ideas and workable alternatives.

90. Jessiman, William and Brand, Daniel. A RATIONAL DECISION-MAKING TECHNIQUE FOR TRANSPORTATION PLANNING. Traffic Research Corporation. Presented at the Highway Research Board meeting, January 1967.

Evaluation of transportation improvements by conventional benefit-cost analysis raises the problem of trying to evaluate benefits (or costs) which cannot readily be converted to dollars and cents. Sometimes these benefits are neglected. Sometimes they are converted to dollars no matter how crude the estimate. Most often they are merely qualitatively weighed-in-the-mind to determine whether or not they are sufficient to alter the decision recommended by the economic analysis based on the quantifiable factors.

To help in these situations, a technique or framework is presented which would treat all pertinent factors more rationally and systematically. Examples are presented showing the results of the technique at each intermediate step. An extension of the technique is made to consider a system of possible projects and the optimal allocation of available capital among them. This extension results in a problem which may be solved by integer linear programming techniqaes. The formulation of this linear program is also shown.

91. Horwood, Edgar M. URBAN INFORMATION SYSTEMS AND TRANSPORTATION PLANNING. University of Washington. Presented at the Highway Research Board meeting, Jan. 1967.

The rapid evolution of multipurpose urban information systems along with emergent changes in the census technology will provide opportunities for a new generation of transportation analysis and planning studies. This paper outlines the logical bases of new systems under development, discusses applications to general urban analysis, and relates these application potentials to urban transportation research, analysis and planning. Particular emphasis is given to the relationship between new information handling capabilities and the needs of urban transportation planning.

92. BUS BAN SUGGESTED FOR CENTRAL LONDON. Surveyor and Municipal Engineer (40 Bowling Green Lane, London EC1), Vol. 127, No. 3847, pp. 16-17, Feb. 26, 1966. HR Abstracts, September 1966.

The Working Party on Traffic of the Incorporated Association of Architects and Surveyors (London) has presented its second report on London Traffic congestion. They recommend that buses be eliminated from the center of London. Taxis should be encouraged. The extension of the present underground should be continued and, if possible, speeded up. As a substitute for buses, they examine a number of conveyor-like pavements and automatic railroads. A chart shows comparative costs of construction, speed, and capacity. Continuous non-stop operation is preferred over start-and-stop train service. One of the more efficient and cheaper modes recommended is the Lewis Never-Stop Railway which was used sucessfully in New York in 1904.

93. HIGHBALLING ON AIR: HIGH SPEED TRAIN WILL RIDE ON A PNEUMATIC CUSHION. Compressed Air (942 Memorial Parkway, Phillipsburg, N.J. 08865), Vol. 71, No. 3, pp. 14-15, March 1966. HR Abstracts, September 1966.

"Best future solution for short- or medium-distance transportation"--this is an objective expert's evaluation of the streamlined Aerotrain which, supported by a suchion of air on a raised, prestressed concrete track and driven by a rear propeller, will carry passengers in comfort and security at 122 to 244 mph. The transport looks like the fuselage of an airliner. Its track is in the form of an upturned tee section, the vertical projection serving as a directional guiding system.

Developed in France by Bertin & Compagnie of Plaisir, the Aerotrain has been given a strong boost toward early commercial application by the French government. The testing of a prototype on a 5-mi stretch of single-rail track near Versailles proved successful recently.

Cost of an 80-seat Aerotrain produced in small numbers is estimated at not more than $300,000 to $400,000, or from $500,000 to $600,000 for a 180-seat

vehicle. Cost of support structure is calculated at $200,000 for about ½ mi or, with double operating lines, $400,000. If the route of the Aerotrain can be placed directly along the land, without being raised on pillars, the cost would be less.

94. Chironis, Nicholas P. FOR REALLY RAPID TRANSIT--FLYING TUBE TRAINS AND COMPUTERIZED TAXIS. Product Engineering (330 W. 42nd St., New York, N.Y. 10036), Vol. 37, No. 6, pp. 96-99, March 14, 1966. HR Abstracts, September 1966.

When the President signed a bill authorizing the Department of Commerce to underwrite a three-year program in the research and development of overland transportation of men and goods, the Department immediately started sponsoring several studies on flying-through-tubes and computerized taxis. The Rensselaer Polytechnic Institute has a scheme which uses a self-propelled vehicle in a closed tube. L. K. Edwards recently put forward a design in which the vehicle is propelled by a vacuum in a pneumatic tube. Edwards' idea is mechanically more efficient than the RPI one but it is difficult to build and maintain a vacuum in the pneumatic tube. The RPI vehicle employs fluid blades to increase the force of the air which moves it.

Detroit is working on plans for a taxi which would ride on overhead rails. The user enters a car which carries up to four people. He punches his destination on an electronic circuit. Automoation takes over from there, directing the "car" to its destination by the shortest route. The power would be provided by an electromagnetic system--a linear induction motor--which is quiet and inexpensive to maintain.

95. Lewis, Russell M. TUBE TRANSPORTATION--A FORWARD LOOK. SAE Journal (Society of Automotive Engineers, 485 Lexington Ave., New York, N.Y. 10017), Vol. 74, No. 6, pp. 36-39, June 1966. HR Abstracts, September 1966.

A proposed high-speed, enclosed-tube transportation system would use a form of internal propulsion, where thrust is generated by a continuous transfer if air from immediately in front to the rear of the vehicle, to reduce power requirements. Vehicle support would be of some form of ground effect and aerodynamic suspension. The use of electricity for power would greatly reduce the problems of ventilation and air pollution. No insurmountable problems in operation and control are expected. The system described was invented by Professor J. V. Foa and has been under study at Rensselaer Polytechnic Institute for several years

96. Ridley, Tony M. AN INVESTMENT POLICY TO REDUCE THE TRAVEL TIME IN A TRANSPORTATION NETWORK. University of California, Operations Research Center (Berkeley, Calif.), Report ORC 65-34, Dec. 1965. 60 pp. HR ABstracts, September 1966.

The principal aim of a transportation study is to produce a plan for a future transportation network. This network should satisfy the traffic demands placed on it and give service to users on the basis of some acceptable criteria within certain budgetary, political and social constraints. Out of a large number of engineering design problems which naturally arise, this dissertation considers a special problem of economic investment in a transportation network.

The transportation network is represented by an abstract graph of nodes and arcs on which are defined real-value variables and functions to represent travel times, traffic flows, and money invested. The travel time on an arc is assumed

to be a known function of investment and the assignment of traffic flow on a route varies with the travel time on the arcs. This dissertation seeks an optimal set of arcs such that investment in these arcs gives minimum travel time.

97. Quinby, Henry D. COORDINATED HIGHWAY--TRANSIT INTERCHANGE STATIONS. UITP Revue (International Union of Public Transport, 19 Ave. de l'Uruguay, Brussels, Belgium), Vol. 14, No. 3, pp. 265-289, 1965. HR Abstracts, August 1966.

In the total transportation planning process under way in urban regions, it is evident that private and public transportation must be coordinated effectively to minimize the aggregate investment in transportation facilities and costs of operation, as well as urban congestion and travel time. The attraction of potential travelers to transit stations and stops is, therefore, of paramount importance. Not only must the transit systems be fast, economical, convenient and comfortable, but the interchange facilities required to attract the patrons to the stations must be abundant and well designed. These stations become critical elements of transition between highway travel and transit travel.

Additional studies are needed with respect to the characteristics of tributary station territories, patronage volumes, feeder transit operations, vehicular traffic operations, modes of access and volume periodicity. To date, rapid transit stations with parking, feeder transit and kiss-ride facilitess available for such studies are relatively limited in number. Until the new generation of rapid transit systems is in operation, further research must be concentrated principally at rapid transit and commuter stations such as those in Cleveland, Boston, New York, Philadelphia, Chicago and a few pioneering cities abroad.

98. Rude, R. G. FORMULATION OF A TECHNIQUE FOR EVALUATING URBAN HIGHWAY NEEDS. Purdue University (Lafayette, Ind.), Joint Highway Research Project No. 26, Oct. 1965. 202 pp. HR Abstracts, August 1966.

Needs studies of urban street systems are costly and time consuming. Sampling techniques can be used to reduce the expenditure and time necessary to conduct these studies.

This needs study was conducted in West Lafayette, Indiana. The initial approach used was the typical engineering analysis where each section of street and each intersection were thoroughly investigated.

Graphs were prepared showing the percentage of sample size vs the standard error of the mean in terms of improvement costs for each classification of streets and intersections. From these graphs and expected variation in the costs of improving the urban system, within known limits, can be determined for a given sample size in West Lafayett, Indiana.

If sampling procedures,similar to those applied to this study are used in a number of urban communities, it may be possible to develop graphs of the percentage of sample size vs the standard error of the mean, for various street and intersection classifications, which could be used as standards by cities for determining sample sizes in estimating their street system improvement costs.

99. Landen, David. PHOTOMAPS FOR URBAN PLANNING. Photogrammetric Engineering (6269 Leesburg Pike, Falls Church, Va. 22044), Vol. 32, No. 1, pp. 136-146, Jan. 1966. HR Abstracts, June 1966.

In the United States and abroad, the development of photomaps combining some of the best features of an aerial photograph with the advantages of accurate planimetric maps is a matter of interest to the engineer and planner engaged in the development of urban areas. The value of uniform-scale photographs has long been appreciated by the engineer engaged in resources surveys. Several remarkable stereoscopic profiling machines are being developed for restituting the perspective view, and the equipment is being automated. Unlike photomosaics, which are generally limited to nearly flat terrain, orthophotomaps can be made where the terrain has considerable relief. Hence the value to the urban planner who is concerned with the terrain relief of suburban hilly areas exceeds that of individual photographs and mosaics.

100. Herbert, Evan. TRANSPORTING PEOPLE. International Science and Technology (205 W 42nd St., New York, N.Y. 10017), No. 46, pp. 30-43, Oct. 1965. HR Abstracts, June 1966.

Transportation is an economic system with technological subsystems. Few of these subsystems match at the nodes where they come together. Travel on public transport is a series of batch processes, and the total flow from actual origin to real destination is slowed by the inefficiency of transfer between various kinds of transportation. New government support for transportation research and development is spurring plans for integrating present subsystems, using faster vehicles, and developing radically new systems. Present transportation technology might be improved by current capabilities in better communication, information technology, terminal design, automatic feeder system, and interconnection of services. New approaches to airport terminal design are being tried in Toronto and Amsterdam, and entirely new ground systems are being developed in San Francisco and at MIT.

101. Edwards, L. K. HIGH-SPEED TUBE TRANSPORTATION. Scientific American (415 Madison Ave., New York, N.Y. 10017), Vol. 213, No. 2, pp. 30-40, Aug. 1965. HR Abstracts, April 1966.

To develop a feasible, competitive transportation system in the "Northeast Corridor" between Boston and Washington, new methods will have to be devised. A group at Lockheed Missiles and Space Company investigating the problem reached the following conclusions: the cruising speed of the vehicle must be at least 400 mph; the vehicle, for safety's sake, must travel in a tube; the logical way to attain such speeds is in an evacuated tube; the vacuum plus pneumatic propulsion can be used to provide the motive power; in order to handle continuous heavy traffic, two tubes would be needed and, for economy's sake, should be parallel and interconnected; and from an esthetic and practical point of view, the tubes would have to be placed underground. Therefore, one would have an evacuated tube system roughly 400 miles long. A tube-shaped car, riding on double flanged, roller-bearing steel wheels, would carry 64 passengers per car.

The pneumatic propulsion could be combined with a gravity drive (trains go downhill from one station and coast uphill to reach the next one, in a modified pendulum swing) to obtain speeds of approximately 500 mph on the intercity runs. Rush hour capacities would be 7,000 passengers per hour. In the off-hours, the trains could be used for moving goods. Shorter lines could be set to provide local commuter service around the urban centers. The cost of the system would be high, but no more than trying to modernize the present day railroads. It would provide a more comfortable, safer, and faster ride than trains, cars, or airplanes.

102. DEVELOPING THE TRANSPORTATION PLAN. American Municipal Assoc. Public Administration Service (1313 E. 60th St., Chicago, Ill. 60637). 1964. 90 pp. HR Abstracts, March 1966.

Until recently, urban transportation planning was seriously hampered by lack of systematic fact-finding. In the past dozen years, the computer and associated mathematical tools have been enlisted in evolving more sophisticated planning techniques to reduce the amount of intuitive evaluation. The new methods seek to expand the predictive components of the transportation studies and, by making it possible to measure variables more accurately, serve to enhance the reliability of forecasts. Basically, the techniques for improved transportation planning involve the appraisal of alternative solutions before the community invests in expensive capital improvements. In other words, the relative benefits and costs of different plans can be explored to find the plan that most nearly meets the social, economic, and physical aims of the community.

Modern planning calls for sound evaluation not only of transportation alternatives but also of land-use alternatives. The contemporary techniques have begun to afford practical insights into how we should plan for the progressive development of our urban areas to make them the best possible places in which to live and work. This publication outlines procedures that can be used to formulate and assess alternative transportation and land-use plans.

103. Bartholomew, Harland. METROPOLITAN TRANSPORTATION PROBLEM. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York, N.Y. 10017), Vol. 91, No. UP1, Proc. Paper 4391, pp. 7-18, July 1965. HR Abstracts, Mar. 1966.

The solution to metropolitan transportation problems should be sought through a continuing comprehensive planning program. The current (as of 1965) transportation problems that have resulted from urban sprawl, expanding population, and increased use of the automobile are becoming more difficult to solve. The problem may be brought into sharper forcs by recognizing the need for more research and study of the smaller metropolitan areas that contain 41 percent of the nation's urban population. Four areas are recommended for additional study and research: (1) the use of the vertical dimension of air space above existing transportation rights-of-way; (2) the use of the time dimension for the reorientation of activities to reduce peak-hour traffic loads; (3) the "design-year" concept; and (4) the advanced acquisition and reservation of rights-of-way. The application of these findings to long-range comprehensive planning and programming will greatly assist the urban and transportation planner in solving the metropolitan transportation problem of the future.

104. Meck, J. P. THE ROLE OF ECONOMIC STUDIES IN URBAN TRANSPORTATION PLANNING. Bureau of Public Roads, U.S. Dept. of Commerce (U.S. Govt. Print. Office, Washington, D.C. 20402), Aug. 1965. 65 pp. $0.45. HR Abstracts, February 1966.

This report is intended as a general guide for those with little or no training in economics to acquaint them with the form economic studies should take for transportation planning purposes. Specifically, its purposes are to: (a) provide assistance and guidance to those responsible for reviewing economic forecasts required as part of the comprehensive transportation planning process in urbanized areas; (b) identify some of the important dynamic factors that influence the process of economic development of urbanized areas, with a view toward providing a better understanding of that process; (c) describe the more commonly

used methods of analyzing and forecasting economic activities employed by various transportation study groups; and (d) provide a listing of useful data sources for economic studies.

105. Meyer, J. R. THE URBAN TRANSPORTATION PROBLEM. Harvard Univ. Press, Cambridge, Mass., 1965. 427 pp. $11.95. HR Abstracts, January 1966.

This is one report of many developed as part of the Rand Corporation study of urban transportation problems which was started in the summer of 1960. The purpose of this study is, by integrating many diverse but relevant pieces of information, to help focus and expedite more cogent discussions of urban transportation alternatives. In the broadest context, an integrated set of data is presented on the forces affecting the demand for and supply of urban transportation services to provide a more rational context for decision-making. The underlying premises are that it should be possible to identify, with reasonable agreement, basic economic and technological forces affecting urban areas and that if this is accomplished, discussion can be focused on appropriate goals or criteria in setting urban transportation policies. Debate on appropriate goals or criteria in a context of reasonable agreement about basic economic and technological forces should significantly improve decision-making in this area.

The report describes the environment within which urban transportation systems and policies must operate, and focuses on cost analyses--the development of procedures and figures for accurate evaluation of the relative costs and efficiency of different modes available for performing the system's functions. The implications of all these empirical and cost findings are developed for policy formulation and planning.

106. Fisher, Ronald J. CENSUS DATA AS A SOURCE FOR URBAN TRANSPORTATION PLANNING. West Bay Rapid Transit Authority, Redwood City, California. Presented at the Highway Research Board meeting, January 1966.

The U. S. Buraau of the Census collects decennially numerous population and housing data. In 1960, information was collected for the first time on the journey-to-work and automobile ownership. In addition to the normal printed reports, all these data were available on magnetic tapes. The data available in different tape series are described.

Discussed are transportation planning uses made of these data, ranging from the traditional ones of providing criteria for the cordon line location and checking the travel surveys to such newer ones as studying employment interchange and the characteristics of workers using mass transit. An indication is given of possible future uses, and suggestions are made for improvements in the data collection and processing to assist in making these uses possible. The cost and operating problems resulting from such changes are not considered.

107. Morlok, Edward K. TOWARD OPTIMAL PLANNING OF A TWO-MODE URBAN TRANSPORTATION SYSTEM: A LINEAR PROGRAMMING FORMULATION. Northwestern University. Presented at the Highway Research Board meeting, January 1966.

The purpose of this study was to develop an analytical methodology or model for finding the optimal combination of two modes in providing transportation service. The specific case treated was that of providing automobile transport

facilities and possibly some rapid transit facilities in a radial, downtown-oriented corridor. The objective was to find that combination of facilities which minimized transport costs--including both capital and operating costs of transit and auto transport--during the design or horizon year.

Since transportation is a service to its environment, the services provided were required to have certain attributes. The capacity of the two modes had to be capable of accommodating the peak period flows. Furthermore, the system had to be designed so that the peak period and non-peak period interzonal travel times did not exceed their respective maximum acceptable values. Because a two-mode system was dealt with, the modal choice behavior of travelers had to be incorporated into the model.

To insure the usefulness of the model, it was developed with reference to a specific real world situation in the Chicago area. The nature of the cost functions for the two modes and the constraints related to capacity, travel times, and modal choice was such that the problem could be characterized within the framework of linear programming. This very efficient optimization technique was used to find the solution which appeared to be quite reasonable.

108. Dyckman, John W. TRANSPORTATION IN CITIES. Scientific American (415 Madison Ave., New York, N. Y. 10017), Vol. 213, No. 3, pp. 163-174, Sept. 1965. HR Abstracts, November 1965.

Urban transportation has to do not only with moving people and goods into, out of and through the city but also with the spatial organization of all human activities within it. As cities evolve into supercities, transportation planners must reckon with future urban form and scale, as well as with future technology. The change is not occurring overnight. Even now, however, we have clear evidence of population overspill into the interstices between cities, of the growth of industry in outlying low-density portions of the linear connections between cities, of the stabilization of employment in the central business districts, of the growth of circumferential and loop connections between employment centers, and of the growing share of metropolitan employment and business outside the central city.

If the transportation systems serving these new agglomerations are to grow out of the present systems, the emphasis will have to be placed on the consolidation and rationalization of present operations, on the building of links now missing in the networks, and on the development of new systems to complement existing ones. An important step in the recognition of the modern urban transportation problem is represented by recent proposals in Boston, New York, Philadelphia and Chicago to integrate various transit companies, railroad operations, bridge and tunnel authorities and other elements in local transport. Coordinated developments of highways and rail transit, of local and express service, of private automobiles, trucks and buses will be the hallmark of any forward-looking transportation plan. Finally, of course, transportation planning will proceed in the context of social choice and individual values, which in the United States set the priorities and the limits of planning.

109. Smith, Wilbur S. TRANSPORTATION CENTERS. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York 17, N. Y.), Vol. 91, No. UP1, Proc. Paper 4396, pp. 19-29, July 1965. HR Abstracts, October 1965.

A keystone to an urban transportation balance would be a coordinated system of terminals or transportation centers that enhance rather than impede the efficient functioning of the urban transport system. The "transportation center" attempts to depict a basic concept of efficient travel-mode interchange that has been embodied, to varying degrees, in comprehensive urban transportation planning. The functional objective of such a center is to provide simple, direct, convenient, safe, comfortable, fast, and economical opportunities to accomplish a desired change of travel mode. A careful evaluation of the needs for urban transportation centers in light of the individual total urban transport plan will achieve a balanced system with the capacity to meet future needs in an economically feasible, efficient, and convenient manner.

10. Garrison, W. L. URBAN TRANSPORTATION PLANNING MODELS IN 1975. Journal of the American Institute of Planners (917 15th St., N.W., Washington, D. C. 20005), Vol. 31, No. 2, pp. 156-158, May 1965. HR Abstracts, September 1965.

The forecast is made that we will continue in 1975 to use our mixture of highly analytic, oversimplified decision devices, combined with subjective decision devices, and to juggle ill-defined goals. However, we will do this with a much higher level of efficacy simply because we will have better information on the state of events bearing on urban transportation planning. Of special significance will be improved information on the hourly states of transportation movements. This information will provide better opportunities for development of models for command and control and for recognition of places where investment is warranted in view of--or in spite of--variations in patterns of use of capacity. It is also likely that better information will improve our ability to forecast the distribution of traffic-generating activities, either through better understanding of how organizations and households react to changes in transportation, or by couching our models in frameworks that reflect the flexibility made possible by better information.

11. Quinby, Henry D. PLANNING PUBLIC MASS TRANSPORTATION. Journal of the Highway Division, ASCE (345 E. 47th St., New York 17, N.Y.), Vol. 19, No. HW1, Proc. Paper 4190, pp. 15-24, Jan. 1965. HR Abstracts, July 1965.

Well-planned and operated public transportation offers a major means of overcoming the chronic and growing urban traffic congestion problem. Future forms of urban development can assume several patterns; prominent among these is the fusion of nearby cities of metropolitan areas to form superregions. Public transit has a complementary role to that of the private automobile and can function most effectively at times and places of peak volume demands. A wide variety of transit techniques and facility types are available in urban planning, and important new ones are being developed. The transportation planning process is outlined. The background, bases, and types of Federal programs of assistance to urban transportation are examined. Important current transit developments and Federal demonstration grants are noted. The Urban Mass Transportation Act of 1964 is specifically outlined.

12. Chilton, Ernest G. RESEARCH PREPARATION FOR MODERN URBAN RAPID TRANSIT. SRI Journal (Stanford Research Institute, Menlo Park, Calif. 94025), Feature Issue 1, pp. 19-22, Jan. 1965. HR Abstracts, April 1965.

Any community embarking on the design and construction of a new or improved public transportation system is faced with a series of economic and technical problems. Selection of routes, type, and frequency of service, financing and repayment will differ from one community to another. More technical questions will be similar in various communities, and a study conducted for one locality often will be adaptable to another. Such questions include power distribution, noise control, steering stability, safety against overturning, automatic fare collection, electronic control, and design of tunnels, subways, and aerial structures.

Many of these problems have come to light during the design of the San Francisco Bay Area Rapid Transit System. It will be a commuter system for a large metropolitan area and requires high-speed trains capable of handling as many as 30,000 seated passengers per hour on each track. Because of geography and existing towns, the system will be in part underground, in part on aerial structures, or on grade.

The builders of a new system generally have time and funds to attack only the most pressing problems, and seldom in the depth necessary to give direction for future systems. Only a sustained research and engineering effort can provide the knowledge and tools to build transit systems the public will ride with confidence and in comfort. Congress has now voted funds for demonstration grants and research projects; the San Francisco Bay Area System has already benefited from this program by receiving more than $7 million.

113. URBAN FREEWAY DEVELOPMENT IN TWENTY MAJOR CITIES. System Planning; Design Concepts; Progress. Automotive Safety Foundation (200 Ring Bldg., Washington, D.C.), Aug. 1964. 64 pp. HR Abstracts, April 1965.

The Foundation, in planning this study, examined the current status of urban Interstate progress in the larger urban areas from U. S. Bureau of Public Roads records to determine those which would produce the maximum amount of data concerning freeways and freeway systems. Twenty cities were selected containing the various types of systems and current developments in freeway planning and design, and providing good geographic coverage of the country. Study of the data indicates that these 20 cities include enough of the total urban population (about 43 percent) and proposed urban Interstate mileage (3,043 of the 5,710 miles designated) to be representative of the status of freeways in the major urban areas.

The study found that 45 percent of the Interstate System in the 20 areas is open to traffic and 40 percent is under development. Only 15 percent of the Interstate System is still in early preliminary stages. However, of the total 6,617-mile system planned in these areas, including Interstate and non-Interstate, only 38 percent is open to traffic and 25 percent is under development. Therefore, indications are that the Interstate System is being developed at a rapid place in urban areas, but there still is a considerable portion of the planned non-Interstate urban system yet to be built. When it is realized that there will be many more miles proposed by urban transportation studies now under way and much additional development undertaken by widening of existing facilities it appears that only about half of the future freeway requirements of these areas will have been met at the time the Interstate System is completed in 1972.

114. Claffey, Paul J. USER CRITERIA FOR RAPID TRANSIT PLANNING. Journal of the Urban Planning and Development Division, ASCE (345 E. 47th St., New York 17, N.Y.) Vol. 90, No. UP1, Proc. Paper 4033, pp. 5-14, Sept. 1964. HR Abstracts, Nov. 1964

Modern rapid transit systems, to serve a useful urban function, must provide a level of service acceptable to users; otherwise, they will fail to attract sufficient patronage. However, a transit system planned to give every user the advantages of the automobile, in terms of privacy and convenience, as well as the freedom from driving responsibility provided by transit, would be prohibitively expensive. Thus, it is of critical importance that an objective set of standards or criteria, designating minimum levels of service acceptable to users, be developed for the guidance of the urban transportation planner.

The aspects of transit service important to users are travel time, rider comfort, rider convenience, fares, and rider safety. Each of these factors is important to users, and each has an influence on their choice of travel mode. These influences, however, do not have an equal effect. A review of recent studies in this area indicates that travel time and travel comfort are probably most important to users, and are followed closely in importance by rider convenience. The effects of fare schedules depend, to a great extent, on user income levels, but for peak-hour travelers, they are probably not too important. Safety is least important as a determinant of urban travel mode.

At present (1964), the planning of rapid transit systems to provide for user needs is almost entirely dependent on planners' subjective judgments. More objective data on user needs for urban transportation service are necessary. Research effort of a high order must be conducted in this area.

115. Martin, Brian V. MINIMUM PATH ALGORITHMS FOR TRANSPORTATION PLANNING. Massachusetts Inst. of Tech., School of Eng., Dept. of Civil Eng. (Cambridge 39, Mass.), Res. Rept. R63-52, Dec. 1963. 63 pp. + App. $3.00. HR Abstracts, Oct. 1964.

This report discusses the results of a comparison of several minimum path algorithms that may be used in transportation planning. The algorithms considered include those of Moore, the Road Research Laboratory, Shimbel and a modification made by the author of the Road Research Laboratory algorithm.

Each algorithm is discussed in detail, the operation being illustrated by use of flow charts and example computations. The results of running the algorithms on six different networks and two computers (IBM 7090 and IBM 1620) are also presented. The program and data storage requirements of each algorithm are given and the ease with which they may be used is indicated. An attempt is made to relate the most suitable algorithm to three characteristics of a network: the number of links, number of nodes and link-node ratio. In conclusion, the computer programs are described and the source statements listed together with details of an operational program that was subsequently developed, based on the findings of this work.

116. Turpin, Robert D. EVALUATION OF PHOTOGRAMMETRY AND PHOTOGRAPHIC INTERPRETATION FOR USE IN TRANSPORTATION PLANNING. Photogrammetric Engineering (44 Leesburg Pike, Falls Church, Va.), Vol. 30, No. 1, pp. 124-130, Jan. 1964. HR Abstracts, May 1964.

In coping with complex problems of data collection for the projection of future transportation networks the planner can profit from using both ground and

aerial photographs for measurement and interpretation, in the assessment of existing and prior conditions, to determine geographic features, land use and value, parking facilities, and traffic patterns.

In addition to fulfilling the need for accurate and reliable data collection, photogrammetric methods offer the planner other advantages. Most of this paper has been devoted to establishing the correlation between the needs of the transportation planner and the means by which he can fulfill them. The complexity of planning emphasizes the strong need for a method of evaluation which will be comprehensive rather than merely a means of producing masses of uncorrelated, individual studies, each based on a different set of conditions or even of different premises. It is essential to be able to see the many facets of planning at one time--to assess not only their emphasis and effects individually but as parts of an entire projection for future growth possibilities. Ground-inventory methods of data collection are hampered by the problem of correlation and the impossibility of re-creation of conditions in existence at the time data were collected. Thus, only a few facets of a situation can be noted before the basic situation will have been altered. The use of photogrammetric methods helps to alleviate these problems since more than one set of data may be secured from the same set of photographs. For each set of data, since the existing conditions would be the same, correlation becomes much more effective.

117. ORGANIZATIONAL PROCEDURES OF 17 URBAN TRANSPORTATION STUDIES. AASHO Committee on Urban Transportation Planning. American Assoc. of State Highway Officials (National Press Bldg., Washington, D.C.), July 1963. 60 pp. mimeo. HR Abstracts, March 1964.

This report, summarizing data on organizational procedures of selected urban transportation studies, was prepared at the request of the Steering Committee of the AASHO Urban Transportation Planning Committee during the Committee's meeting in Washington in January 1963. It was anticipated by the Committee that a report presenting organizational alternatives that could be adapted to unique conditions would be helpful in organizing continuing urban transportation planning studies in areas of more than 50,000 population.

The selection of the 17 individual urban studies comprising the report was influenced in part by their noteworthiness and in part by their organizational and technical procedures. Because of limitations of time, or duplication of procedures, studies of equal interest and value may have been omitted. No attempt has been made, either by the inclusion or exclusion of a study, to endorse or recommend a particular procedure.

The 17 studies reported on are: Jonesboro, Arkansas; Madison, Wisconsin; Salem, Oregon; Tuscon, Arizona; Lake County, Illinois; Nashville, Tennessee; Phoenix, Arizona; Akron, Ohio; Southeastern Virginia; Minneapolis-St. Paul; Pittsburgh, Pennsylvania, Puget Sound, Wahsington; Southeastern Wisconsin; Upstate New York; Detroit, Michigan; Penn-Jersey; and Chicago, Illinois.

118. Pollard, William S., Jr. INTERDEPENDENCE OF TRANSPORTATION AND CITY PLANNING. Journal of the City Planning Division, American Society of Civil Engineers (345 E. 47th St., New York 17, N.Y.), Vol. 89, No. CP1, Proc. Paper 3633, pp. 47-66, Sept. 1963. HR Abstracts, February 1964.

Transportation planning is presented as one component of comprehensive city or regional planning. Comprehensive planning for a metropolitan area includes

land use, community facilities, transportation, regulatory measures, and financing. Comprehensive city planning tries to mitigate conflicting purposes or goals in order to enable the city to move forward progressively. Transportation planning steps are indicated, and the influence of transportation on urban growth is examined. The need for planning as a continuing process is emphasized.

119. Stuart, Robert C. and Creighton, Roger L. A CENTRAL ORGANIZATION FOR CONTINUING TRANSPORTATION PLANNING. Upstate New York Transportation Studies. Presented at Highway Research Board meeting, January 1964.

The state of New York, in cooperation with the Bureau of Public Roads, has created the Upstate New York Transportation Studies, a group charged with preparing comprehensive transportation plans for six metropolitan areas in upstate New York. Drawing from experience gained to date on various phases of four studies, the authors discuss (a) the functions of transportation studies and changes therein; (b) the continuing functions, with special reference to the problem of data maintenance; (c) the implied staff organizational requirements; (d) the impact of computer technology; (e) alternative locations for staff and/or division of staff functions; and (f) devices for coordination.

120. Deen, Thomas B. FISCAL POLICIES AND TRANSPORTATION PLANNING. Traffic Quarterly (Eno Foundation for Highway Traffic Control, Saugatuck, Conn.), Vol. 17, No. 1, pp. 108-123, Jan. 1963. HR Abstracts, June 1963.

Momentous and far-reaching decisions are currently being made on the form and mix of future urban transportation. These decisions are and must be made in most instances without adequate answers to many pertinent questions, such as: "What portion of our resources are we justified in commiting to travel mobility in our cities?"; "Are new exclusive right-of-way transit systems justified in the face of financial deficits now experienced by transit, and in the face of transit's partonage decline?"; "Can we ever provide enough transportation capacity to adequately handle peak-hour travel demand?"

This paper has attempted to show that our current fiscal policies, more accidental than designed, are directly involved in our present difficulties and, at the same time, the solution to these difficulties.

The principle of self-support is a fundamental fiscal policy which would, if initiated, provide a solution to many of today's urban transportation woes. This principle requires the transportation user to pay the costs of the transportation service which he himself consumes. Collection difficulties and political obstacles are barriers to the immediate initiation of such a policy.

Our present pricing policies do not provide an effective constraint on peak-hour travel, and until the peak-hour traveler is required to pay something approaching his real transportation costs, it will be difficult, if not impossible, to satisfy peak-hour travel demands.

Presently, peak-hour travelers are subsidized regardless of mode of travel. Transit has relatively fewer off-peak riders (compared to automobiles), so that it experiences substantial financial difficulties which are unrelated to its relative efficiencies.

Fiscal policies now in effect tend to reduce the freedom of local transportation planners to propose balanced transportation, since no "external aid" transit funds are now available, as opposed to 90 percent federal financing for urban interstate freeways.

Current collection procedures, which cause users of very high-cost urban highways to pay the same as users of low-cost urban roads (often paid for by non-users), encourage wasteful practices by transportation consumers, and made obscure the cost-revenue situation on new freeways as compared to new transit. The need here is for a proper definition of what constitutes a "major element" of the system for which the cost-revenue ratio can be compared to competing modes.

Although on balance, it appears that both past and present fiscal policies tend to discriminate against transit, this, in itself, does not in any particular instance say anything about what mix of modes is to be recommended. There are many cities with small and/or very dispersed population and employment development which cannot be served in a substantial manner by transit, no matter what fiscal policies were introduced. In any city, only rigorous economic analysis of the relative service and costs of several alternative modal mixes will indicate which is best in each specific situation.

121. Levinson, Herbert S. and Wynn, F. Houston. SOME ASPECTS OF FUTURE TRANSPORTATION IN URBAN AREAS. Wilbur Smith and Associates, New Haven, Connecticut. Highway Research Board Bulletin No. 326.

This paper summarizes some of the basic interrelationships between cities, people, and their transportation requirements. The paper, predicated on extensive research, shows how the present trends in travel and urban development affect the demands and potentials for public and private transportation; sets forth a rationale for predicting transit usage in urban areas, both on a daily and CBD basis; and denotes how the capabilities and limitations of public transportation relate to the various predictors, from which generalizations can be presented for the role of each form of future urban transportation. Consideration is also given to the spatial aspects of the central business district.

122. Martin, B. V. and Memmott, F. W. METHODS FOR PREDICTING FUTURE DEMAND FOR URBAN AREA TRANSPORTATION AND THEIR RELATION TO THE TRANSPORTATION PLANNING PROCESS. Highway Research Board Bulletin No. 326.

This paper summarizes the results of a study of current principles and techniques for predicting the present and future demand for urban area transportation often referred to as traffic estimation and assignment.

Emphasis is placed on the transportation planning process as a total process, requiring the integration of many of the interacting characteristics of the urban environment. The principal phases of the total process outlined are (a) inventories of existing conditions, such as land use, population, vehicle ownership, vehicular and personal travel, transportation facilities and monetary resources; (b) estimates of future urban area growth in terms of population, economic activity, vehicle ownership, land use and available transportation network; and (c) determination of future travel demand based on trip generation, modal split, interzonal transfers, and the assignment of traffic to transportation facilities. The feed-back from level of service supplied by available facilities to traffic demand is stressed. Features of the transportation planning process where current methods appear inadequate are pointed out and recommendations are suggested for future research. An annotated bibliography includes 177 items pertaining to literature on predicting the future demand for urban area transportation.

123. Oppermann, Paul. METROPOLITAN AREA APPROACH TO COMPREHENSIVE AND COORDINATED TRANSPORTATION PLANNING. Northeastern Illinois Metropolitan Area Planning Commission. Highway Research Board Bulletin No. 326.

Although metropolitan transportation planning has improved through the years, and is probably at an all-time high as far as urbanization is concerned, there are still certain important elements which have not been dealt with adequately. Experience in the Chicago metropolitan area has brought some of these elements to light. These are defined, their implications are indicated, and suggestions are made for their inclusion.

124. Wolfe, Roy I. CONTRIBUTIONS FROM GEOGRAPHY TO URBAN TRANSPORTATION RESEARCH. Geographic Advisor, Ontario Department of Highways. Highway Research Board Bulletin No. 326.

In recent years there has been an accelerating demand for attack on the problem of urban transportation, with emphasis on the need for interdisciplinary study of all relevant aspects of both the city and the various forms of transportation.

As an integrative discipline that concerns itself, in part, with the way different areas on the earth's surface interact with each other, geography has a great deal to offer toward meeting these needs. Its value is well recognized by urban planning bodies, but much less so by State highway departments, only two of which have geographers on their permanent staffs, doing the sort of work for which they were trained.

No more than a half-dozen papers have been presented by geographers at the annual meetings of the Highway Research Board, and it may therefore be of value to present a brief review of the geographic concepts that are applicable to urban transportation research. These concepts are not necessarily unique to geography, but the insights that arise from them may be. Among them are location theory, central place hierarchy, urban functional classification, regional land use analysis, simulation models, systems analysis, graph theory, and especially new approaches to cartography, including use of machines in mapping, mathematical maps, and distortions that will calrify the relations between distance, cost, and time.

A great many substantive studies have been performed on specific cities and highway problems, and the mass of material accumulated by geography departments in the universities can be of considerable value to local researchers from other disciplines.

125. Telford, E. T. and Shaver, J. W. LARTS: HUGE COOPERATIVE STUDY IS KEY TO METROPOLITAN AREA PLANNING. California Highways and Public Works (P.O. Box 1499, Sacramento, Calif.), Vol. 40, Nos. 1-2, pp. 32-36, 68+, January-February 1961. HR Abstracts, June 1961.

The Los Angeles Regional Transportation Study is being conducted under the general coordination of the California Division of Highways with the cooperation of the Bureau of Public Roads, the five counties of Ventura, Los Angeles, Orange, San Bernardino and Riverside, 117 cities in these counties, and several public and private organizations associated with transportation. Its purpose is to determine the transportation needs of the study area for 1960-65-70-75

and into the future for use in local and regional integrated transportation planning. This will be done by relating the movement of persons and goods to land use, utilizing modern high speed computers, and the latest land use and traffic model techniques.

Working within the framework of community and area-wide planning, the land use model will be used to project and distribute changes in population, employment and land development. The derivation of this model depends on the collection and analysis of data which can best be related to area growth, such as: distribution of past, present, and proposed land use, employment, population, land costs, topography, and the availability of water, sewers, highways, etc.

The traffic model is based on inventories of transportation facilities, determination of travel characteristics, and factors of land use that give the greatest accuracy in predicting travel and trip production. This model converts the information derived from the land use model to person and vehicular trips and assigns these trips to the network of freeways, major arterials, and collector roads by 5-year intervals into the future.

The LARTS Study is not only designed to give greater insight into the interrelationships between land use and transportation; but it also offers local and regional authorities the planning tools for objective evaluation, in terms of transportation needs, of their present and future planning--both as to its effect on local areas and on the region.

This study is intended to be a continuous planning operation utilizing new data at regular intervals and lending to greater refinements of study techniques. Although the first 2-year phase of this study will be oriented toward vehicular travel, it is planned in subsequent phases to include the possibility of other modes of travel and any other likely innovation in the movement of people and goods.

As the study progresses and its potentialities for local as well as region-wide coordinated planning becomes evident, engineers, planners, public officials, and others will not only lend support, but will share a common realization that significant progress has been made toward a well-founded plan of integrated transportation facilities for the greater Los Angeles area.

Legislators, planners, administrators, engineers and others are charged with the responsibility of ensuring the orderly development of the greater Los Angeles Area on a local and regional level. The problems of adequately meeting this responsibility grow more numerous and complex as this area rapidly coalesces into one super metropolitan region. It becomes increasingly clear that the knowledge and skills of social and scientific disciplines should be coordinated in a common effort to understand the interplay of forces shaping the development of this super-region. A key to this understanding lies in the proper evaluation of the inter-relationships of land use and transportation.

The Los Angeles Regional Transportation Study offers the means for deriving and using these relationships through integrated land use and transportation planning. It offers a study procedure for investigating the whole region without submerging the unique characteristics of the individual local communities. It offers the tools and the understanding required for more effective community and regional planning--all within the framework of existing governments--through voluntary cooperation.

126. Carroll, J. Douglas. TRANSPORTATION PLANNING FOR CENTRAL AREAS. Journal of the American Institute of Planners (Suite 410, 2400 16th St., N.W., Washington 9, D.C.), Vol. 27, No. 1, pp. 26-34, February 1961. HR Abstracts, May 1961.

The CBD (Central Business District) is the site of highly concentrated and specialized activities and is inseparably linked to the entire region. Transportation planning must be geared to the individual characteristics of each CBD and the surrounding region. Fundamental characteristics such as land area, floor area, types of activity, daytime population, and transportation facilities must be inventoried and measured. Planned changes in any or all of these characteristics must recognize the interrelatedness of these factors, realistically weigh the costs of such changes against the expected returns, and, above all, avoid possible conflicting proposals such as increased parking facilities and transit subsidies.

The intent of this brief article has been to suggest an appropriate way to examine central-area transportation problems. This way is to apply measures to certain key phenomena so that the more important of the interrelationships between land use, travel, and transportation systems can be grasped. This in turn permits a sane, whole view of the CBD in the urban environment. Such an approach is a natural one for planners, who are--or should be--trained to look at things whole.

The CBD is only a part of an urban region--but a very specialized and impor tant part. Its size and functions depend on the size of the surrounding area and also on the networks of transportation which are available. Size and functions are also affected by the changing technology of communications and by the organization of business. The CBD is intricately tied into the whole urban society. It affects, and is affected by, the changes which come with time and with growth.

A common desire in planning is for a bigger CBD--often tacitly assuming that bigger equals better. To achieve such a desire, proposals for tremendous improvements in transportation may be made. These are made on the assumption that, if everything remains equal, improved accessibility ought to produce increased intensity of development, which in turn would help to pay for transportation improvements. But all things rarely remain the same. Highway improvements to the center appear to decrease pressure for high-density development--both by requiring tremendous areas for parking, and by making suburban locations more accessible. Rail improvements to the center do not now provide the amount of increased site advantage which they formerly did, because there are alternative means of transportation, alternative forms of business organization and, with generally improved road accessibility, more alternatives for business location.

It seems imperative, therefore, to balance the objectives with the means available, and to make a decision in the light of probable costs and returns. Such a balancing ought, at the very least, to prevent conflicting proposals from being made--proposals such as requiring parking and subsidizing transit at the same time. To make a proper balance, measurements are required. The population capacity of the CBD, its peak-hour in-take requirements, the capacities of transportation systems, and the sources of its workers must be measured. The scale of future growth must be estimated and cost in appropriate images.

127. PROFESSIONAL RESPONSIBILITY OF CITY PLANNERS AND TRAFFIC ENGINEERS IN URBAN TRANSPORTATION. Joint Policy Statement of the American Institute of Planners and the Institute of Traffic Engineers. Journal of the American Institute of Planners (Suite 410, 2400 16th St., N.W., Washington 9, D.C.), Vol. 27, No. 1, pp. 70-73, February 1961. HR Abstracts, May 1961.

This statement covers those phases of urban transportation in which the city planner and traffic engineer have commnn interests, such as, highways, transit, and terminal facilities, and services. It recommends the establishment of certain interprofessional relationships that normally should be followed to foster sound community development and to insure safe and efficient transportation service.

The governing bodies of the American Institute of Planners and the Institute of Traffic Engineers have adopted this as their interprofessional policy statement.

Close cooperation of various professional groups is indispensable in any urban transportation program. This certainly applies to the city planner and the Traffic engineer. However, many others are directly involved, such as the public works director, city engineer, police official, transit official, and utility manager, as well as the county, state, and Federal highway officials. All must participate since urban transportation has so many facets--planning, design, construction, operation, and maintenance.

For his part, the city planner is assigned the responsibility of developing and guiding the implementation of the comprehensive community plan. Transportation is one of the most important elements in such a plan. Therefore, the city planner, of necessity, must see that transportation facilities are integrated with other key elements of the community plan. This, of course, can be achieved only by coordinating his efforts with those of other professionals who are responsible for building and operating these facilities. The city planner must weigh with the other groups the interrelationship between various elements of the comprehensive plan.

The traffic engineer's responsibility is to see that the transportation system in a community is operated safely and efficiently. In this task he is interested in the planning and designing of the transportation facilities as they will untimately affect the operation of the system. He is also interested in the operational control measures such as traffic signals, signs, and markings, as well as the necessary laws regulating traffic required for safety and efficiency. In fact, he is concerned with any plans that will affect desires and needs relating to the movement of people and goods.

The outline indicates the general responsibiliyy of the city planner and the traffic engineer in various phases of the transportation program. In carrying out these responsibilities, the type of cooperation will naturally depend upon the status of transportation and other community plans. While the transportation plan and land use plan are under development, cities will undoubtedly move ahead with various types of projects which will call for collective action. In this event it is essential that the city planners and traffic engineer get together as early as possible in the development of sound projects.

Basic to any sound transportation plan is a continuing fact-gathering program.

When the facts have been collected and analyzed, appropriate standards and objectives should be adopted to guide the development of the plan and to measure transportation and terminal deficiencies, present and future.

In carrying out the plan, a close working relationship between the various professional groups can help to insure the logical development of the transportation program, while at the same time minimizing disruption of normal community activities.

Division of responsibility to this stage would be as follows:

Joint Responsibility

1. Determining the exact location of proposed transportation facilities.
2. Establishing transportation improvement priorities.
3. Keeping the data and plans up to date.

City Planner's Responsibility

1. Establishing the necessary planning program (off-street parking and load requirements in zoning ordinances, requirements that subdivisions conform to the transportation plan, etc.) to foster the development of the transportation plan.

Traffic Engineer's Responsibility

1. Establishing the necessary operational and control measures to assure smooth traffic operation during construction of facilities.
2. Determination of operational measures necessary to effectuate the transportation proposals.
3. Review with the city planner proposed major traffic operational changes like one-way street and through-street program.

128. Wingo, Lowdon, Jr. ON THE MEASUREMENT OF CONGESTION. Associate, Resources for the Future, Inc., Washington, D.C. Highway Research Board Bulletin, No. 221.

Since much urban highway planning has as a major objective the reduction of congestion, an understanding of the characteristics of congestion losses may provide efficiency criteria for the development of urban transportation systems. In spite of the fact that there appears to be an element of capriciousness in the occurrence of congested conditions in transportation systems, it is possible to identify a kind of congestion loss that is inherent in any system of transportation in which the instantaneous demand exceeds the instantaneous capacity at any point. This load loss derives from the imposition of time restrictions on the distribution of demand, given a capacity limitation. As demand increases, the load loss per unit increases, hence there is suggested a partial criterion for the efficiency of a system. The organization of a transportation system in space and time has identificble consequences for the level of load loss. The nature and magnitude of load loss in high volume systems has some implications for highway planning policy in urban areas.

129. Carroll, J. D. and Creighton, R. L. PLANNING AND URBAN AREA TRANSPORTATION STUDIES. Chicago Metropolitan Area Traffic Study. Highway Research Board Proceedings, p. 1, 1957.

New developments in transportation planning are emerging which hold much promise for the future of both transportation planning and city planning. These grew out of the accumulated experience in origin-destination studies in over 120 cities in the past 10 years, the assimilation of new techniques, and the enormous data handling possibilities of accounting machines and electronic computers. What are these developments? What is their promise for the future?

A basic idea is the integration of analysis with data gathering one continuous process whose product is the tested plan. The process utilizes part of the data obtained by survey to develop formulas, which are then tested against the remainder of the data. Once the formulas are proved, they can be used to predict traffic flows on any system of transportation.

To join data gathering effectively to analysis and formula preparation, the

various surveys--home interview, truck-taxi, and external--must be designed expressly for this purpose.

A continuous, integrated analysis and planning process consists of three major parts, each a considerable advance in itself. These are: estimating traffic generation from land use; predicting future lines of travel desire; and predicting traffic flows on a transportation network.

Existing land use patterns and existing transportation systems were used for analysis and formula development. With the process now established, different imputs can be used. Estimated or planned future land use can be inserted and their traffic consequences studied, or new systems of transportation can be inserted and the changes in flow patterns observed. Re-development projects, the closing of a bridge, the construction of a mass transit facility, or the building of an expressway--all these could be tested, using known rules and assumptions.

None of the foregoing could be done without high-speed means of handling vast quantities of data. The electric accounting machine and the electronic computer can economically provide solutions with refinement and accuracy.

There are three major implications for the future to be drawn. One is that we are on the threshold of the era when a continuing agency with a computer can furnish statements on the consequences of any urban transportation policy decision. Second, transportation is so vital to urban land use that it may be considered an instrument for aiding and abetting a land use policy. Third, land use so affects the use of transportation systems that land use controls may have to be applied more rigorously to safeguard transportation investment.

130. PROJECT TO AID CITIES WITH TRANSPORTATION PROBLEM. Public Safety, Vol. 47, No. 1, p. 37, January 1955. Highway Research Abstracts, March 1955.

A program to eliminate traffic congestion, improve street conditions, and better mass-transportation service in cities of all sizes throughout the country has gotten under way under auspices of the National Committee on Urban Transportation. It is aimed at helping cities to get the facts needed to: (1) properly determine the deficiencies of urban transportation systems, (2) plan realistic programs to overcome these deficiencies, and (3) present clear statements of needs to legislative bodies and the public.

131. Claffey, P. J. PLANNING RAPID RAIL SERVICE FOR INTRA-URBAN TRAVEL. Traffic Quarterly v 17 n 4 Oct 1963 p 503-15.

Study of problems in connection with rapid rail transit in railroad transportation system to obtain decisions regarding need for new or improved rapid rail lines; study includes survey of need, evaluation of transit equipment relative to needs, assessment of effects of alternative plans, and review of economic factors.

132. Mayer, H. M. URBAN GEOGRAPHY AND URBAN TRANSPORTATION PLANNING. Traffic Quarterly v 17 n 4 Oct 1963 p 610-31.

Discussion of current interests or urban geographer, theoretical and applied which are related to work of planner and traffic engineer; role of urban geographer; concepts of potential and hierarchy in urban planning.

133. Mortimer, W. J. and Quinlan, L. R. DEVELOPMENT OF CRITICAL PATH METHOD IN PLANNING AND SCHEDULING FOR HIGHWAY IMPROVEMENT. Am Assn State Highway Officials--Regional Conference on Improved Highway Eng Productivity, New Orleans, La. Sept. 7-8 1962. AASHO Committee on Electronics pt I(B) 1962 p 38-60. Cook County, Ill.

Highway Dept's use of method for urban highway projects with particular reference to planning and scheduling of various operations necessary from programming stage to completion of highway improvement; tables, graphs and diagrams on examples of method application.

134. Hand, I. and Hixon, D. C. PLANNING, TRAFFIC AND TRANSPORTATION IN METROPOLITAN AREAS. Traffic Quarterly v 17 n 2 Apr 1963 p 254-73.

Discussion of current state of affairs as realted to planning, traffic and transportation in terms of authors' experience in Nashville-Davidson County Metropolitan area.

135. Levinson, H. S. and Wynn, F. H. Some ASPECTS OF FUTURE TRANSPORTATION IN URBAN AREAS. Nat Research Council--Highway Research Board--Bul 326 1962 p 1-31.

Interrelationships between cities, people, and their transportation requirements; how present trends in travel and urban development affect demands and potentials for public and private transportation; analyses are based on information obtained from series of urban areas varying in size, location, and economy.

136. Johanson, I. C. EFFICIENCY IN MAKING--INDIANA ADOPTS FACTURL PROGRAMMING. Traffic Quarterly v 16 n 3 July 1962 p 357-80.

Flexible and rational sufficiency rating program for rural state highways; ratings are used by Div of Planning as guide in preparation of highway construction programs projected up to 1967; advantages of ratings in logical planning; differences between Indiana ratings and those used elsewhere are pointed out.

137. Hansen, H. W. GUIDES FOR TRANSPORTATINN PLANNING. Traffic Quarterly v 16 n 2 Apr 1962 p 201-11.

Review of studies on city transportation aimed to establish major travel corridors for intercity traffic; application of models to future population data for each city is proposed to afford more comprehensive view of transportation relationships.

138. Wood, G. A. and Ames, R. F. JOINT PLANNING FOR 1980. Traffic Quarterly v 16 n 3 July 1962 p 381-92.

Comprehensive plan to Southeastern Virginia Regional Planning Commission to guide growth and development of metropolitan area of approximately 1200 sq. mi; project represents one of first joint programs for coordination of transportation and urban-development planning; characteristics, advantages and disadvantages of 3 land use plans presented by commission.

139. Pollard, W. S., Jr. INTERDEPENDENCE OF TRANSPORTATION AND CITY PLANNING. ASCE--Proc v 89 (J City Planning Div) n CP1 Sept 1963 paper 3633 p 47-66.

Transportation planning is presented as component of city or regional planning; comprehensive planning for metropolitan area includes land use, community facilities, transportation, regulatory measures, and financing; planning steps are indicated, and influence of transportation on urban growth is examined need for planning as continuing process is emphasized.

140. Pollard, W. S., Jr. TRANSPORTATION PLANNING RE-EXAMINED. ASCE--Proc v 89 (J City Planning Div) n CP1 Sept 1963 paper 3632 p 17-45.

Examination of current transportation planning methods is presented in context of true comprehensive planning; steps for planning transportation system are considered in 6 categories and different study approaches and degrees of detail possible are examined; development of comprehensive plan should result in general plan, definitive plan, and effectuation plan, and these plans should include major streets and highways, parking and circulation for central business district, mass transit, and terminal facilities for rail, water, and air movements.

141. VEHICLE ROUTES PLANNED BY COMPUTER. Data Processing v 6 n 4 July-Aug 1964 p 244-8.

Vehicle routing program to 500 delivery points devised by English Electric-Leo Computers is discussed; computer calculates optimal route and prints list showing order of delivery and related information; it was possible to reduce number of vehicles used on routes planned by manual methods, by between 5 and 30%.

142. Cowdery, R. C. LOGICAL URBAN TRANSPORTATION PLANNING GUIDE. Traffic Eng v 33 n 6 Mar 1963 p 23-7.

Review of Nat Committee on Urban Transportation program of long-range highway plans which are properly coordinated with plans for improvements in other affected forms of transportation and which are formulated with due consideration to their probable effect on future development of urban areas of more than 50,000 population.

143. Blunden, W. R. INTEGRATED TRANSPORT PLANNING. Australian Road Research n 4 Dec 1962 p 24-32.

Nature of interaction between transport and land use activity; operational characteristics of various urban transport modes; separate and integrated roles as related to main land use functions in urban areas.

144. Spiegelman, G. and Duke, K. E. PROJECTING TRAVEL DEMAND FOR URBAN TRANSPORTATION STUDIES. Traffic Quarterly v 17 n 3 July 1963 p 355-74.

Analytical framework and methodology for projection of automobile travel demand used in City-County Highway Plan of San Mateo County, Calif and associated transportation study to project to 1990 number of automobile trips from

home to work among large number of subareas during peak period from 7 to 9 a.m.; procedure followed in arriving at 1990 projections is shown schematically.

145. PLANNING AND DEVELOPMENT IN URBAN TRANSPORTATION--1959. Nat Research Council--Highway Resaarch Board--Bul n 221 1959 66 p.

Papers presented at 38th Annual Meeting Jan 5-9 1959 in Washington, DC as follows: Measurement of Congestion in Transportation Systems, L. Wingo, Jr. 1-28; Central Business District and its Implications for Highway Planning, R. E. Murphy, 29-32; New Roads for Old Cities: European Experience, W. F. Bogner, 33-6; General Planning, Urban Renewal and Highways, R. L. Steiner, 37-9; Measurement of Central Business District Change and Urban Highway Impact, E. M. Horwood, R. R. Boyce, 40-55; Shoppers' Paradise Concept, R. C. Blensly, J. A. Head, 56-66.

146. Smith, R. G. CO-ORDINATED TRANSPORT PLANNING FOR ST. LOUIS AREA. Traffic Quarterly v 14 n 2 Apr 1960 p 143-60.

Summary of St. Louis Metropolitan Area Transportation Survey, 1957-1970-1980, for St. Louis City and County giving only certain total figures and outlining other features as follows: population estimates, travel pattern, area transportation problem; determination of rapid transit type; recommended transit system; transit assignments; service requirements; recommended program's financial aspects; schematic layout of CBD-loop.

147. Cherniack, N. PASSENGER DATA FOR URBAN TRANSPORTATION PLANNING. ASCE--Proc v 85 (J Highway Div) n HW4 Dec 1959 pt 1 Paper n 2275 p 37-54.

To aid planning and to solve transport problems, analysis of changes in passenger travel in section of New York-New Jersey metropolitan district are examined for 1948-58 decade; it is shown that if communities wish to take advantage of economies of existing mass transit on rails, redevelopment of employment sites in areas where mass transit would be more attractive than automobile, should be encouraged.

148. Hall, E. M. SAN DIEGO TRANSPORTATION PLANNING STUDIES. ASCE--Proc v 85 (J City Planning Div n CP2 Dec 1959 paper n 2306 p 11-27.

Concepts and administrative organization of San Diego, Calif continuing urban transportation planning program; examples demonstrate approaches to coordinated solution of transportation problems; necessity for cooperation between all levels of government and agencies concerned is emphasized.

149. Creighton, R. L. COMPREHENSIVE TRANSPORTATION PLANNING. ASCE--Proc v 84 (J Highway Div) n HW 3 Oct 1958 pt 1 Paper n 1803 15 p.

Example of Chicago Area Transportation Study to describe particular approach of "comprehensive transportation planning" system; systematic methods for analyzing data and preparing and testing plans for all types of transportation facilities in urban areas, based on forecasts of traffic as generated by future land uses; traffic flow forecasting model for predicting trip generation and distribution and for estimating traffic flow.

150. Marsh, B. W. TRANSPORTATION PLANNING: PROSPECTS FOR COORDINATION. Am Soc Civ Engrs--Proc v 82 (J City Planning Div) n CP2 paper n 988 May 1956 13 p.

Deterioration of city transport conditions as result of lack of coordination; need for effective cooperation efforts and solutions among municipal agencies and civic planning groups.

151. Maier, E. TRANSPORTATION PLANNING IN HOUSTON. Traffic Quarterly v 8 n 3 July 1954 p 311-20, 1 plate folding sheet.

Methods and results of origin and destination survey and parking survey conducted in Houston, Texas.

152. Evans, H. K. LOOKING AHEAD IN URBAN TRANSPORTATION. Traffic Eng v 21 n 6 Mar 1951 p 189-92.

It appears that urban transportation will be subject to more controls from federal government and possibly compulsory conservation measures; urban transportation officials and local business men should be prepared for this shift in thinking and it would be of benefit to all concerned if voluntary conservation measures were begun now to make better use of streets and vehicles.

153. Williams, L. COMPREHENSIVE PLANNING CAN SOLVE METROPOLITAN TRANSPORTATION PROBLEMS. Civ Eng (NY) v 20 n 3 Mar 1950 p 30-1.

Effective planning for any form of transportation r quires consideration of natural resources, economics, geography, population, land utilization, plans for other community needs, future growth and development of whole area and welfare of people served.