

A Key to Change

Urban Transportation Research

Introduction

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In September 1961 a distinguished group of some sixty men met at the National Academy of Sciences to consider the complex transportation problems of our rapidly growing urban areas. The subject was:

How can research be employed to aid in their solution?

Included were top authorities from many fields — scientists, engineers, planners, public officials, industrialists, to mention only a few.

Quickly, they divided into five panels. Under the direction of Henry Fagan, J. Douglas Carroll, Jr., Donald C. Wagner, Morton J. Schussheim, and Paul Oppermann they debated the major issues of research into land use, personal desires, economic impacts, public programs and urban government as affected by and as affecting transportation.

At a second general session, they reported back their findings, listened to the criticisms of their colleagues who had been in other sessions, and left to their competent staff men the task of rounding out preliminary reports based on the discussions.

In January 1962 the same group met again, this time as part of the annual sessions of the Highway Research Board; heard the preliminary reports which by this time had been submitted back to the several panels; and again went through an open discussion.

SIGNIFICANT BEGINNINGS

Out of this process have come the five panel reports which constitute this document, the significant beginnings of an organized effort to focus public attention on the vital need for research in the urban transportation area and to secure funds to carry the work forward.

In the consideration which members of the steering committee of the conference, themselves authorities in the field, gave to these reports, it was unanimously decided that they should be presented just as they were approved by the members of the several panels.

In doing so, it was recognized that there is overlapping at times and in places. Also, although the initial purpose was to present a definitive set of urban research projects to complement HRB Special Report 55, on priority research areas, the wide variance in the fields did not make this goal fully attainable at this time. Thus, this is an interim report.

Therefore, the flavor of the several personalities has been retained and their fields of study are presented from widely differing points of view. Personal desires in urban transportation, for example, do not now lend themselves to the same degree of precise measurement that can be found in questions of land use. The field of economic impact of transportation is far apart from the study of government or of public programs—yet the interactions cannot well be separated.

Men who know this, tell you the story here without editorial restraint.

In result, there is found in these several reports a brilliant analysis of the problems involved, a statement of many projects of deep concern to foundations, industry, universities and public agencies; and the first step toward a coordinated approach to their solution in the public interest.

CHANGE AND PEOPLE — THE THESES

Throughout the sessions, the one predominant and vital note was found in the words of a Greek philosopher, Heracleitus, who said two thousand years ago that "nothing is permanent save change."

Nowhere, perhaps, is this truth more evident than in the structure of the cities of the world over the passing centuries.

Nowhere has change been more intensified than in the field of transportation as modern technology has suddenly made time, not distance, the measure of movement.

If we add to these truths the cogent words of Wilfred Owen that: "The basic fact of urban life is that cities are for people. The test of everything we do in metropolitan areas is how we want to live. We must aim at making metropolitan areas fit for human beings"¹ — then we have a summation of the high purpose which brought these men together.

Today, our population centers have burst through the restraining chains of horse and buggy days and all over the free world, people are moving now with a freedom and range that has brought with it new requirements in many and diverse fields.

CHANGE IN POPULATION

With technological change has come also a population explosion. Between 1950 and 1960 the 48 contiguous States and the District of Columbia experienced the greatest numerical population growth in their history, and the greatest percentage increase since the decennial census of 1910. This is an absolute growth equaling the total growth in population up to the year 1855 in the United States.

Recent population projections by the Bureau of the Census² which are based on varying assumptions of population fertility rates, indicate that the total population of the 48 contiguous States and the District of Columbia will reach at least 231 million and possibly 273 million by 1980.

CHANGE FROM CENTRAL CITY TO SUBURBS

However, the sweeping changes in population distribution that have taken place are far more significant for our purposes than is the change in total population. At the time of the 1950 census, under the new definition of urban territory, 64 percent — or two out of every three Americans — were living in urban areas. Now it is 70 percent — three out of four — and still climbing. The returns of the 1960 Census of Population show that 23.6 million of the population increase of 28 million took place in 212 metropolitan areas, and that of this 18 million of the metropolitan-area increase occurred outside of the central cities.

In the 168 urban areas recognized by the Census Bureau as metropolitan areas in 1950, the growth in the suburbs between 1940 and 1950 was 9 million inhabitants. Between 1950 and 1960 both actual and relative growth in the central cities of these urban areas slackened. Growth in the suburban fringe in 212 areas now officially recognized was 18 million, representing a 99 percent increase, or five times the rate of growth of the central cities and seven times that of territory outside of metropolitan areas. Moreover, 4.9 million of the 5.6 million growth of the central cities was due to annexation of suburban territories.³

The present growth in suburban areas made possible by the ever-increasing extent of automobile ownership has dominated recent population movements, and there is no

¹Owens, Wilfred, "Cities in the Motor Age." Viking Press, New York (1959).

²Statistical Abstracts of the United States, 1961, Table 3, p. 6.

³United States Summary, 1960 Census of Population Tables P and R, page xxvi (Introduction)

apparent indication of either a reversal or decrease in this trend. It has been brought out by Cherniack⁴ that automobile ownership increases in approximately an inverse relationship with decreases in population density. Thus, if the rate of increase of suburban population continues in future years according to the trend followed in recent years, with a continuing decline in central-city population, the total motor vehicle population is likely to continue to increase at a more rapid rate than the human population. This prediction is based on the assumption that there are no economic, technological, or sociological brakes applied to this trend in automobile ownership.⁵

CHANGE THROUGH MIGRATION

An important aspect of the expected population change arises from redistribution through migration.⁶ This migration is taking place not only from the rural areas to the urbanized areas, but also from some parts of the United States to others. This analysis of the changes that occurred between 1950 and 1960 indicated that the total population increase in New England was just about equal to the net natural increase of births over deaths, indicating no net migration into or out of the area. Slight increases over the net natural increase were indicated for the Middle Atlantic, East North Central, South Atlantic, and Mountain Census Divisions. A net increase over the natural increase of 3.6 million inhabitants was shown for the Pacific Division. Decreases were recorded by the West North Central, the East South Central, and the West South Central areas; in other words, increases in population in those areas were less than the natural increases.⁷

CHANGE IN MOTOR VEHICLE REGISTRATIONS AND VEHICLES IN USE

If, too, we glance at the statistics of transportation movement, the changes that are reflected there are almost beyond belief.

In 1920 there were 9,239,161 motor vehicles in the United States.⁸

In 1960 the Bureau of Public Roads reported (Table MV-1, 1960) that in 48 contiguous States and the District of Columbia there were 61,425,000 automobiles, 11,893,000 trucks, 271,000 buses or a total of 73,590,000 motor vehicles registered.

The 1960 Census of Housing reported a total of 52,814,000 housing units in the same area. Breaking these figures down, Census reported that 30,068,000 of these units had one car available. In addition 10,034,000 had two; and 1,335,000 had three or more. Thus, nearly 11,375,000 or more than one-fifth of all households, reported having more than one vehicle available.⁹ By coincidence 11,400,000 housing units had had none.

Deducting most company-owned and publicly-owned vehicles from the total car registration, the Bureau of Public Roads found that there were 54,100,000 motor vehicles available for households or 1,300,000 more cars than households.

Since virtually half of these vehicle movements is found within urbanized areas, the highway problems which are imposed by them are of serious moment. Coincidentally, the growing use of motor trucks particularly for collection and delivery services reinforces the need for adequate urban highways.

CHANGE IN INCOME AND AUTOMOBILE OWNERSHIP

Rising real income in the United States has served in several ways to increase the density of automobile ownership. As income of families has increased, they have sought

⁴Cherniack, Nathan, "Critique of Home Interview Type O & D Surveys in Urban Areas." HRB Bull. 253, pp. 177-188 (1960).

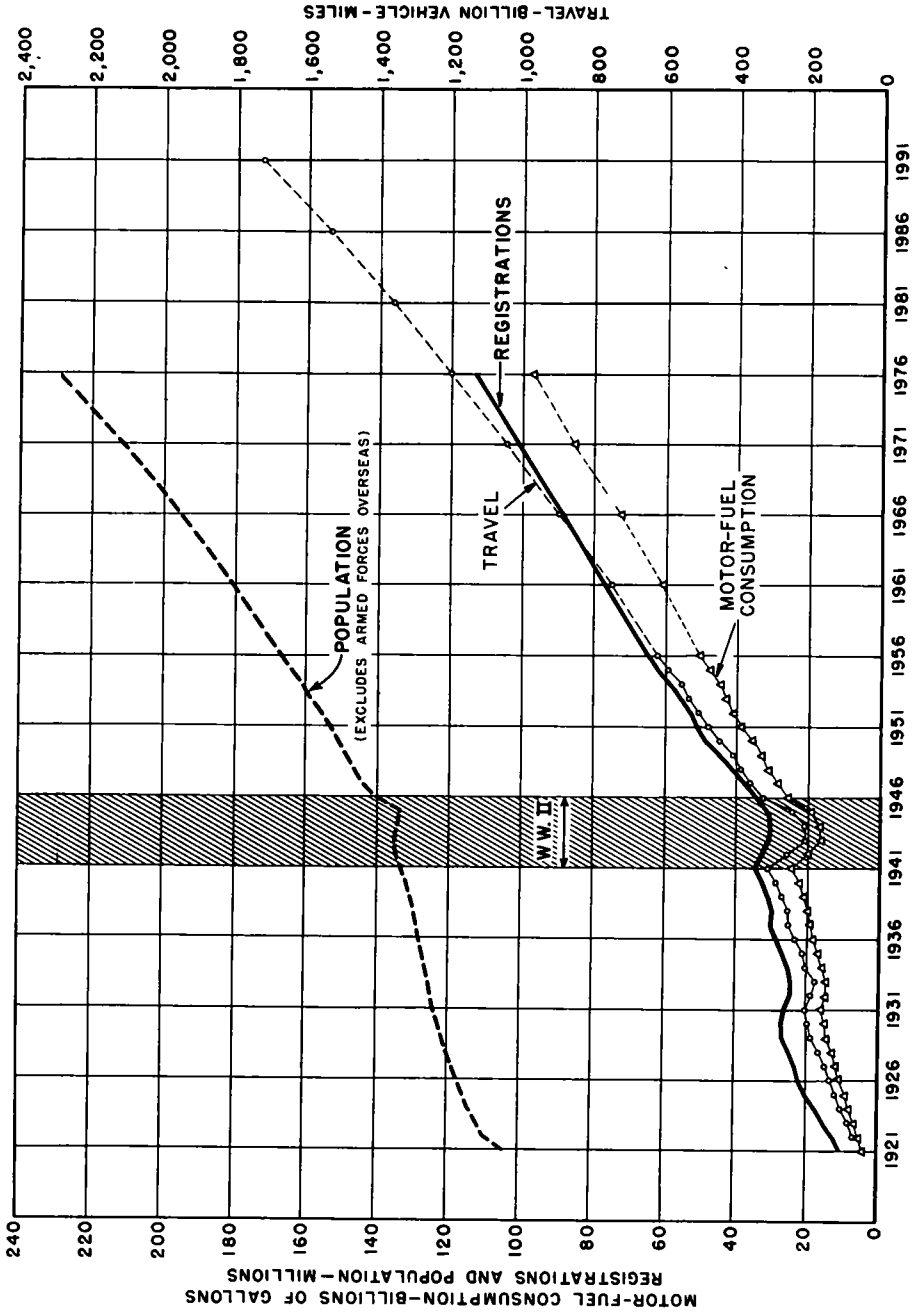
⁵Steele, C.A., "Characteristics of Motor Vehicle Ownership and Use." HRB Proc. 40: 95-110 (1961).

⁶Kanwit, E.L., and Todd, T.R., "Recent Population Trends and Their Highway Implications." HRB Proc. 49: 1-33 (1961).

⁷Ibid., p. 3.

⁸"Highway Statistics Summary to 1955." Bureau of Public Roads, p. 28 (1957).

⁹Calculated by Bureau of Public Roads from HC (A3) preprints, Census of Housing, U.S. Bureau of Census (1960).



Estimates of population, motor vehicle registrations, travel, and motor fuel consumption for selected years.

the space and privacy of the suburbs where the population increase during the past decade has been concentrated. It is in the suburbs where dependence on the automobile is greatest: for the trip to work, for shopping, recreation, school and church. Multiple automobile ownership in our time has become commonplace, particularly in the suburbs.

In the past 10 years real income per family has been growing more than 3 percent per year, and exceeded \$5,600 in 1960.¹⁰ A minimal rise of 50 percent over the next 20 years in keeping with this trend seems certain to bring about a vast increase in multiple-car families. On a basis of projections prepared by the States for the Bureau of Public Roads, qualified observers calculate that total motor vehicle registration will reach from 115 to 120 million by 1980.¹¹ The resulting concentration in metropolitan areas should serve as stern warning that any delay in urban highway construction would be disastrous.

CHANGE IN PATTERNS OF TRAVEL

Increasing car ownership and decreasing residential densities which are direct reflections of higher incomes and rising standards of living, have fostered increased travel, particularly for other than work purposes. The total vehicle-miles of travel in the United States has increased some 200 percent since the end of World War II.¹² Of the 720 billion vehicle-miles of travel in the United States in 1960, nearly 50 percent occurred within our rapidly expanding urban areas.¹³ Today, in the larger urban areas, the average resident makes about 2 trips per day by all modes of travel, while those in smaller areas make about 2½ trips per day by all modes. In all cities, the average resident travels about 10 miles each day in all pursuits.¹⁴

Although the volume of urban travel has been increasing rapidly, the most significant factor is the change in travel patterns which has accompanied this increase. The changes in travel patterns have closely paralleled the urban area structural change. There has been a relative decrease, and sometimes even an absolute decrease in the number of trips to the central business districts, while crosstown travel has risen rapidly. This trend appears in smaller cities as well as larger ones. The central business district is no longer the only prime attractor for urban area travel. Working, shopping and recreational opportunities have become dispersed throughout the urban area. In many of our larger cities less than 15 percent of the travel involves the central business districts.¹⁵

These changes have, in turn, greatly affected the mode of travel by the tripmakers.

CHANGE IN MODES OF TRAVEL

Since the end of World War II automobile usage has been increasing while transit usage has been decreasing, to the point that today, in all but a very few of the largest cities, over 85 percent of the urban tripmakers travel by automobile.¹⁶

Since the end of World War II total transit patronage per capita has decreased by some 66 percent although total tripmaking by each person has increased significantly. Nationwide, total transit revenue passengers has declined nearly 35 percent since 1950, while rapid transit patronage declined 11 percent during the same period.¹⁷ However, it is important to point out that transit patronage to the central business districts during

¹⁰"Consumer Income." Current Population Reports, U.S. Bureau of Census, Table C, p. 4 (1962).

¹¹Also see "Future Highways and Urban Growth." Wilbur Smith and Associates, p. 187 (1961).

¹²"Statistical Abstract of the United States." Table 755, p. 557 (1961).

¹³"Highway Statistics." Table VM-1, U.S. Bureau of Public Roads (1960).

¹⁴"Future Highways and Urban Growth." Wilbur Smith and Associates. Chapter III. (Special report for Automobile Manufacturers Association, 1961. Most of this information originally came from O-D studies).

¹⁵Ibid.

¹⁶Ibid.

¹⁷"Monthly Transit Traffic." American Transit Association.

the peak hour still remains relatively high and consequently plays a significant role in satisfying total urban travel demands. In our larger urban areas, from 40 to 90 percent of the peak hour travel to the central business districts continues to be made by public mass transportation.¹⁸

CHANGE IN ECONOMIC AND SOCIAL ACTIVITIES

The most immediate and obvious results of modern highway improvements are the greatly increased speed and ease with which travelers can get around in metropolitan areas. The total impact of new roads goes far beyond such traffic or highway user benefits, however.

Modern highways have a profound influence on urban and rural life, especially with regard to changes in land values, reorganization of land uses and the effect this has on investment and output, and changes in employment and labor supply.

Highways afford enlarged opportunities for mobility, fluidity, employment, recreation, and for services by public utilities and governmental units, and, in so doing, affect the entire pattern of urban life. Highways increase the accessibility of land and allow it to be used in its most productive and beneficial manner.

The spectacular growth of shopping centers, which emphasizes easy highway access and customer parking, has changed the whole complexion of retail selling in all parts of the nation. Highways often facilitate the fusion of capital, labor, land, and management — the basic factors of production — and thereby contribute to and in part determine the physical characteristics of our industrial expansion. Perhaps the outstanding characteristic of land use in the United States is the suburban development and it is to a large extent dependent on highway transportation facilities which allow the city worker to live in the country.¹⁹

SIGNIFICANT CHANGES WROUGHT

These, then, are some of the significant facts about the revolution in transportation which has been going on in the United States over the last half-century, but which only came into full flower after World War II.

Out of that revolution have come profound changes in our social and economic structures which have affected both the way of living and the ways of making a living of all of us. Out of it, too, have come large public questions many of which have their roots at the community level, be it large or small.

As these changes have taken place, increasingly they have brought changes in the role of the several Federal, State, county and city governments.

Initially, the highway program was a partnership (as it is today) between the Federal and States' governments. However, since the cities had their streets and street cars, the original law passed in 1916 limited the relation to the rural aspects of transportation.

As the use of the vehicle grew, it became apparent that balanced systems of communication would be needed to tie the rural and urban areas together and so the law was changed. Today, Federal funds are used in both areas and today the States, counties and cities are cooperating to work out their mutual problems.

COOPERATION AT THE FEDERAL LEVEL

Another symptom of the same problem, in 1947 the Congress created the Housing and Home Finance Agency to provide a single agency responsible for the housing programs of the Federal government and their functions in urban areas. In its beginnings, the relationship of this agency to the highway program was found largely in the work of the Urban Renewal Administration where questions of adequate highways cropped up as a part of the rehabilitation efforts.

More recently, the HHFA administration has created offices of program policy and transportation and it is to these groups that the administration has assigned the Federal part of the problem of urban mass transportation.

¹⁸Wilbur Smith and Associates, *op. cit.*, Chapter 4 generally and p. 147.

¹⁹House Document No. 72. Eighty-Seventh Congress, First Session.

Under Rex M. Whitton, Federal Highway Administrator, the U. S. Bureau of Public Roads has been cooperating closely with HHFA. It was out of this relationship that there came on March 28, a joint report to the President of the United States from the Secretary of Commerce, Luther H. Hodges, and the Administrator of the HHFA, Robert C. Weaver, stressing the urgency of the urban transportation problem and recommending action.

Finally, the Federal Council for Science and Technology has recently designated a Committee on Natural Resources with a whole string of special panels on water resources, economics, etc. This committee and its panels have been asked to determine the present nature and scope of Federal or Federally-aided research, to evaluate its quality and adequacy and to project an adequate 10-year Federal research program.

A transportation subcommittee of the panel on Civilian Technology under the general guidance of the President's Scientific Advisory Committee is also exploring avenues of support for research into transportation technology.

It is obvious that these efforts will be significant in connection with a Federal research program for the coming decade.

PRESIDENT URGES TRANSPORTATION POLICY

On April 5, 1962, the President sent to Congress a message dealing with the nation's transportation system²⁰ in which he emphasized the vital need for the development of a national transportation policy including the urban problem. He said: "The basic objective of our Nation's transportation system must be to assure the availability of the fast, safe, and economical transportation services needed in a growing and changing economy to move people and goods, without waste or discrimination, in response to private and public demands at the lowest cost consistent with health, convenience, national security and other broad public objectives. Investment or capacity should be neither substantially above nor substantially below these requirements — for chronic excess capacity involves misuse of resources, and lack of adequate capacity jeopardizes progress. The resources devoted to the provision of transportation services should be used in the most effective and efficient manner possible; and this, in turn, means that users of transport facilities should be provided with incentives to use whatever form of transportation which provides them with the service they desire, at the lowest total cost, both public and private."

Further on, he added: "Considerable research and analysis, going far beyond our present findings, will be required before we know enough about the costs and other characteristics of various forms of transportation to guarantee the achievement of these objectives in full."

Coming to grips with the urban transportation problem, the President cited facts already related in this report, and concluded that: "Our national welfare therefore requires the provision of good urban transportation with the properly balanced use of private vehicles and modern mass transport to help shape as well as serve urban growth."

Among his important recommendations were the grant of funds for aid to communities which stepped up to their own problems: a requirement for comprehensive planning on an area-wide basis and an increase in Federal funds available for research and planning. Bills have been introduced in Congress which would implement his total program.²¹

Inclusion of these actions in this report is solely for the purpose of underscoring the fact that the Administration has recognized both the need for a program and for funds for urban research.

If passed as introduced, pending bills will sharply increase research funds now available through the U. S. Bureau of Public Roads and the Housing and Home Finance Agency.

Other Federal agencies such as the Department of Health, Education and Welfare are pointing up research in their respective fields.

²⁰House Document 384.

²¹Mass Transportation: Multer HR 11158, William S. 3126; Federal Aid Highway Act of 1962: McNamara S. 3136, Buckley HR 11199.

OTHER ORGANIZATIONS IN THE FIELD

Many other organizations are expressing similar points of view.

The American Association of State Highway Officials, always interested in research, has recently set up a new revolving fund for that purpose.²²

A long list of universities are dealing with facets of the problem. Boston, Cornell, Denver, Harvard, Massachusetts Institute of Technology, Michigan and Michigan State, North Carolina, Pennsylvania, Princeton, Purdue, Texas A & M, California and Yale are examples. The Ford Foundation, Brookings Institution and Automobile Manufacturers Association are illustrative of many undertakings.

Some eighteen comprehensive regional studies, participated in by Federal, State, city and county units are under way in large metropolitan areas. Many individual cities are devoting increasing funds to urban transportation study.

From the point of view of the Committee on Urban Transportation Research of the Highway Research Board, all of these actions are evidence of the national interest in our changing cities. Each documents the need which exists for thorough-going research into all facets of urban life. Each will make its own contribution to the peculiar problems which face each community, and the people who live in them.

All of the issues which are posed by the five panels of our Conference are of immediate interest to all of the people of our country. By no means all-embrasive of the problem, all require action now.²³ In future meetings further programs can and should be added. As one major contribution to a coordinated approach, we expect to establish a clearinghouse which will digest all current material pertinent to urban transportation research.

NO STATIC SOLUTION POSSIBLE

Since change is the order of the Universe, no static solution can be had to any of these problems, yet there remains the necessity for comprehensive planning and research.

This is not to say that a plan can be shaped and put into the archives as the final word. Life goes on. We must live in the present. But we cannot today fully envision the needs of the future. So we must search and re-search, plan and re-plan, build and re-build knowing full well that tomorrow's discoveries may scrap much of our past work.

There is nothing new in this process. Industry has employed research constantly through the years as the one sure prescription to survival in a competitive society. Whole buildings and costly tools are frequently scrapped but a better product, one geared more closely to the needs of the user, emerges. The same statement applies equally to all public works.

One thing, however, is clear. The surest way to plan and to build soundly is to keep abreast of the desires of the public and the changing technology of the times.

This is the work which the present reports of the five panels initiate on behalf of the Committee on Urban Transportation Research.

This is the work which the Committee itself is pledged to carry forward in the years ahead.

In closing, the writer expresses the thanks of the Committee, its steering committee, and the Highway Research Board, to the chairmen of our several panels, their membership and secretaries, for the outstanding material contained in the several reports. We look forward to continued cooperation with all members of the Conference.

²²"Availability of New Highway Funds for Research Purposes." A.E. Johnson, Executive Secretary, AASHO, before ASCE, Houston, Texas, February 21, 1962.

²³"A Framework for Urban Studies" HRB Special Report 52, Coleman Woodbury. "Needed Research in Urban Transportation." Paper presented by M. Earl Campbell, Northwestern University, February 1, 1962.