

Human Values Related to Urban Transportation

(SUMMARY REPORT OF PANEL 2 ON SOCIAL STRUCTURES OF URBAN AREAS AND PERSONAL DESIRES)

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The task of Panel 2 was to isolate and underscore research needs in a particular field or territory. First, urban; second, transportation, and finally, social and personal values are the defining words. All groups were limited to urban transportation; Panel 2 was further constrained to concentrate on research needs which could be classified as related to the social and personal value aspects of urban transportation.

The remarks presented here represent an attempt to report the consensus (where it existed) or range of thoughts expressed by panel members. Since no person can accurately report on another and much less on a group's comments, this report will be colored by the interpretations of the writer.

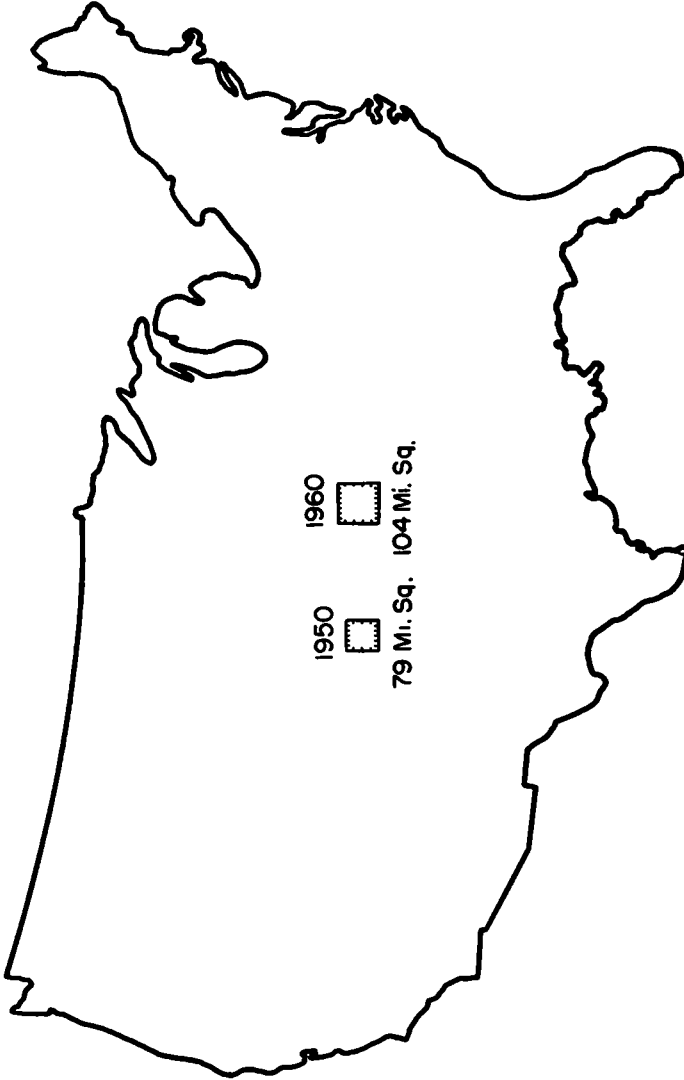
In a democratic society it is important that all public works and actions, especially those with regard to the transportation system, be sensitively adjusted to the preferences of people. This requires more knowledge of personal values and ways in which transportation facilities can be supplied or modified with respect to these preferences. It is also clear that there is insufficient understanding of many of the cultural and group values which are so important in defining useful and satisfactory urban living conditions.

I have been repeatedly surprised in making sample surveys to find how great and unexpected is the range of differences in behavior, and way of life of urban populations. First, everyone does not work downtown. Second, less than 70 percent of the labor force go to work in the morning of a typical weekday — the other 30-odd percent either do not go to work or they are on other time schedules. Some 15 percent do not even have a fixed work spot — they are the construction, home repair, and other "floating workers." See how far this may be from the natural belief that everyone is more or less like we are.

The need for research in this area is more than academic in nature. The planning and construction of comprehensive transportation systems and extensive renewal programs will be severely handicapped by an imperfect understanding of why people choose to live where they do, at differing densities, and at differing distances from downtown or their work places. The highly diverse as well as the more common preferences of people must be properly understood if public policy is to be effective in meeting the needs of people.

Scientists of previous decades have shied away from the notion of personal value. The objective, disinterested scientist, who pursued his research without concern for the social implications of his work, was the image to which most investigators aspired. The true scientist, it was felt, could not be scientific about what people ought or wanted to do — only with what they actually did. This is no longer so true. The question today is not whether, but how to measure and analyze values. This kind of research is a rapidly growing and enlarging field.

Many different techniques are being used for this purpose. Some are direct, such as depth interviews in which the interviewer probes by intricate questions in an attempt to get at the individual's viewpoint and value weights. Some techniques involve new ways of putting humans in laboratory settings and in artificial roles to see what reactions they give to decision or choice situations. Some techniques, like the O-D survey, are indirect. Even a so-called phenomenological approach, which would carefully avoid dealing with individual personal values, can shed light on preferences insofar as it is



<u>ITEM</u>	<u>1950</u>	<u>1960</u>
AREA (SQUARE MILES)	6,213	10,838
POPULATION	48,377,240	57,975,132
NUMBER OF CENTRAL CITIES .	172	254

SOURCE: DEPARTMENT OF COMMERCE
BUREAU OF CENSUS

Central cities of urbanized areas in the United States (areas in 1950 and 1960).

successful in describing group behavior. And finally, members of our panel have suggested that it may even be possible for computers (backed by competent programmers) to explore aspects of human behavior and values by simulation.

This subject matter has tremendous range and cannot be claimed by any one field or discipline. The focus on urban transportation does not restrict this scope. Certainly ecology, psychology, economics, anthropology, geography, and city planning, to name a few, can make important contributions. The panel hopes and encourages any and all disciplines to bring their specialized training and point of view to bear on this problem territory. It is the feeling of this panel that many research topics may best be carried out by teams representing several disciplines.

The discussions of needed research and research problems that were carried on by this committee are organized, for purposes of this report, into four broad categories. Within each of these, illustrative problems are described. The first deals with human values and behavior as associated with the spatial arrangements of people and activities in the community. The second deals with the changing patterns of travel consumption associated with changes in levels of income, changes in transportation technology, increased leisure time, etc. The third area deals with aspects of traffic flow; people and/or goods in motion -- and the ecology of transport. The fourth area is concerned with social criteria which must be developed and measured and refined if human values are to be used to appraise policies and actions.

These categories are quite broad, yet they limit the research on human behavior to the areas relevant to the transportation system and provide a framework within which specific topics can be organized and pursued. Attached, as an appendix, is a series of research proposals made by researchers who wish to carry out specific projects. These are appended for further treatment by the whole committee.

SOCIAL VALUES ASSOCIATED WITH THE SPATIAL ARRANGEMENTS OF PEOPLE AND ACTIVITIES WITHIN THE URBAN COMMUNITY

It is the spatial arrangement of human activities which the transportation system must serve. The spatial pattern for most cities has evolved slowly and has been influenced by a variety of factors such as transmission of power, construction technology, terrain, and the transportation system itself. A factor which is often overlooked or dismissed as not being amenable to measurement, is that of personal values. This factor is much too important to ignore.

The journey to work will serve as an illustration. Given the supply of residence and work places, one "best" or most "economical" arrangement must be that which would minimize the total distance between home and work place. While studies have shown a tendency for workers' residences to be clustered or concentrated with respect to their work places, it is apparent that the real world adjustment is distinctly not a spatial minimization; i. e., the residence of workers could easily be more closely grouped around their place of work than is actually the case.

It is clear from the evidence that people do not wish to travel too far to work. Yet, people have not chosen residences or work places which minimize this distance. There must, then, be other things which people value, and they will increase their travel distance in the final decision because of the weight of these other values. These will be such things as neighbors, relatives, the quality of schools, the fact that there are other wage earners in the household, or any number of factors which have value to the individual decision-makers.

Just how much differing space requirements, resulting from family size, income, etc., condition the final compromise which results in a particular commuting distance, is not known. The impact of "amenities" can hardly be discounted in attempting to account for the distribution of residences with respect to work places. Statistical examination of different arrangements which can standardize such things as income and occupation, and measure the variation in commuting distances would begin to shed light on the importance people place on reduction of travel as opposed to other things which have value.

Another aspect of the work-home linkage relates the length of time in transit to levels

of participation in community affairs. To what extent does the "choice" of the amount of time required to get to work condition the time which is available for participation in the P. T. A. , the Boy Scouts, or other residentially centered activities. Research is currently under way which will examine the behavior of suburbanites versus city dwellers. A proposal for a more detailed inquiry into mode of travel and other family behavior patterns has been prepared by Professors Hawley and Zimmer.

The density of activities on the land is a measurable physical parameter of the urban structure, and one which bears directly on transportation requirements. Some writers have suggested that densities actually result from the transportation system and can be manipulated by rearranging transportation services. Basic to any such manipulation is the prior question, "What density do people prefer?" Additional preferences for the arrangement of open space, schools, shops, etc. , must be an ingredient to define an arrangement that best pleases the residents. This would be of critical importance to urban renewal projects. It is also a necessary ingredient in any attempt to understand the relationship of the CBD and other subcenters to the entire community and to know when to adjust transport systems to support revised land use patterns.

A collateral yet important question of study would be the extent to which the transport system affects the choices of people. Such simple things as the location of sidewalks and local streets have been shown to influence neighboring and visiting patterns—and can possibly have an important role in participation in many other kinds of activities. What, it has been asked, are the effects of different street patterns, block sizes and house arrangements?

Finally, much interest is evidenced by industry as suggested by Mr. Osgood of Sears Roebuck & Company. He points out the very grave problem found by industrial concerns and other large employers in metropolitan areas. Many firms are situated in the central, but older parts of cities. Their plants or buildings are growing old, too. The management is approaching a decision as to how long to keep investing in older structures, and this leads to whether they should rebuild where they are or go to the suburbs. They are sensitive to the needs of their workers, to the problems of recruiting help. They want to know a great deal more about the preferences of their people for travel by bus, train, or by private car. They need to know how the city can improve service to the existing location. These are questions which are of interest to all large employers and research on these matters would be most welcome.

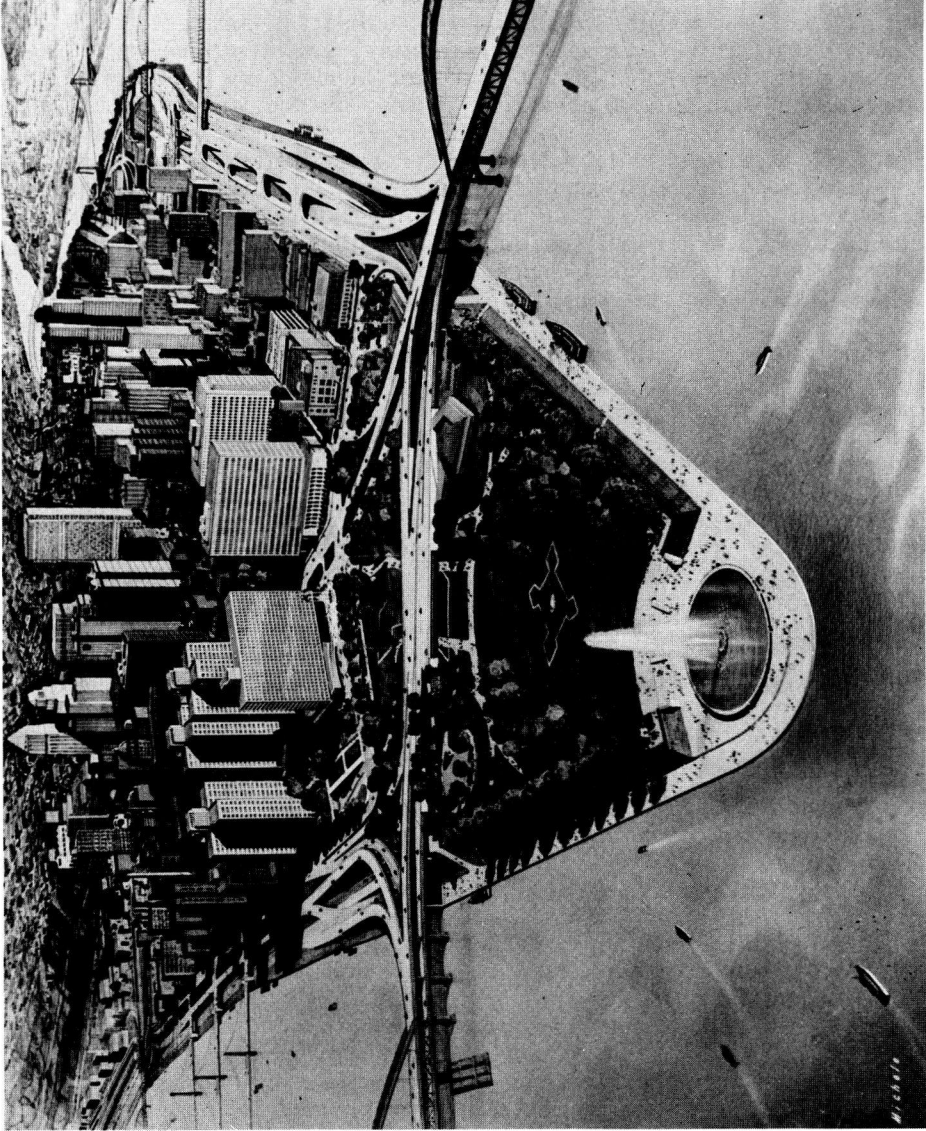
Another project submitted by Mr. Manheim of the Harvard-M. I. T. Joint Center for Urban Studies proposes a case study of individual and family location and transport decisions. These depth investigations are expected to provide more evidence as to factors of significance on people's preference for residential locations and their modal and route choices.

TRAVEL CONSUMPTION RELATED TO INCOME, LEISURE TIME, TRANSPORTATION TECHNOLOGY, ETC.

The urban community is not a static grouping of people and activities. There is growth and decline, new inventions, changing economic conditions, etc. This constant shifting makes the problem of measurement difficult at even one of the most basic levels, counting people. The problem this poses in providing facts and estimates in planning new transportation facilities is obvious.

For example, if we expect the population of a region to double, would we expect the volume of travel to stay the same, double, or quadruple? In recent years, the increasing per capita consumption of automobiles has tended to give a multiplier effect to per capita travel consumption. So the answer would be more than double and might, quite possibly approach a factor of four.

But such a quick answer must be tentative because technology has made advances in all areas, not just in transportation. Studies of travel consumption must consider the problem of substitutability. To what extent can television be substituted for travel? What of the substitutability between different modes of travel? The eight hour day and the two day week-end represent a greater amount of leisure time. People obviously can devote only a portion of their entire lives to travel. They must sleep, work and do



Pittsburgh's Golden Triangle is an outstanding example of what can be accomplished when freeway construction and urban redevelopment are coordinated.

other important things. Is there a definable ceiling to the amount of time people will devote to traveling? Will we have the two house, instead of the two car family in the future? What kind of time budgets do people keep and how are these affected by changing income, increased leisure time, etc. ?

Recent O-D studies have revealed that trip making and car ownership are highly associated, as are income, density, transit service and use, distance from the CBD, and a variety of other factors. These relationships are basically static. It remains to be seen to what extent the variation in trip making associated with car ownership is constant through time. Yet such variations can be of great importance in estimating demand for transportation facilities, parking, regional parks, etc.

What kind of impact do these changes in travel consumption, income, etc. , have on the community? Are the park and open space requirements of the transit oriented, apartment dweller substantially different from those of the two car suburbanite with a vegetable garden? Are the consumption of travel, the packaging of people in residences, and the structuring of nonresidential activities intertwined with the type transportation? Are recognizable trends in the consumption of leisure time emerging? Research proposals reviewing the use of leisure time have been made as a basis for explaining community participation and better to assess future recreation needs.

A specific problem area is that of choice of mode of travel. Studies of mass transit users (as opposed to automobile users) indicate that only a small portion of the riders could have chosen to use an automobile. That is, the bulk of them were captive riders because no car was owned by the family, no car was available at the time they made the trip, they were too young to drive, they were not licensed to drive, etc. Yet, might not those who chose to use an automobile make a different choice under different conditions of service level, convenience, comfort, parking conditions at the terminal end, etc. ? Factors in mode preferences need to be carefully isolated and measured in order to understand mode choice.

Specific problem statements and research needs have been submitted on this subject. They suggest the use of depth investigation of a sampling of people in specific urban settings. The environment of choice, the actual choices made and the reasons for making such choices would be separate parts of this analytical study. Another proposal that has been brought forward by Committee members would involve a careful analytical study of the costs of several types of urban transport. This would be aimed at finding whether truly economic decisions are made when individuals select their means of urban travel.

SOCIAL ASPECTS OF TRAFFIC FLOW

Our society is one in motion. Not only is it rapidly changing and adapting to many new things over time, but, as of any instant, many people are in motion. A sudden, instantaneous stop at the period of peak movement in an urban region would find about 10 percent of the daily travelers en route from an origin towards a destination. People, when in motion, have a different outlook, a different character and, very possibly, quite different values than when they are at home, at work or at some other fixed position. There can be no argument but that families are quite different when in the family car and taking a journey than they are at home.

There is, in spite of this obviously important aspect of social life, very little information available about traffic flows and about people in motion.

Collection of flow data has been quite limited in comparison to that available on the more static events such as population, housing or employment. This is somewhat inherent in the nature of things, since catching people in motion is a tricky problem in methodology. This lack of good flow data has retarded investigation in this area.

The methodology of collecting and analyzing movement data should, therefore, be considered. Review of existing techniques of collection and measurement, suggested improvements therein, and proposed analytic studies are needed. Especially important is the inclusion of a basis for relating these data to our other stock of information represented by the Census material, Labor Department statistics, assessment records, etc. Fortunately, the Census is interested in this subject and will prepare some basic

reports on intra-metropolitan work travel. Census data can be used to analyze the social and economic characteristics of workers according to the type of travel flow.

A specific aspect of traffic movement deals with the culture and environment of the people actually en route. The anthropologist sees people in motion on expressways or toll roads as having a culture of their own and quite different from what would be found in their homes. All activities in the vehicle may be subordinated to getting from here to there. The driver is the master and sometimes seems willing to drive himself far beyond the limits of endurance normally associated with his job and home life. Moreover, there is evidence that man as father and as driver is two different people. In a private car, environment is one of a sea of cars, a variety of eating and gasoline stops, of motel or hotel accommodations, of stop lights and rapidly shifting scenery. Americans have adapted to a degree of mobility unknown in other cultures. An anthropological approach to the study of people in motion would be fresh and would supply a perspective on aspects of personal value systems. Some studies are currently under way on this subject.

Another view considers the effect of environment on the choice of mode of travel. Does the comfort of a transit vehicle materially affect usage? Does the prospective user's image of what the environment is like (whether or not his image corresponds to the facts) condition his choice? Notions of black leather jackets, mugging, and zip guns on subway and elevated facilities may deter a trip or change the mode of travel. Both the image and the appraisal of the rider have been shown in some studies to affect the willingness to travel and the choice of mode. Studies in Detroit showed that many drivers avoided freeways because they were afraid of running out of gas or of having tire trouble with no roadside facilities available.

This problem of environment design is especially important in designing new fully automated facilities such as moving sidewalks or moving belts. How will people react to the environment of such new facilities? How can potentially disturbing elements be screened out?

SOCIAL CRITERIA AND STANDARDS

The applicability of research findings is of special interest in the area of transportation and associated planning. In order to utilize the relationships obtained, however, we must propose standards and objective criteria against which to measure results. Any new proposals in urban areas are weighed in some balance of benefits vs costs. Rewards are very often difficult to cast in dollar terms. They include a more pleasant life, greater comfort, greater safety, better health, and many other socially desirable rewards which often defy exact measurement. The ordering of these social objectives and criteria into measurable forms is an essential undertaking to support the making and execution of public policy.

One objective of a transportation plan is to move people more quickly to their desired destinations. But how large a time saving is needed to justify a million dollar investment?

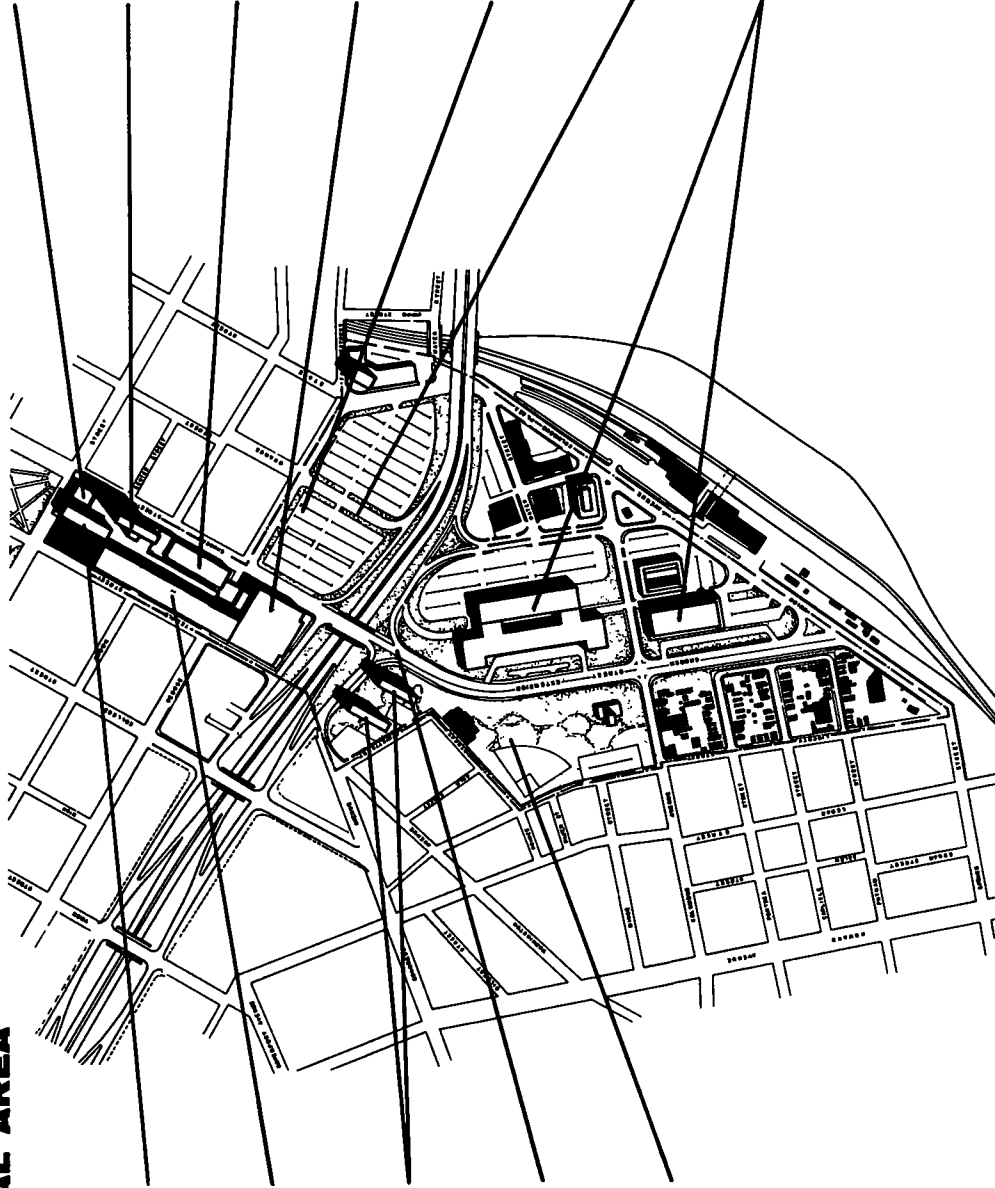
Everyone wants more parks and open space, but how do we set standards appropriate both to desires and pocketbooks?

If a systematic investigation of residential densities reveals relationships with transportation facilities, schools, parks, etc., can these relationships be used to set meaningful density standards? Can we measure the social utility of these standards against their costs?

The entire field of standards measured in human terms — of human values used to evaluate projects — puts a new idea out in front — engineering with human values in mind. While there are standards of pounds-per-square-inch or tensile strength, or b. o. d. counts, or many other frequently used measurements of performance, there are few or no evaluations which are pointed solely towards satisfying personal values.

For example, people certainly value trees or parks or historical buildings (simply try to remove them to increase traffic flow or parking). There are many such important and difficult dimensions of personal preferences which cannot be given market value yet which bear quite heavily on the success or failure of any particular change in the

CHURCH STREET REDEVELOPMENT AND RENEWAL AREA



NEW FIRST NEW HAVEN NATIONAL BANK BUILDING—8 stories, 130,000 square feet. Completion July 1960

SHOPPERS' GARAGE—Indoor ramp parking for 1,500 cars. Direct access to retail shopping and conveniently located for all downtown New Haven.

APARTMENT DEVELOPMENT—High-rise apartments to be built by private capital on 3-acre site between Church Street Extension and Congress Avenue

CHURCH STREET—Widened 20 feet from George to Chapel and extended from George Street to the Railroad Station

SCHOOL/RECREATION FACILITY FOR THE HILL—8-acre site allocated for new school and recreational facilities in the area of Prince Street School.

TERRACE RESTAURANT—Near Church and Chapel Streets overlooking the Green. Capacity 250

HOTEL—18 stories, 4 office floors, 300 rooms. Banquet facilities for 1,000. Completion May 1962

RETAIL SHOPPING AREA—Modern stores ideally situated to revitalize New Haven's central business district

DEPARTMENT STORE—240,000 square feet of selling space on three floors to attract thousands of shoppers from all over south central Connecticut

TEMPORARY BUSINESS RELOCATION STRUCTURES—Attractive project to provide premises for firms waiting for stores in the retail shopping area. Completion February 1959

CONNECTOR PARKING LOTS—1,500 parking spaces in area bounded by Church Street Extension, George Street, State Street and Oak Street, Connecticut

COMMERCIAL PARK—19 acres to be developed for office, wholesale or research uses

Discourages overcrowded highway and long drive to downtown

physical environment. If these can be ordered and known and given dimension, then certain criteria can be established which will be useful in appraising the public value of policies. Human values, as well as economic or other "objective" measures, can be weighed in the decision making process. With such criteria, designs for new systems of transport or new living arrangements can be created to conform more closely to the values of occupants of our urban communities than to the preferences of the designers.

CONCLUSION

The deep interplay of human values in the ongoing adaptation of people to the urban community and to its transportation system is subject matter too little explored in the past, yet ripe for research today.

There was no consensus that one point would be the best place to start. It seemed quite clear that the curiosity of the researcher would provide the best clue to the identification of rewarding research. In time, such a broad field might be subdivided and graded with research priorities. At present, far too little is known, and yet the subject matter is of overwhelming importance.

For these reasons, a sampling of the type of questions being asked by researchers as well as by policy oriented officials has been given. The further understanding of human values is considered by all participants to be crucial to clearer understanding of the nature of usage and demands for transportation in urban regions.

It is strongly urged that research be pushed ahead of these dimensions. It is a sad state of affairs that large companies producing consumer goods spend millions of dollars examining the preferences and values of the consumer, whereas the provision of urban transport — being quite frequently provided by a tax supported agency or a heavily regulated utility — spends little or nothing on systematic investigation of this kind.

Appendix

RESEARCH SUGGESTIONS MADE BY MEMBERS OF PANEL 2

Some of these are put in "hard" terms of proposals to which researchers are (or were) attached. Others involve some listing of problems and subject areas where research is needed. Both should be helpful as a sampling of what people wish to do or have done in the area of urban transportation and personal desires.

HUMAN VALUES RELATED TO URBAN TRANSPORTATION

I. NAME OF PROJECT

Census Characteristics of Urban Recreation Travelers.

II. PROBLEM STATEMENT

City parks, semi-urban recreation areas (county parks and nearby state parks), parkways, historical sites and structures, resorts, amusement areas, and so on, are used by thousands of city dwellers, both of local origin and from out-of-town. For current management purposes, patterns of use (daily, weekly, seasonally, etc.), are either known or are obtainable from existing or easily created data.

But, for intelligent planning of both future locations and characteristics of recreation facilities and roadway access thereto, (as well as roadway schemes which may inhibit or enhance enjoyment and use thereof), it is appropriate to know who are the recreationers, where they

come from, how they got there (routes and modes of conveyance employed). Knowledge about these characteristics needs to be obtained in such a form that predictions can be made. These predictions are most difficult in the face of the accelerating geographic, social, and occupational mobility of the population. This acceleration occurs not only because of endogenous factors within the institutional structure of society, but also because of exogenous civic programs, such as urban redevelopment.

By anchoring information on recreational traveler characteristics to census data, a firm link can be established to series of statistics which are regularly up-dated. Then, on the basis of known changes in the geographic, economic, and social structure of urban populations, intelligent forecasts can be made concerning travel characteristics.

III. RESEARCH PROPOSAL

A series of statistical investigations should be undertaken in a selection of metropolitan areas. Statistical samples of recreation travelers should be collected. These samples would relate recreation facilities and services used and modes of travel employed to regularly available census characteristics of the population.

IV. COMMENT

A not unimportant product of such investigations would be the delineation of those sectors of the population who are not users of various recreation facilities and the roadway accesses thereto. One can imagine there arising from such results a host of corollary inferences by placing the findings in juxtaposition to administrative policy, the incidence of various social problems, and so on.

Submitted by:
Raymond L. Freeman
Advance Planning Officer
U.S. Department of the Interior

My general views are as follows:

1. I am still impressed with the similarity of research areas and objectives (in the field of social or human values) as regards urban transportation and other urban problems such as we are encountering in the sanitary or environmental engineering field. Certainly such subjects as density of residential development, value of open spaces and industrial zoning are good examples of these relationships.
2. A substantial share of research in this field must be done in the community itself, rather than in laboratories or offices. Such studies are difficult and expensive.
3. Community-based surveys and studies related to one type of urban problem might be useful in other problem areas.
4. Cooperative studies might have potential. We are financing some research (through our research grants program) on urban problems, and propose to emphasize this area of study.

Submitted by:
Wesley E. Gilbertson, Chief
Division of Environmental
Engineering and Food Protection

You asked also for a proposed research project. I had some ideas -- some of which are set forth or implied in your material. Here they are:

1. What value factors, including those relating to transportation, are the most important for various economic, social, and other groups in determining place of residence within a metropolitan area?
2. What are the major reasons why people in different economic, social, and other groups use (a) buses, (b) passenger cars, (c) trains, (d) home-to-work transportation?
3. What changes in service or conditions have caused or would cause individuals in these groups to change their choice of transportation method? The same investigation could be applied to trips with other purposes than home-to-work and it would be desirable that such studies also be made (in both #2 and #3).
4. How important is (a) the required time for the home-to-work trip, (b) the ready availability of public transportation, (c) the adequacy of such public transportation service, (d) the convenience and attractive features of passenger car transportation as to the change of residence location -- or of continuing in an established residence location?
5. What densities of activities, and consequently of population, do people prefer in various areas of the city -- especially downtown and in residential areas?
6. Can variations in preference be related to group characteristics, such as age, family status, economic level, social grouping?
7. What ceilings exist for various age, economic, social, and other groups of persons as to maximum time they will devote to a one-way trip between home and work?
8. What knowledge, attitudes and reactions do high-ranking university graduate students have as to the urban development problem, including transportation -- its magnitude, importance, urgency of progress, challenges as a lifework? What appeals to such leading students will be most effective in interesting them in specializing in the field of urban research, including transportation.

Submitted by Burton W. Marsh
Director, Traffic Engineering
and Safety Department
American Automobile Association

Proposed Urban Transportation Research Project
on
MAJOR HUMAN FACTORS GOVERNING CHOICES AS TO MODES OF
URBAN TRANSPORTATION

Problem Statement

More complete and more accurate understanding is needed of the major human factors which cause people of different economic, social, and other groupings to use the various major modes of transportation in making the home-to-work trip, and if the person doesn't work downtown, in making trips from home to downtown. Valuable also would be better information on what changes in service or in conditions have caused or would cause people to shift from one mode of transportation to another. Clearly, urban transportation planning could be on a much more effective basis if such better information were available.

Research Proposal

Proposed is a carefully planned sampling personal interview study. The interview form would be in three parts: Part I would provide information as to the person's economic and social grouping, his residence location and its relationship to the central business district, public transportation, freeways, etc., the kind of residential district, the person's family status, age, business or profession, location of work-place, and other needed background information.

Part 2 would provide information as to what the person did (say on the preceding work-day) as to mode (or modes) of transportation used, length of time required, approximate number of stops en route and reasons, proportion of trip made while standing, customary frequency of such trips, how close to destination did the transportation used take him -- and how the remainder of the trip was made, etc.

Part 3 would provide information on the persons reasons, desires, values, etc. -- and as to this, the social scientists would have to determine how to obtain the most accurate and reliable information.

There would be special value in obtaining information from persons who have recently changed their mode of transportation, because they would generally have in mind some rather definite reasons why they made the change. Therefore, this information should be sought in the inquiry. Similarly, in an area where new transportation facilities have been provided or there has been a major change in transportation facilities, it would be very helpful to identify what the effects of such new or altered facilities had on the actions and preferences of people. Therefore, it would seem desirable to include an item covering this subject in the inquiry. One example of a change in transportation, which would presumably have appreciable value, would be the elimination of the requirement for transferring.

Submitted by:
Burton W. Marsh, Director
Traffic Engineering & Safety Dept.

PROPOSED RESEARCH PROJECT

- I NAME OF PROJECT: An Evaluation of Highway Benefit-Cost Techniques
- II PROBLEM STATEMENT: Some of the major problems encountered in highway benefit-cost analyses concern the selection of alternatives and the treatment of uncertainty and intangibles. In the case of intangibles, for example, these problems may in some cases be of greater significance than problems of determining measurable benefits and costs.
- III RESEARCH PROPOSAL: The research would deal principally with questions concerning benefit-cost criterion, the selection of alternatives, the evaluation of intangibles, accounting for uncertainties, facility life and interest rates, and the ranking of alternatives. Consideration would also be given to optimizing the amount of engineering which goes into project evaluation.
- V CONTRIBUTOR: Richard M. Soberman

PROPOSED RESEARCH PROJECT

- I NAME OF PROJECT: The Pricing of Transportation
- II PROBLEM STATEMENT Current public policy on transportation pricing, rate regulation, and taxation fails to allocate resources for transportation in an efficient manner, due to the failure of these techniques to accurately reflect the true costs involved in the production of transportation. As a first step in formulating public policy on transportation, therefore, cost functions for various modes of transportation should be determined.
- III RESEARCH PROPOSAL: The research would involve determination of cost functions for highway, rail transit, railroad, and air transportation through the collection of accounting data and the investigation of technological characteristics of these modes. Special emphasis would be placed on 1) distinguishing between average and marginal costs, 2) indicating the fixed and variable components of the cost functions, and 3) attempting to evaluate the social costs which are involved.
- IV ESTIMATE OF COST REQUIREMENTS: One years salary for one man in addition to travel costs (data procurement) and possible data processing costs.
- V CONTRIBUTER: Richard M. Soberman

CURRENT RESEARCH PROJECT

- I NAME OF PROJECT: Technology and Costs of Rail Transit Systems
- II PROBLEM STATEMENT: A study of the characteristics of rail transit systems in terms of their technological and economic capabilities with primary emphasis on the relationship between capacity, service quality, and cost.
- III RESEARCH: Information and cost data for existing and proposed rail transit systems has been gathered from the files of operating transit authorities and consulting firms in the U.S. and Canada. On the basis of these data technological capabilities have been evaluated and cost models have been developed.
- IV TIME REQUIREMENTS: The study was initiated in June 1960 and is now near completion.
- V RESEARCHERS: Under the sponsorship of the Joint Center for Urban of MIT and Harvard the research is being conducted by A. Scheffer Lang and Richard M. Soberman.

I. TITLE:

An intensive study of individual decisions about transportation and locational choices.

II. PROBLEM STATEMENT:

Current metropolitan area transportation research is concerned with two problems: the prediction of travel patterns, assuming a given spatial distribution of human activities, and the prediction of a spatial distribution, given a transportation network and the travel patterns resulting from the loadings on that network. In all efforts to date at the resolution of these questions, it has been necessary to make assumptions about individual behavior, and to attempt prediction on the basis of a very small number of behavior-affecting variable. For example, diversion curves have explicitly included only travel times and costs, whereas a great many other attributes of the alternative systems, such as amenities of one sort or another, may well be more significant factors for a critical percentage of individuals (even 30% affected strongly by some other variable would be significant).

What is needed is to understand the ways in which individuals themselves, in terms of their particular circumstances and attitudes, view the choice situations in which they make their locational and travel decisions. It is hypothesized that the unique particulars of these situations overshadow the less-personal characteristics of the problem in influencing the choices of significant numbers of individuals. (For instance, residential location may be influenced by cost, schools, status, accessibility in general, etc., but perhaps the determining factor is such a random, unpredictable element as the nearness of a particular friend or relation, or some peculiar characteristics of a specific house.)

III. RESEARCH PROPOSAL:

It is proposed that a series of intensive case studies of families and other groups of individuals be undertaken, to explore the actually significant elements of decision-situations concerning location and travel. These case studies should be useful in determining those parameters which describe a transportation system in terms most relevant to the system's impact on choices. An attempt would be made to develop simple stochastic choice models, in terms of these parameters, which would have some validity for the prediction of aggregate reactions to system changes. However, the primary emphasis of the project would be upon developing the intensive case studies as a source of information for model building efforts at a later date.

IV. ESTIMATE OF PROJECT COST AND TIME REQUIREMENTS:

Information not yet available.

V. NAME OF INDIVIDUAL OR AGENCY UNDERTAKING PROJECT:

This project has been suggested by Marvin L. Manheim of the Joint Center for Urban Studies of Harvard University and the Massachusetts Institute of Technology, 11 November 1961. This project may be undertaken as part of thesis research by him, or as a project of the Joint Center.

I. TITLE:

An analytical investigation of the influence of transportation systems on regional growth.

II. PROBLEM STATEMENT:

The construction of models of urban growth are necessary for the evaluation of alternative transportation systems. Such models are currently being constructed under the auspices of several different research efforts. However, these efforts are focused on the substantive problems of building growth models which are as realistic as possible. Not enough attention is being devoted to the issue of whether the influence of transportation on urban growth is significant enough to warrant such efforts. To explore this, it is necessary to clarify two interrelated questions: what assumptions must be made about the importance of transportation in the decision-making of individuals, in order that transportation systems have significant influence on urban growth; how different can transportation systems be and still have approximately the same impact on the evolution of the urban area?

III. RESEARCH PROPOSAL:

It is proposed to study these questions by constructing a very simple model (computer-based or pencil-and-paper) for the simulation of urban growth. The importance of transportation in the making of individual locational and travel decisions would be explicitly varied in this model. The growth model might be no more than a dynamically-oriented gravity model, in which the transportation-importance variable is simply the exponent of the distance-friction function. Experimentation would consist of varying the variables describing the relative importance of transportation, and running the model to yield corresponding patterns of urban development. Additional experimentation would consider the impacts of alternative broad patterns of transportation system development (both spatial and temporal), to determine, also in a preliminary fashion, the significance of distinctions among proposals. This research would not produce definitive evaluations of the role of growth models, but would certainly suggest specific experiments to be performed as more realistic empirically-based models become operational.

IV. ESTIMATE OF PROJECT COST AND TIME REQUIREMENTS.

Information not yet available.

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I. TITLE:

Analysis of the pattern characteristics of real transportation networks.

II. PROBLEM STATEMENT:

Each element of a transportation system has the same abstract characteristics: whether a street, an intersection, or an expressway, each element can be described by its particular volume-delay characteristic (a curve showing the way in which average delay per vehicle increases with increasing volume). Alternative schemes for improvement of existing systems can be evaluated, in principle, by testing in the framework of an urban growth model. However, for a long time to come such testing will be complicated, time-consuming, and expensive, so that the number of alternative new systems which can be tested is limited. In particular, the effects of small-scale improvements, such as changing the volume-delay characteristics of one or two intersections, will be difficult to evaluate even with the growth models under development. The purpose of this project is to identify some of the significant characteristics of transportation systems by investigating how they function under their loadings, with particular attention to the hypothesis that small local events have impact throughout the system.

III. RESEARCH PROPOSAL:

The method of analysis would assume as given a traffic generation and assignment model. However, only models which incorporate capacity restraints and especially, a variety of facility characteristics, could be used. Such models exist, notably the KCS-Toronto and CATS models.

The analysis would be performed on a real transportation system, such as that of Toronto, and at least, for the first experiment, the existing pattern of origins and destinations would be assumed constant.

The first experiment would consist of specifying one single facility in the network (a street or intersection), and allowing the volume-delay characteristic (function) of that facility to vary over a wide range of different service levels. For each value, the assignment program would be used to determine the loadings on all links of the network. After the conclusion of the series of assignments, the link loadings for the several different assumptions would be compared (for all links in the network), and a boundary drawn on a system map, such that all links outside the boundary were not affected by any of the changes in the subject facility, while all links within had had changes in their loadings. The results of this experiment, would be analyzed to determine what characteristics of the network give rise to the peculiarities of these limit-of-perturbation boundaries. It is hoped that useful insights will be gained about the significance of different patterns in the arrangement of low-capacity facilities.

Additional experiments, if the results of the first group are successful, would be similar, except that the basic patterns of origins and destinations would be altered and the perturbation-boundaries compared for different O-D patterns. The results of the experiments would not be analytical formulae, but kinds of statements which would have intuitive meaning -- statements about "patterns" of "chokes," e.g., an important part of the experiment would be the determination if such elaborate analyses give any better answers than more informal approaches.

IV. ESTIMATE OF PROJECT COST AND TIME REQUIREMENTS

Information not yet available.

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PROPOSED RESEARCH PROJECT

I NAME OF PROJECT Commuting—Socio-Economic Analysis

II PROBLEM STATEMENT

A. Problem

Apart from the results of sporadic secondary investigations based upon origin-and-destination data collected in surveys sponsored by the Bureau of Public Roads, very little is known about the working population in the context of the journey to work in the United States. Estimates of the numbers of workers leaving one county to work in another have been prepared over a period of years in most of the larger communities by employment security offices in the various States. These estimates are based, however, only upon "covered" employment and no social and economic characteristics are available from these sources. The relationship between the number of workers insured under employment security programs and persons at work at the time of such surveys is varied and, in terms of small areas such as counties and cities, is not particularly well understood.

B. Hypothesis

Students of the human community working with available data have set forth in tentative terms several generalizations concerning the flows of workers among the components of metropolitan communities. Social and economic differentials in flows from communities in the metropolitan rings to central cities, from central cities to rings, and among components of rings have been commented upon by Hawley, B. Duncan, and Schnore, among others. A series of hypotheses may be derived, therefore, from earlier studies, of which the following statements are examples:

1. Inward and outward flows of workers between central and noncentral parts of metropolitan communities will be sharply differentiated as to socioeconomic level and family settings, although these differences will vary depending upon the size and character of the community.
2. Worker flows among components of the ring of a metropolitan community will display characteristics more like those from central city to ring than those traveling from ring to central city.
3. The greater the distance of residence of the worker from workplaces, of those who work in the central city of the community, the higher the socioeconomic level.
4. The socioeconomic level of those who work in central cities, for workers residing in the rings, is higher than that of their non-central-city-workplace counterparts.
5. Among families residing in the rings of communities, those with children are more likely to have family heads employed in the central city than those without children.

III. RESEARCH PROPOSAL

The assembly and review of literature concerning both volume and characteristics of commuters constitute the groundwork for this study. This work should be followed by (1) assembly of economic and geographic characteristics of standard metropolitan statistical areas (SMSA's) and their city and county components; (2) the analysis of the flows among the components of SMSA's from published 1960 Census data; (3) the analysis of the social and economic characteristics of the population of each SMSA as these relate to commuting flow summaries, again being available from published census sources; and (4) the final analysis, based upon the findings from steps (1) through (3), is a detailed analysis of socioeconomic differentials by type of commuting, type of residence, and location and structure of the metropolitan community. This last part may be prepared by means of special computer tabulations of census summary records.

IV. ESTIMATE OF PROJECT COST AND TIME REQUIREMENTS

This proposal may be broken into two parts: (1) the analysis of published census data on flows and characteristics, and (2) the analysis of unpublished census data via computer tabulation of census summary records.

The first part, which should include an intensive review of related literature, is roughly estimated to take one and one-half years and about \$20,000. The second part, the detailed design of which must await the results of the analysis of the published data, should prove to be expensive insofar as computer programing and tabulating are entailed. While the work on this part may take an additional one and one-half years, the cost of this analysis is roughly estimated at \$70,000.

V. NAME OF INDIVIDUAL OR AGENCY UNDERTAKING PROJECT

Gordon F. Sutton
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Washington 20, D. C.

PROPOSED RESEARCH PROJECT

I NAME OF PROJECT

FAMILY AND INDIVIDUAL CIRCULATION PATTERNS IN DIFFERENT
SIZED METROPOLITAN AREAS

II PROBLEM STATEMENT

How do travel patterns and mode of travel of different family members vary by the circulation patterns of other members of the family of all ages, at different family life cycle stages, for central city and suburban residents in small, medium, and large metropolitan areas?

III RESEARCH PROPOSAL

In modern urban society much of the activity of all members of the family occurs outside of the home. Consequently, there is a great deal of daily travel by various members of the family to participate in a wide variety of events. This proposal attempts to get at the demands that are placed on different modes of travel resulting from the movement of all members of the family, and how the travel consumption patterns of dependents influence the travel modes and patterns of the adult family members. The converse is also of equal interest.

Specifically, attention will be focused on such questions as: How do circulation patterns vary by stages in the family life cycle, family composition, and by place of residence in the metropolitan area? How do these circulation patterns vary by size of metropolitan area, growth trends, and for different social and economic groups in the population? What are the modes of travel used, the distances different family members travel, and the time spent in travel as well as the cost, in order to get to work, to school, to church, to shopping, to downtown, to central city or other voluntary formal organizations, or to participate in informal activities such as visiting friends or relatives. How are the travel patterns for one type of activity related to the travel patterns for other activities and how are the separate travel patterns related to the separate and overall movement of all members of the family? How do multiple workers in a family alter the whole circulation pattern of the family members? How does access to and use of public transportation and car ownership affect the movement of people? How do circulation patterns vary by the residential movements within the metropolitan area? and how do the circulation patterns of different family

III Research Proposal, continued:

members in the suburbs differ for residents moving out from the central city and those native to the suburbs, or for central city residents moving in from the suburban areas, as compared to those who have lived only in the city? Do migrant families differ in their travel patterns? How do distances to different activities influence the level of participation in community activities of central city and suburban residents? How do modes of travel used influence participation? How does participation in the community vary by time spent in travel to work and to other functions?

This research proposal could be carried out from data collected in six different metropolitan areas in three different population size classes. In this survey an equal number of interviews were obtained from a random sample of residents in the central city and suburban areas in each metropolitan area. The analysis would be based on 3,000 families.

IV ESTIMATE OF PROJECT COST AND TIME REQUIREMENTS

This study could be completed in approximately one year at a cost of \$15,000.00. The analysis would be done on an electronic computer.

V NAME OF INDIVIDUAL OR AGENCY UNDERTAKING PROJECT

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Submitted by:
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