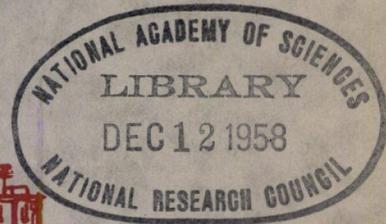


HIGHWAY RESEARCH BOARD

Bulletin 190

*Urban Research
in
Highway
Planning*



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Foreword

This bulletin contains the papers presented at the first Urban Session sponsored by the Committee on Urban Research as part of the 37th Annual Meeting of the Highway Research Board. At this and previous Annual Meetings the number of papers dealing with urban questions, and the many participants in these sessions, have indicated a live interest in these questions.

Traffic and transportation affect the economic and social development of urban areas. Research in transportation can be used as a means to advance understanding of the city as a whole and the process of urbanization.

The Urban Research sessions at future Annual Meetings will therefore be used as a common meeting ground for researchers in the many fields concerned with transportation and urbanization. In addition to reports on significant urban research, at future meetings the Committee plans to sponsor symposia on vital current questions.

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Introduction

WILFRED OWEN, Senior Staff Member, The Brookings Institution, Washington, D. C.

● MAJOR metropolitan areas have been unable to adapt to the revolutionary changes in transportation that have made the United States a nation on wheels. Expansion of automotive transportation has outstripped the provision of highway and terminal facilities, and neglect of public transportation has resulted in standards of service that are in sharp contrast with Twentieth Century advances in transport technology.

Equally important, the possibilities of influencing transportation demand to bring it more nearly into balance with the supply of facilities have been almost completely overlooked. As a result, the underlying causes of congestion continue to multiply more rapidly than remedies can be applied, and it is clear that a new approach will be necessary if there is to be any real progress toward solution.

Such an approach is now being taken by the Highway Research Board. The Board, recognizing the complexity of the urban transport problem and the wide variety of measures that will have to be taken to cope with it, has recently created a Committee on Urban Research to deal with these matters.

For many years the Board has directed a considerable share of its energies to the engineering and economic problems of roadbuilding in urban areas. Now, however, under the Committee on Urban Research, it has greatly broadened the scope of research undertakings in this field. The Committee on Urban Research will be concerned with all relevant aspects of the urban transport problem, including not only transportation as a whole, but also the many other features of urban life that create the environment in which transportation must function.

This first session under the Committee's sponsorship includes aspects of the geography, psychology, engineering, and economics of the urban transportation problem. These papers combine the work of the physical sciences with the contribution of the social sciences in what is hoped will be an effective continuing attack on the growing problems of our cities.

Planning and Research Implications of The Washington Transportation Study

PAUL C. WATT, Director, National Capital Regional Planning Council

This study is being conducted jointly by the National Capital Planning Commission and the National Capital Regional Planning Council, with funds appropriated by Congress.

There were two significant policy determinations in establishing the study program: (a) it was agreed that a general regional plan should be developed as a basis for determining the transportation plan; (b) it was decided that the transportation plan ultimately recommended would result from the objective study and analysis of both the automobile and public transportation needs to secure a balanced solution integrating the best use of each to the other. The Regional Planning Council, having member and staff representation from each of the local jurisdictions, undertook the preparation of the regional plan. Existing land use was mapped. Economists and demographers studied the growth possibilities for the area, permitting the planners to project population to 1965 and 1980. Following a series of area-wide staff conferences to determine the significance of regional growth factors, the next step was to accommodate this new growth by locating it as resident population within the 2,300 sq mi. The projected growth in Federal, commercial and industrial activity was plotted indicating expansion of existing centers as well as development of new centers. In composite this data represents the land use plan for 1980, using as its circulation system the pieced-together highway plans existing at the time. The final circulation system will be developed, after the traffic is projected from this planning base and assigned to varying transportation schemes.

● **METROPOLITAN** centers in the United States are in the midst of a vast new growth pattern. They are confronted with not only forecasts of a greater and greater number of people to service but also with strong indications of significant changes in the future pattern of development.

The Bureau of the Census has been continually revising upward their estimates of future population growth. Not too long ago it was thought our population growth was becoming constant with possibilities of actual decline. Fifteen years ago projections were indicating a maximum of 140 million during the 1950's and a 1980 population of about 160 million. These estimates were based upon then declining current trends of birth rates, reduced immigration, and the status of the national economy. Migration from the rural areas to the urban communities was expected to continue but was not considered significant because there would be no real increase in the total population.

The fact that this country did not grow as these past trends indicated is not stated to embarrass those who made the estimates but to highlight the problem to be faced. During the period after these projections were made two wars were fought, which brought about tremendous demographic changes.

Today's population is estimated to be 170 million instead of 149 million estimated earlier. It is estimated that there will be 225 million in the Nation by 1975 instead of around 160 million. Furthermore, it is estimated that of this 55 to 60 million increase about 40 million will reside in urban centers. This means that by 1980 better than 75 percent of the population of this country will be urban.

The effects of this dynamic growth will radically change the urban pattern, requiring the development and applications of bold new concepts and techniques to derive its ultimate form. Before this can be accomplished it is essential that there be a better understanding of the basic elements involved in the transition now taking place.

These elements are too complex to be managed by, not to say understood by, any

single profession. Economists, of all kinds, sociologists, demographers, psychologists, agronomists, geographers, health and welfare specialists, political scientists and public administrators, lawyers, highway and traffic engineers, and planners—there are others who could be mentioned—all must contribute to the task of comprehending this complex mass of multi-faceted interrelationships—the metropolis. Since none of these technicians and specialists can do this job alone, it is absolutely necessary that they work together. The sooner this fact is recognized, the sooner each will learn to respect the need for his contribution and that of every other participant. If this point of view is valid, then these professionals have a definite responsibility to the general public to join together and get the job done.

There are a number of comprehensive transportation studies underway across the nation which may develop the new concepts and techniques to properly service this metropolitan phenomenon. They might also serve as the proving grounds for professional unification, since the best of them are doing a complete job beginning with economic and population studies, and land use planning, through origin and destination studies including traffic projections and assignment, highway and transit plans, and finally finance, operation, and administration. The approach used in the Washington Transportation Study is a case in point.

WASHINGTON TRANSPORTATION STUDY

This study was authorized by Act of Congress in 1955 and is being jointly conducted by the National Capital Planning Commission and the National Capital Regional Planning Council. The Congress appropriated \$400,000 to finance the study. However, it should be noted that this would have been insufficient except for the genuine cooperation from others such as the Bureau of Public Roads; Bureau of the Census; Bureau of Standards; the Highway Departments of the District, Maryland, and Virginia, which provided the origin and destination data; the Public Utilities Commissions of the District, Virginia, and Maryland; and all of the jurisdictional planning agencies. This assistance was at least equal to the \$400,000 appropriation.

Joint Steering Committee

A special Steering Committee was appointed by the Commission and the Council to determine the policy and program for carrying out the study. The significant policy determinations recommended in the final study program are as follows:

First, the Committee recommended that as the basis for the transportation study a general regional development plan or future land use plan for the study area be prepared. This plan was to consist of detailed population and economic base studies, analysis of existing and proposed land use, study of water supply and sewage disposal requirements, zoning, parks and open space needs, and the development of an over-all circulation system.

Second, the Committee recommended that the study should encompass the total transportation requirements for the region, instead of just the mass transportation needs as contemplated earlier. The Committee stated that it was imperative that the automobile movement be analyzed along with the mass transit needs in order to present a complete picture. The final objective was to present a balanced transportation plan making the best use of the automobile and highways in conjunction with the best form of transit, each complementing the other. To attain a complete picture the Committee recommended that three different types of transportation systems be tested on a comparable basis against the projected traffic. These three systems consist of "Automobile Dominant," "Express Bus," and "Rapid Transit—Supported or Suspended."

Automobile Dominant System. This system would have almost all the future traffic predominantly carried by automobiles on freeways. Local transit would remain much the same as it is today or possibly decline. The location and number of lanes required for this freeway movement would be determined; the cost of these needed facilities would be estimated; and finally, the amount of land required and the development cost for parking in the central core would be analyzed.

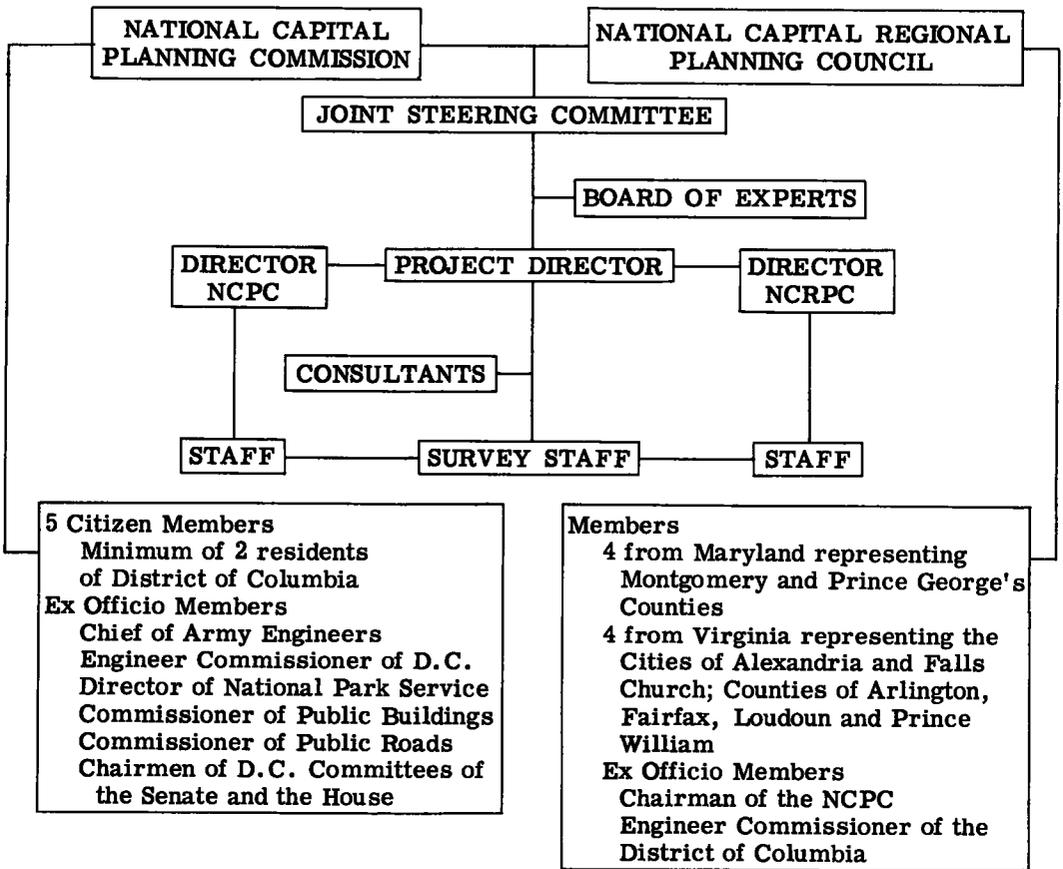


Figure 1. Organization chart.

Express Bus Transit. This system would be basically a network of expressways together with separate ways in the right-of-way for buses where express bus operation is required. This would prevent the bus operation from lowering the capacity of the highway with turn-outs and, more important to the transit users, would allow the bus to meet the highspeed time schedules necessary to attract patronage. This system would be analyzed as to its effect on the number of highway lanes required, the total system cost and the net operating cost, and the effect on the amount and cost of central parking.

Rapid Transit System—Suspended or Supported. This system would consist of a highspeed, semi-automatic system, either on rail or rubber, suspended or supported, depending upon which design the engineers find is feasible. This system would have a completely separated way of whatever construction (subway, elevated, open cut, or median strip) that would best answer the engineering finding. A fast and complete central delivery system would be developed as a part of this scheme. Station intervals in the outer areas could be up to 2 miles apart with large parking areas where the automobile would be used to feed the system in an area where automobile movement is still unimpeded. Again the effect this transit operation would have on the number of highway lanes would be analyzed, as would be the total system cost and the net operating cost of this system, and the effect on the amount and cost of the central and outlying parking.

It was generally agreed that no one of these systems would be the proper solution for the whole region, but that the data from these three studies would be used to determine the final transportation plan, which plan could well be a composite of the three schemes.

The Steering Committee recommended that the final phase of this study should be a careful analysis as to how the final transportation plan would be financed, regulated, and operated. Since the Washington area is one of the more complex interstate regions it is imperative that there be some sort of governmental mechanism which would accommodate Federal, District, State, and local jurisdictions. This feature may ultimately call for some unprecedented action which might be a forerunner to providing an orderly solution to the metropolitan problem.

Finally, the Committee determined the organization and procedures to be followed in carrying out this study (Fig. 1). The recommended procedure was to establish a continuing Steering Committee from the Commission and the Council, having general supervision. A board of experts consisting of eminently qualified transit and highway transportation experts would be established to give policy direction. This Committee would work with a Project Director in selecting consultants for each phase of the study and coordinating their activity. A very small base staff would be utilized to provide the "house-keeping" duties for the study. In addition, the staff of the Planning Commission and the Regional Council would assist the Project Director in administering the study and providing certain phases of the work.

The study itself was divided into four major parts (Fig. 2): first, the preparation of the General Development Plan, which would provide detailed population, economic, and land use analysis and projection; second, the Traffic Analysis, which would process the present and future population and land use in conjunction with the origin and destination data prepared by the Regional Highway Committee¹ to show the kind, amount, and general location of traffic demand; third, the design engineering analysis which, utilizing the traffic demand data, would locate the needed rights-of-way to accomplish the movement demand; and finally, the fiscal and organizational study which would determine means for financing and operating the system and suggest the political and administrative organization that might accomplish the job.

It is important to realize that none of these operations is carried out completely independent of the others, although the working process suggests that this is so if viewed at any one time and only one time. It is in this process that the interplay among the various technicians and specialists mentioned earlier evolves.

PREPARATION OF THE GENERAL DEVELOPMENT PLAN

Since the Washington Transportation Study is still in process of being completed and the results of the traffic, engineering, and organizational studies are still to be determined, this paper from here on will emphasize the approach utilized in preparing the General Development Plan, indicating the necessity of complete cooperation among the various professions, followed by some of the significant planning and research implications (Fig. 3).

The Regional Planning Council

The Washington Transportation Study is charged with providing for present and

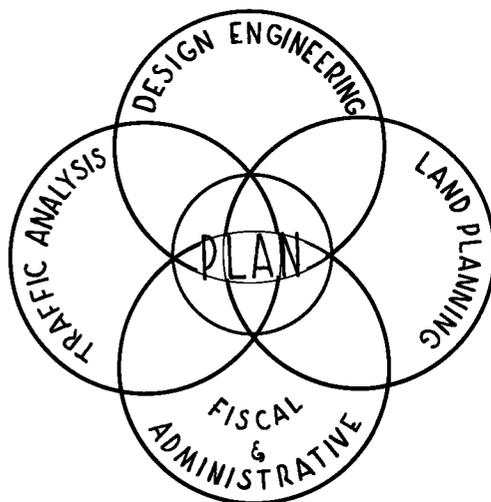


Figure 2. Components of the transportation plan.

¹The Regional Highway Committee consists of representatives from the Highway Departments of the District of Columbia, Maryland and Virginia.

future transportation needs for the National Capital Region. This region includes the District of Columbia; Montgomery and Prince George's Counties in Maryland; and, in Virginia, Arlington, Fairfax, Loudoun, and Prince William Counties, as well as the municipalities of Alexandria and Falls Church. This complex interstate region contains 2,300 sq mi with an estimated population of over 2 million persons. The National Capital Regional Planning Council, an official regional planning agency, sponsored by the Congress, is charged with preparing a regional plan for the National Capital Region. It was logical that the Council should be the agency to spearhead the development of a general plan for the region as the basis for the Transportation Study.

The Council consists of members from each of the jurisdictions in the region (Fig. 4). Each member serves on the local planning commission, where one exists. The Council also is assisted by a Regional Staff Committee composed of the Director of Planning from each of the jurisdictional planning agencies. This Committee also provides liaison with local, state, and Federal agencies as required, such as Public Works offices, State Highway Departments, Interstate Commission on the Potomac River Basin, and U.S. Corps of Engineers.

Public Law 592, which established the Council, not unlike the majority of regional planning enabling acts, provides for a voluntary, cooperative approach to preparing a regional plan. This fact is even more significant in a complex interstate region such as this. The Regional Council cannot tell any jurisdiction what will or will not be on the plan but must seek through cooperation and collaboration to provide the best gen-

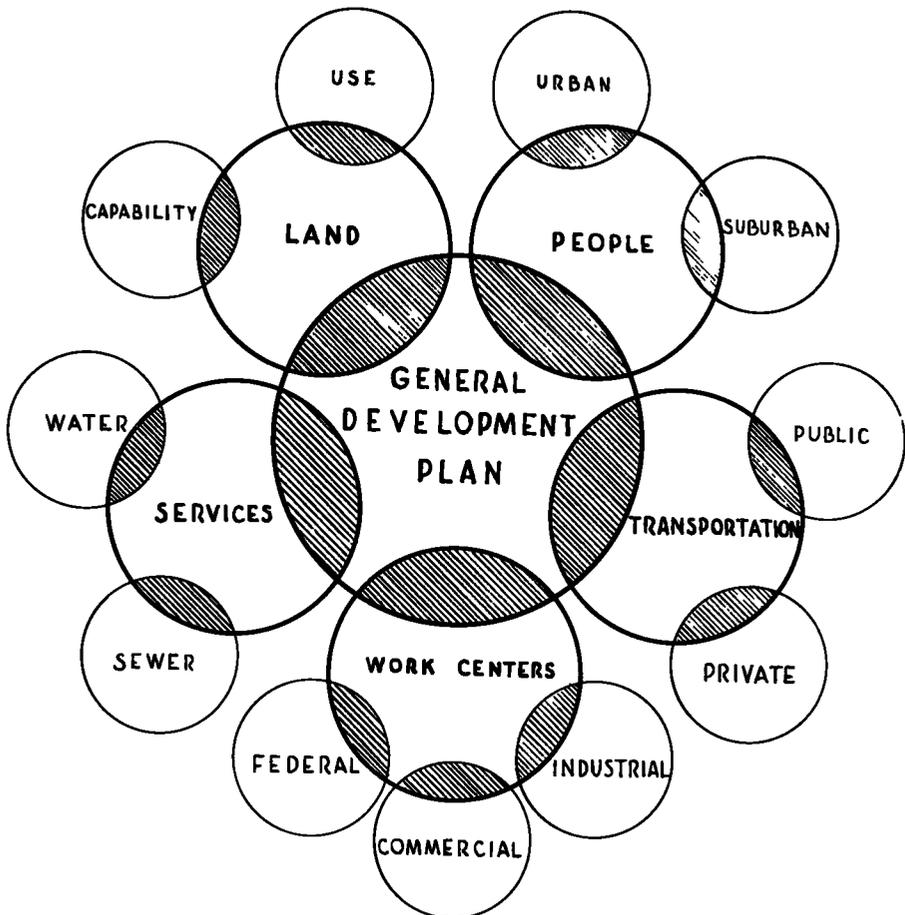


Figure 3. Elements in the general plan.

eral scheme utilizing the plans each of the jurisdictions is preparing as a guide. It is important to note that this regional plan is a General Plan which is to serve as a guide for each jurisdiction in carrying out its local planning.

It was the Council's mission then to develop this general regional plan which would provide the basis for determining the transportation requirements. The first big job was the economic base analysis. A local firm of consulting economists, who enlisted the aid of several specialists in various branches of economics, statistics, geography, demography, and industrial land economics, was retained to develop the economic and demographic factors which have a bearing on the future population and its distribution, as well as the future employment potential which would be reflected in the land use pattern.

Economic Base Analysis

While taking into account the demographic factors influencing the region's growth, the economists also put particular emphasis upon the job potentialities of the future, dividing the region's economic activity into "sectors" for purpose of analysis. Seven of these individual sectors were termed "independent", for their scale depended upon national and international forces unaffected by any local considerations. These seven, considered to be the fundamental basis for past growth, somewhat akin to the concept "basic employment", were: Federal, tourism, professional and service employment—here in larger proportion than elsewhere due to the peculiarities of the Nation's Capital; university activities; international activities; research activities; and retirees. The economists projected an expansion of this employment of about two-fifths up to the year 1980. The other sectors, termed "dependent", were the professional and service activities based upon local needs, agriculture, and industry. The present level of industrialization is quite low, representing only about 15 percent of the maximum which the region's mass market is theoretically capable of supporting. This employment, which is expected to grow considerably, increasing to about 25 to 50 percent of the theoretical maximum which a 3 million population mass market could sustain. Fitting together the economic growth potentials and the demographic factors, the economists supplied the planners with the framework for making total population and employment projections.

Existing Land Use Map

While these studies were under way work was begun on preparing the existing land use map of the Region. The Regional Staff Committee after a number of meetings agreed upon a land use legend to be followed. This was significant in that each planning agency had land use data available in some form; however, it varied as to scale, color key, and legend. Each jurisdiction agreed to take the U.S. Geological Survey quadrangle sheets for its portion of the Region and transfer the land use using the standard legend. In some instances this meant considerable field work. Once these sheets were completed they were brought into the Council office where they were compiled on a one mile to the inch map. This map became the first existing land use map of the Region and the basis for locating the projected population and land use for 1965 and 1980, the future dates determined for the study. A regional planning consultant was retained to assist the staff in merging the economic and demographic factors with the land use planning process to develop the regional plan.

Land Capability Studies

The next step was to work with each of the local planning agencies to locate the anticipated future population and employment in relation to existing and future land use requirements. Land capability studies were made to determine the amount of population the various parts of the Region could absorb in keeping with sound development policies. In order to do this it was necessary to map the major physical factors that would influence the growth of the Region. These factors were as follows: the presently urbanized area within which the pattern is set; regional parks and other large open spaces required; large public lands, particularly Federal, which will probably not be

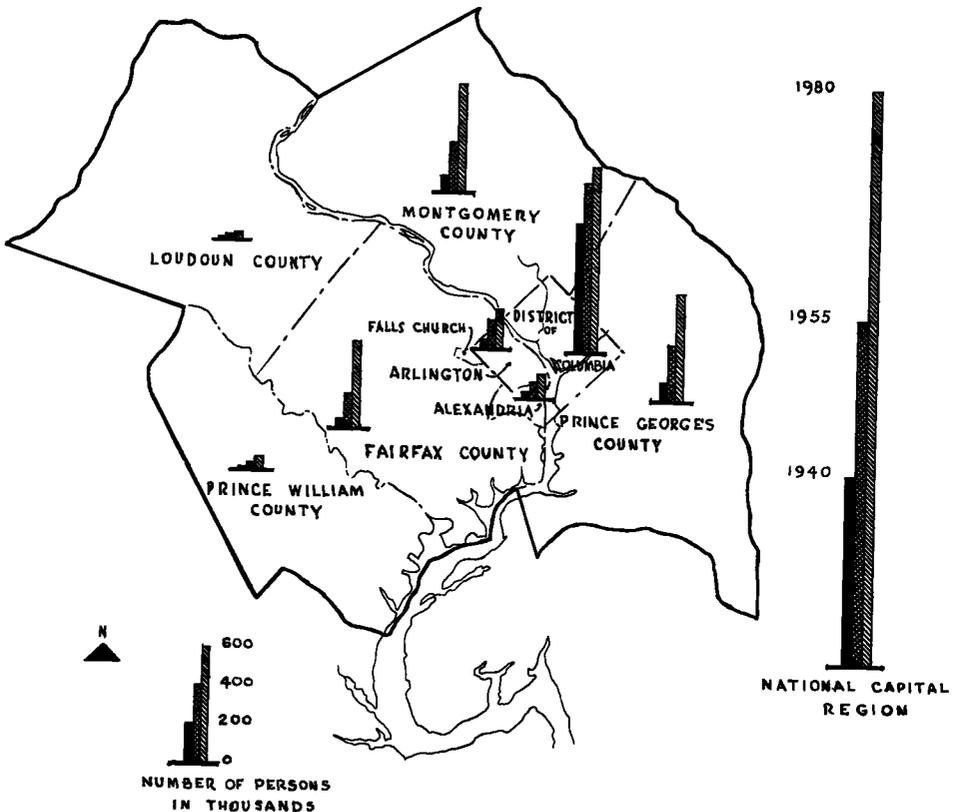


Figure 4. National Capital Region.

returned to tax rolls and are therefore not available for residential development, but may become employment centers; existing and future airports; areas of poor soil or geological conditions, which should not be intensively developed; critical watersheds; lands adjacent to existing and future sources of water supply; those areas which can be most efficiently served by sewer and water facilities within the timetable of the study; and, finally, a preliminary circulation network.

Now was the time to determine the kind of region that was desired for the future. What pattern should it take? Continuation of the urban sprawl, or a designed pattern of reasonable density interspersed with open development and satellite communities? All trends indicate that people desire land for more spacious living, but the need for community services and the higher cost of providing them at low density limit this possibility somewhat.

Regional Factors Influencing Growth

The major regional factors influencing development which were agreed upon, were as follows:

Water Supply and Sewage Disposal. A primary consideration in any land plan is the necessity to provide for the future water supply, and the corollary necessity to protect that supply from waste disposal. In the National Capital Region that policy led to the elimination of the critical watersheds as areas for intensive urban development.

Airport Requirements. Sites for future airports use up as much as fifteen square miles and have other indirect effects upon land development—finding the proper location for them is not an easy task in a metropolis.

Soil Conditions. There are often large areas where the soil and geological conditions are adverse to urban development; obviously, these areas should be utilized for other than urban use.

Defense Considerations. Also taken into account was the official federal policy "to encourage and, when appropriate, to require that new facilities and major expansions

of existing facilities important to national security be located, insofar as practicable, so as to reduce the risk of damage in the event of attack". This policy served as a guide in locating future federal employment in the environs of Washington.

Developmental Objectives

While these were the major factors existing which would affect the plan, the planners also adopted the following "development objectives"² to provide a framework for setting the scale and pattern of the plan.

Provision for the Seat of Government. Since Washington is the Nation's Capital, one of the prime objectives of the regional plan must be to provide the physical framework for the efficient and economical conduct of the work of government. This means to plan sites for the location of both central and outlying facilities in such a manner as to maintain the economic stability of the central area as well as preventing its overcrowding.

Provision for Population. Another objective is to provide a good environment for the population of the region, healthful, convenient, and pleasant residential areas conveniently linked to employment and recreation, and served by local and regional shopping, cultural, and educational facilities.

Provision for Employment. It is the objective of the plan to provide sites for the economic activities, primarily commerce and industry, which support the population.

Provision of Accessibility. This objective, which is applicable to the three preceding ones, is to provide maximum accessibility to all parts of the region. This calls for locating related land uses as near to each other as possible and for providing a means of circulation of maximum speed and capacity.

Provision for Open Space. This objective is also keyed to the first three and should provide reservation of open space for public use as well as the preservation of an open character of development throughout extensive parts of the region. The purpose is not just for recreation, even though this by itself would be sufficient in view of the increasing urbanization and the prospective longer leisure time and higher standards of living; another purpose, because this is a general regional plan, is to allow for the preservation of flexibility in many kinds of future developmental decisions. Still another purpose is to save irreplaceable natural resources, scenic and historic, as well as to preserve valuable agricultural resources. Yet another purpose is to allow for the possible separation of clusters of development from each other, in such a way as to encourage the evolution of social relationships in communities of small enough scale to function as self-contained entities.

Design Elements

These major regional factors influencing development and the developmental objectives were approved as policy by the Regional Planning Council and the National Capital Planning Commission. The next step in the process was to work through the Regional Staff Committee with each jurisdiction in the step-by-step accommodation of the design elements from which the general plan would evolve.

Population Distribution and Residential Land Use. The 1965 and 1980 population projections, which resulted from the merging and inter-action of the demographic, economic, and land use factors, were apportioned for each jurisdiction for distribution in keeping with the major regional factors influencing growth and the developmental policy agreed upon.

Discussions in the Regional Staff Committee as to how this population would be distributed in each jurisdiction indicated that the growth to 1965 and 1980 invited two different design policies on the location, character, and density of residential uses.

For 1965 it was evident that most of the significant decisions affecting the pattern of development have already been made. Actually this was a predictable growth rather than a planned growth in most instances. The intensive development to 1965 would be by accretion to the present pattern where sewer and water lines have been built and are,

²"Policies for a Regional Land Use Plan for the National Capital Region" by John T. Howard, Consultant.

or can be, readily extended; highways are in place, or are being built; sub-divisions are being approved; land is being held in speculation, and zoning has been approved to permit urban and suburban densities. It was a relatively simple matter to map the 1965 growth pattern based upon the intimate knowledge of the planners in each jurisdiction.

The 1980 growth, however, being far enough in the future, should benefit from the influence of a regional plan—even though there would be some continued accretion growth, of course. But by following major physical factors influencing growth, and the developmental policies agreed upon, a more imaginative pattern was mapped. (It should be emphasized again that within the "voluntary-cooperative" modus operandi for regional planning here this pattern was not completely satisfactory to everyone, but it was a first big step in the right direction.)

The new pattern splits the sprawling growth with wedges of open space extending in to the edge of the 1965 development. A number of outlying concentrations of population are mapped separately from present growth by bands of open spaces—parks, public land, poor soil areas, etc.—or rural density development. It is significant that some of the major regional factors influencing growth, particularly the preservation of the Potomac Watershed, impose sharp limitations upon the extent to which some of these outlying concentrations can be developed.

The circulation system and the established zoning policies were important factors in shaping the growth pattern. New growth was mapped generally along the major radial travel corridors. Population densities were developed in ranges allowing for variation of housing types adaptable to existing zoning policies.

Generally, the 1980 pattern of residential land use development, except for outlying concentrations, follows the trend of low density "scatteration" or horizontal growth in a 360 degree arc. Analysis of the existing 1955 land use indicated that approximately 78 acres of land per thousand population was in use for all urban purposes. The 1980 pattern, in keeping with the trend of greater open space needs, wider rights-of-way for transportation, and the general desire for more spacious living, sets aside nearly 150 acres of land per thousand population. Even though this is nearly double the land area previously used, it is significant that a population of 3 million still leaves a tremendous amount of accessible, developable land available in the region. The hardest planning problem of all is how to attain a desirable land use pattern instead of the uncontrolled sprawl.

Employment Distribution and Commercial and Industrial Land Use. The next step in the process was to distribute the projected employment that was allocated to each jurisdiction.

Federal employment was mapped separately. Federal employment, unlike commercial and industrial, is influenced directly by the actions of the Congress and the plans of the National Capital Planning Commission, the central planning agency for the Federal Government. Existing Federal employment is highly centralized, about 80 percent of the 279,000 jobs being located within a five mile radius of the center.

The bulk of the new Federal employment was located in the central area following specific action of the Congress and the plans of the National Capital Planning Commission. However, there were a number of locations proposed outside the District of Columbia in relation to future new concentrations of population for which these Federal sites would be the focus.

Commercial and industrial employment projections were distributed in each jurisdiction in keeping with the ability of its land use and zoning to accommodate such activity and following the over-all "regional factors and developmental objectives." Existing commercial and industrial employment, like the Federal employment, is heavily centralized. However, the bulk of the new employment was located in outlying areas in expanded existing centers and in new regional centers following the pattern of population distribution. This does not mean that this was done at the expense of the Central Business District. A significant increase was projected in the Central Core as a consequence of the centripetal forces of the total regional population increase and the anticipation of greater accessibility to the center resulting from the transportation study.

It is significant to note that although the distribution of the future resident population is predominantly outlying, the bulk of the employment remains highly centralized.

This is the core of the transportation problem—how to tie together scattered homes to concentrated jobs.

Recreation and Open Space. The recreation and open space requirements were analyzed, jurisdiction by jurisdiction, after mapping the existing facilities of the area. Again the agreed-upon policies of "regional factors and developmental objectives" guided the mapping. Regional park sites were located throughout the region to service considerably more than the estimated 1980 population. This was done to insure adequate open space for long range—for if land is not set aside now it can never be re-covered, and yet the surplus land can always be released. Stream valley parks, conservation areas protecting water supply, airport sites, poor soil areas, good agricultural areas, and possible expansion of public lands were analyzed and mapped to provide a buffer or insulation pattern between communities in keeping with the plan objectives. Because of the fact that it is impractical for lands for such open space uses to be acquired as public lands, other means of preserving them must be developed. More extensive studies are underway which will, it is hoped, develop new approaches for bringing this about.

Circulation. The circulation system, at this point, could only be preliminary, based upon the land use planning and the plans existing in various stages of completion and official status in each jurisdiction. The preliminary circulation system indicates the major corridors requiring a high type of service based upon the land use planning of residential population and the job centers. The completion of the Transportation Study, including the closest working relationship with the highway engineers, will furnish the final circulation system.

The General Development Plan

The compilation of all of the design elements on one map represents the Regional Plan that becomes the basis for the Transportation Study. There are a number of important points about such a plan which should be mentioned.

This plan is by necessity a preliminary plan. The fact that it is a General Plan allows for flexibility. As the transportation elements of this study are completed it will undoubtedly be necessary to do some revising of the Land Use Plan. One of the most important phases of this study will be the better measuring of the resultant impact of the interaction of the Land Use Plan and the transportation system.

The fact that this is a flexible, general plan, should be emphasized in relation to the continuing work of the Regional Council and its member planning agencies toward the preparation of a final Regional Plan. As stated earlier, present operating procedures, not to mention time and funds, do not allow for the preparation of a plan at this stage that has attained what everyone is striving for. However, the methodology utilized in the preparation of this plan was carefully developed to allow maximum shifting without detracting from the statistical data prepared from it for the transportation analysis. This will allow for considerable extending, detailing, and reshaping—particularly the open space elements—in the preparation of the final plan.

Relation to Transportation Planning

The completed General Development Plan now represents a model of how the region is proposed to be developed. The next step is to determine the transportation requirements. The Plan was translated to a statistical form by process of dividing the area into more than 130 zones. In the central area these zones were the same as the districts used in the 1948 and 1955 Origin and Destination studies; beyond the cordon they were combinations of census tracts and planning areas utilized by the various jurisdictions. The areas are increasingly larger as they extend outward from the District.

For each of these zones in 1955-1965 and 1980, the population, dwelling units, employment, labor force, auto registration, average income, and percent of retail sales were tabulated reflecting the economic and land use elements of the General Development Plan. This data was then accepted by traffic engineers and became an integral part of the traffic extrapolation to determine future trip volumes and travel patterns.

The Transportation Study is now in the process of assigning the projected trips to the varying transportation schemes—auto dominant, express bus, and rapid transit—

as discussed earlier in this paper. Engineering consultants are studying the type of system ultimately required and its right-of-way needs. Public administration specialists are compiling the data that will provide a basis for recommending the financial, regulatory, and operating requirements for the final system, along with the best governmental mechanism for implementation.

PLANNING AND RESEARCH IMPLEMENTATION

Studies such as this one bring to light new and stimulating implications with far-reaching planning and research significance. A few of these follow:

There is a distinct need for the establishment of a central data clearing house for metropolitan areas, so that everyone concerned with the metropolitan problems can have comparable, current data for research, planning, and developmental decisions (Fig. 5). Keeping the fund of essential data current is a project in itself.

The researcher today faces an almost impossible task of correlating the data he gathers before putting his analytical talents to work. What is needed is to establish a single standardized system of data gathering, punched on computer cards, keyed to a metropolitan base map and grid coordinate system. Population, employment, land use, and even traffic data could be readily kept current and quickly run off on electronic equipment for any unit area required.

Intensive use of this data by economists, statisticians, planners, traffic and highway engineers, public utility technicians, school boards, local governments, and anyone else connected with the metropolitan problem would give innumerable direct and indirect benefits. A direct benefit, of course, would be merely the fact that everyone was using the same data as a basis for decisions. A single example of an indirect benefit is the effect upon local and regional planning such a metropolitan data system might have. It is easy to preach the regional point of view, but laymen will understand its impact and its necessity far better when they see local data transposed to regional terms.

Research "in depth" is needed if the dynamic new metropolitan growth patterns are to be mastered, for it must be admitted that it is not known what the long-range future holds. Will the metropolis be vastly different in the year 2058? Why, or why not? Is it really known what the present low density sprawl in the suburbs means? Is it what people really want, or is it only what has been made available? Does the increasing mobility of people and the ever-growing de-personalization of our society mean that

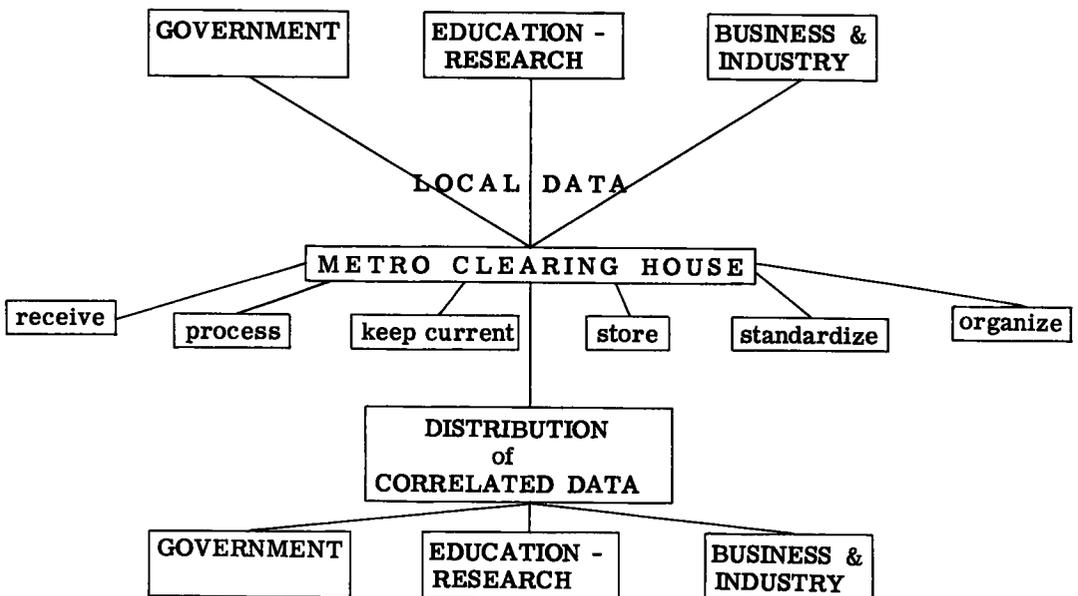


Figure 5.

the future resident of the metropolis will not participate in local affairs? Until these and countless other questions can be better answered through urban research, planning will not be doing its best job.

It is evident that new political forms or realignment of those existing are needed, in order to facilitate area-wide research and planning—and more important, will result in the implementation of area-wide plans based on such work. By now practically everybody remotely interested in the metropolitan problem realizes that existing political forms are inadequate to cope with the situation. The analysis of a metropolitan area on a regional basis points up in proper perspective the impact of the existing and anticipated expansion.

Even in the simplest type of metropolis, one where within a single state a massive central city dominates a few weak municipalities, it will not be easy to reach workable solutions. In the more complex metropolis, one which sprawls into more than one state and includes many strong municipalities and urban centers, solutions will be much more difficult. (There is experience enough with the ad hoc authority type of agency to indicate that none of these problems is solved piecemeal; the problems are temporarily shunted aside, but they persist and worsen just the same.)

Even if the fullest expression of professional cooperation in problem solving is attained, the work will come to naught unless the new political framework permits the adoption of plans and guarantees their implementation.

One of the main points of this paper should be repeated here: until all of the professions collaborate on metropolitan problem solving, the present-day piecemeal studies approach will continue to be too little and too late. Professionals should prepare themselves now to act together when the opportunities arise, as they undoubtedly must, and with increasing rapidity.

Regional Research and Highway Planning

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● IT IS GENERALLY recognized that the demand for highway construction and improvement is greatly influenced by the rate and form of urban expansion, by regional economic growth, by growth in national income and interregional trade, and by similar developmental forces. It is also generally accepted that highway construction and improvement directly and indirectly influence these same developmental elements. The implications of these relationships are not yet so widely recognized, however, nor generally acted upon. This paper is concerned with one of the more evident implications: namely, that highway planning should logically be grounded in the most advanced knowledge concerning the developmental forces which influence, and are influenced by, highways—as well, of course, as other forms of transportation.

Three points are emphasized in this paper. Firstly, that the study of these developmental forces, with their many complicated interrelationships, can be brought into an understandable focus through regional analysis and the concepts of regional planning. Secondly, that regional research is currently providing a substantial and growing pool of knowledge and of analytical techniques which have great potential value for highway planning. And thirdly, that, given the actual and even greater potential value of regional research for highway development, highway people might well take a leadership role in trying to improve the caliber and applicability of regional research.

It is worth noting the many ways in which the knowledge and techniques of regional analysis can be helpful in the activities of highway units. Such knowledge and techniques can help (a) in the location and design of highways through analysis of the effect of changes in the developmental forces and in spatial arrangements on the generation and flow of traffic and alternative desire lines; (b) in pinpointing the economic impact of various types of highways, bypasses, and other facilities; (c) in the development of transportation system concepts and system services; (d) in the interpretation of O & D and other highway research activities that lead to the formulation of policies; (e) in clarifying the types of issues raised in public hearings and other public discussions of highway plans and other highway matters (that is, generally in public relations); and (f) finally, they can help through a broader and more rigorous definition of the many other types of problems that are involved in highway planning and highway research, and particularly in relating highway development to other important developments in the economy and society.

DEVELOPMENTAL FORCES

The country is experiencing extremely rapid industrialization, growth in service activities, and urban growth—particularly suburbanization. Historians looking back at this period may well use such terms as "Advanced Industrial Revolution" and "Age of Urbanization." The major phenomena are nationwide in character—as one would expect them to be in the closely knit national economy and society—but the timing and specific form they take tend to vary greatly from one part of the country to another. Thus, at any point in time, some regions—as is true of the Pacific Coast—are growing rapidly in population, industry, and income; others are growing slowly if at all; and still others are moving ahead at just about the national average. The picture is even more complicated than that. Some regions gain rapidly in population and industry, but not so rapidly in per capita income; others may gain in per capita income at the same time that population remains stable or declines, as has been true of some of the Plains states during the past two decades. If the 48 states are compared as to absolute and relative levels of growth with regard to only three indicators—changes in population, total real income, and per capita real income over the past two decades—no less than 25 different varieties of growth patterns are indicated. In other words, the regional growth picture is an extremely complicated one.

Many of the most significant changes that have taken place in the United States in recent decades have added up to a dramatic shift in employment from agriculture and other resource exploitation to employment in manufacture and services. Between 1939 and 1954, for example, at the same time that employment in agriculture dropped 15 percent and in mining 9 percent, employment in manufacturing increased by 63 percent, in construction by 121 percent, and in general services by 62 percent. (The percentages are not particularly significant in themselves since they vary depending on which years are chosen for the comparison, but they are useful in indicating the general order of magnitude of relative growth of the various sectors of the economy.) The consequence has been not only a very rapid growth in metropolitan communities in general, but a very great concentration of activities in regions with special advantages for different kinds of manufacture and service activities (including such services as wholesaling and recreation).

Relative regional advantages or disadvantages for economic growth are in very many instances largely a matter of access to markets, to raw materials, to labor force, and to special services. Access is, of course, essentially a matter of transportation cost and time—or what is sometimes called "distance friction." A transportation cost map looks very different than a linear distance map, and producer and consumer decisions are normally made in terms of cost and time considerations and not in terms of distance as such. It follows, then, that highway construction and improvement are among the significant molders of relative regional advantage and disadvantage.

Whenever a firm makes a locational decision—either in expanding its existing plant, moving its plant to another area, or deciding where a new plant is to be located—it naturally considers relative total cost in one location versus all other possible locations, as well as relative sales and gross returns in the different possible locations. Everytime a new major highway is constructed or improved the likelihood is that it has changed the relative cost of moving things and persons and therefore influenced the basis on which locational decisions are made.

For many firms, the ability to get a given number of workers of the appropriate skills to their plants or offices is the central consideration in location. Commuting time to and from the plant serves to determine the size of the labor pool which the firm may tap. Highway improvements are thus critical factors in the location and size of labor markets.

The importance of what is called "access" considerations for locational decisions of business firms has, of course, been dramatically highlighted in recent years through the developments along such highways as the New Jersey Turnpike, Route 128, near Boston, and the East Bay Freeway in the San Francisco area. But while these developments are dramatic enough to bring attention to the role of highways in locational decisions, the much more pervasive force of changes in access through highways (and other forms of transportation) on the growth and economic health of regions is not seen except through regional studies of a comprehensive type.

It seems that what needs major stress is the fact that the nation as a whole is best off when each region of the country is carrying out those activities for which it is best suited. In turn, the people in every region of the country can enjoy a high level of income, if not always a rapid growth in the over-all volume of activities, if the region is making a sound socio-economic adjustment in tune with the demands of the pervading national developmental forces. In other words, each region can enjoy economic health, if not hectic growth—but only if the important things are kept in balance and the needed adjustments are helped along through conscious group efforts. This would suggest the necessity of at least a minimum of regional planning, which can lay a foundation for decisions in such fields as city planning, industrial location, natural resources development, and transportation.

Such planning, and sensible decisions within each of the important development fields, calls for a great deal of information and knowledge. It is essential, in the making of decisions which have important impacts, that they be based on an understanding of the key forces at work in the economy and society. This is possible. For in spite of all the complications and in spite of the speed with which certain changes take place, careful and imaginative study often reveals patterns which can make the

changes understandable and at times even predictable—at least in broad ranges and in terms of probabilities. Since it can be assumed that highway planners would want to base their decisions on the most advanced knowledge available concerning the forces which influence, and are influenced by, highways, there would seem to be value in discussing the state of such knowledge and the desirability of improving it.

REGIONAL STUDIES

The developmental forces with which we are concerned tend simultaneously to play a role on the national, the regional, and the local scene. Thus, technological and economic changes which may have national and even international roots—say, automation of a given industrial process for making plastics—and which influence national supply and demand for the product, will at the same time influence the amount produced and purchased within each region—that is, have a regional impact—and also at the same time influence the choice of the local site on which a new plastic plant may be built.

The elements which are of particular interest for highway planning are those related to the location of persons and economic activities and to the movement of persons and things. For that reason, from the standpoint of highway planning, the picture of the developmental forces can be brought into focus most sharply through regional analysis and the concepts of regional planning. Regional analysis serves to bring national and local forces, as well as regional elements, into a manageable framework and serves to bring to the fore questions of location and of spatial arrangement—or more generally, the interrelation of persons, things, and forces in space.

The relevance of regional research for highway planning can also be highlighted by listing the developmental questions which are of particular concern for any type of transportation planning and noting the extent to which they fall within the context of regional studies. These would include such items as: (a) the rate and pattern of regional economic growth; (b) the changing patterns of interregional trade; (c) interregional, urban-rural, and intra-metropolitan population migration; (d) the rate and form of urban expansion; (e) the changing structure of the metropolitan community (f) industrial location and siting; (g) urban, suburban, exurban, and rural land-use patterns; and (h) relation of urban expansion to natural resource use and development; and (i) patterns of interregional and intra-regional movement of persons and things.

It is worth noting that problems of this type are being intensively studied in many centers throughout the country. A survey of regionally-oriented research and graduate education activities at U.S. universities, conducted by Resources for the Future, Inc., and published in May of 1957 (1), has revealed that over eighty universities are now carrying out regional studies of one type or another. Certain of these studies are providing valuable new data and insights into the developmental forces and spatial problems which are of significance for highway planning.

Even persons who have long been connected with the field of regional studies have been surprised to discover how extensive the current efforts are. There is regional work of some importance under way within each of the social science disciplines and in a number of the natural and technical sciences as well.

Every major graduate geography department in the country is sponsoring regional research of one type or another and, as a matter of fact, the whole discipline has a strong regional orientation. Among other subjects, land forms, land use, and land planning are receiving a good bit of research attention, as are resource use and resource management problems more generally. The study of physical elements and natural resources within a regional framework is carried out also by many other departments and schools. While much of this research is rather specialized, a significant portion of it is directed at a basic understanding of the physical environment of the type needed as background for various types of developmental efforts, including transportation planning.

Regional Economic Development

Regional economic development is a central focus of interest of bureaus of business and economic research in universities throughout the country. Such bureaus gen-

erally provide continuing research on the economic problems of the state within which they are located. A few titles of studies carried out by various bureaus of business research can suggest the type of problems covered: An Analysis of Iowa Income Payments by Counties; Retail Trade Area Analysis of 11 Southwest Iowa Towns; Economic Development in South Central Kansas; Coal in the Maryland Economy; Tourist Days and Tourist Spending in Southeastern Florida; Retail and Service Business Classified by City Size; An Economic Survey of Dallas County, Texas; and Factors Influencing Plant Location in West Virginia.

In addition, in quite a few of the universities, research in local economic problems is carried out by departments of economics, schools of business, departments of geography, departments of agricultural economics, and similar units. It would seem that there are few, if any, states in the country which do not have at least one research center concerned with questions of regional economic development.

The Metropolitan Region

The metropolitan region is currently the subject of a great deal of university, as well as non-university, research—much of it of direct or indirect relevance for highway planning. Metropolitan physical structure, patterns of growth, land use, urban economic development, social structure, and political problems—these and related topics concerning the metropolis are all being investigated. In quite a few instances, problems of transportation are specifically studied within the context of urban research. Examples are the study of "Commuting Patterns of Industrial Workers", which was carried out by the Housing Research Center of Cornell University, and the urban transportation studies carried out by the Department of Land and City Planning of the University of Pennsylvania. Even where transportation is not studied directly, the research often provides concepts, methods, and data of some value for highway planning.

Some of the research currently under way is directly concerned with methods and techniques of regional analysis. While it is difficult to generalize about methods which are likely to be especially valuable in one particular area of concern, such as highway planning, there seems little doubt that highway planning will increasingly be able to draw on the growing and improving kit of tools of regional analysis. Several of the foci of methodological research deserve attention. Included are those in the realm of population and human ecology, such as methods of analyzing regional population structure and shifts, and of projecting future populations within regions; geographic field survey methods; techniques for analyzing industrial location, including the market potential concept; methods of regional income accounting and interindustry or input-output analysis; spatial interaction methods of analysis; and techniques for making regional economic projections.

The main point is, there is every reason why highway research and planning should make optimum use of such studies and why, in fact, regional analysts and planner should be drawn into the highway planning process.

Comments thus far have been concerned only with possible use of regional research by highway planners. Actually, of course, regional studies, as well as other types of socio-economic and physical research, have long been used in highway planning. A current example is the series of economic impact studies being sponsored by the various state highway departments and the U.S. Bureau of Public Roads. These studies are suggestive in a number of ways, and serve to symbolize the current stage of regional research in general.

First, it is worth noting that in getting economic impact studies under way in 21 states, reliance in the majority of cases has been placed on university research groups. The remainder are being carried out by the state highway departments themselves (as in California, Oklahoma, Missouri, and South Dakota) or by private consulting groups. As might be expected, quite a few bureaus of business research have been tapped, as in the case of the bureaus at the University of Oregon, the University of Kentucky, and the University of Wyoming. Several of the universities are relying on schools of business administration, others on transportation institutes (e.g., Michigan State University and Texas A & M), and still others on ad hoc interdepartmental research groups. It is worth noting that in many instances the individuals carrying out the impact

studies have been closely associated with regional research and tend to apply the concepts and methods of regional analysis.

The economic impact studies are certain to be valuable in highway planning, as well as for other purposes, and are likely to be the first stage in a continuing series of studies geared to providing socio-economic information for highway officials and the general public. The persons carrying out these studies would be the first to indicate that the methods which must be employed are crude and imperfect and that more sophisticated concepts and methods must be worked out if the best results are to be obtained from impact studies and similar studies with a regional socio-economic focus.

Actually, it is only too evident that the potentialities of regional research are only beginning to be touched. What is involved here is not a perfected system of analysis whose value needs only to be appreciated by highway planners and other possible users. What is more to the point is that regional studies to date have shown that regional research has much to offer to highway planners as well as to other groups whose functions are influenced by, and who in turn influence, regional socio-economic and physical development. If regional research is to realize anything approaching its potentialities for usefulness, it will have to be strengthened. This really means that abler persons will have to be recruited into the regional field and that they will have to be better trained when they are at present. Better research almost always implies better education—the two generally go hand in glove. Highway researchers and planners have a vested interest in the field and might well take the lead in an effort to strengthen regional research and regionally-oriented graduate education. The objectives would be to help in the establishment of strong research centers at universities to which highway departments can turn for help in dealing with complicated socio-economic research problems, and in the establishment of regional educational centers which can provide graduates well equipped to do, among other things, high-caliber highway research and planning within highway departments.

In a recent book (2) it was suggested (as have others) that the highway planner can function most effectively as a member of a team concerned with regional planning and development. Other members of this "team" are (a) persons concerned with other forms of transportation, (b) those with a responsibility for the development and conservation of natural resources within regions, (c) those working on problems of metropolitan expansion, (d) individuals concerned with area development or industrial development, (e) those in state planning, and (f) individuals with responsibilities for regional research, including research in industrial location, marketing, and similar fields sponsored by public and private groups. These persons, in carrying out their activities, are inevitably concerned with many physical, economic, political, and social elements which are closely interrelated. The education of persons who have, or will have, responsibility for such activities—no matter what their professional training may have been—can hardly be considered to be adequate unless they have had an opportunity to achieve an understanding of these forces, and of methods for analyzing them, through specially focused interdisciplinary study. Such study might be in the form of supplementary education, in large part for persons already in the field who return to a university on a fellowship basis. If properly organized, regional education programs of this type would tend to have a strong research focus. The task of advancing regional research and of improving the education of persons with responsibilities in regional planning and development should logically go hand in hand.

There is every reason why highway researchers and planners should take a leading role in the sponsorship of such regional education and research programs.

Highway officials have been entrusted with a powerful tool, one which, properly employed, can help promote sound regional development and healthy national growth. This is a most serious responsibility; it is also an exciting and challenging opportunity. They are in a position to provide leadership in getting the diverse developmental efforts to add up to something really effective and sensible. This opportunity can be pursued in a number of ways: by helping to bring into being what is called the "regional team" as the focus for cooperative effort and coordinated regional planning; through raising the level of public discussion of the key regional factors which shape the development

and welfare of the various parts of the country; and, finally, through alliance with other interested groups in increasing the excellence of regional research and regional researchers. The obvious direction in which to move to do these things is a joining of forces with universities in the development of strong centers of regional research and education in various parts of the country, where, among other things, highway and other transportation studies can be carried out in a broad and fruitful framework.

The requirements for decision-making in a field as significant as highway planning are demanding. It is only a matter of common sense that those who have this responsibility do everything they can to strengthen the sources of the knowledge on which such decisions must inevitably depend.

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Planning the Physical Environment

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● I OFTEN remember the gang of my early adolescent years sitting around discussing a new hangout in the neighborhood. Our discussion explored every possible human variable that might be involved in this new venture. We tried to anticipate everything that could have turned our projected move into a misadventure. We talked about who would use the hangout, who would be excluded, what our relations would be with other clubs, how it would affect our neighborhood status, how adults and other neighborhood groups might react to it, and so forth. All the pros and cons were weighed.

A discussion I recently attended revolved around a similar kind of venture. It had, however, a much different tone and quality to it. Here were experts—administrators, planners, engineers, real estate people, and the like—trying to discuss the future of a city. All, as I said, were experts in their special fields. They knew all about concrete, bricks, steel, tensile strength, traffic patterns, work-home travel distances and similar things. As I heard the discussion go on I was excited, because these topics were relatively new to me. How conclusions were reached to plan a highway or clear a slum were somethings I closely followed. Suddenly, I hesitated and then asked a question. What happened to the needs and problems of people in this discussion. I asked about what would happen to people as certain changes were made? How are their needs and relationships affected by change? After I asked these questions, the group was willing and even eager to discuss them. As I thought about it later, I wondered why the questions were left out in the first place. This was certainly not a new way of looking at problems for this group. They were surely aware of the problems of people, in many different contexts, all their lives. But why was it left out in this context?

Today my topic is people—and how they are involved in community decision-making—and perhaps why certain concerns about them are usually left out by well-intentioned people. I can summarize my feeling in several simple statements:

1. Among those persons involved in community government there is all too often only a limited awareness of the potential psychological impact of community decisions on groups and persons. Only infrequently do the needs of the people take precedence over the "things that really matter"—bricks, buildings, roads, and, above all, money.
2. Plans that are developed by city planners, highway engineers, and the like, though meeting the standards of their own groups, are often not executed in the way they are expected to because they fail to meet adequately the needs of the people of the community.
3. Programs of highway construction and slum clearance produce beautiful new roads and buildings, but they often leave human rubble in their wake as well.
4. Decisions about such things as highways, rapid transit and sewer lines, for example, often predetermine patterns of living that markedly affect the population of a community.
5. Basic to any approach leading to change is awareness that communities can change and want changes. If permitted, communities can develop methods peculiar to their own situation to put a program into action. Such self-imposed change is longer lasting than an externally imposed program. People whose needs are met by involvement in planning and implementation of a program can give it various kinds of needed support.
6. The understanding gained from involvement in such activities of planning is often transferrable to new projects and proposals making the process of change easier in the future. Conversely, nonparticipation may create further unexpected road blocks interfering with implementing programs.
7. Any program that does not consider all aspects of the problem in its approach

suffers, since unidirectional action leaves important and related areas behind and hinders long-term solution.

Let me turn to a more complete discussion of these points. People in decision-making positions are most often trained in either the physical sciences or economics, and less often have a background or experience in understanding the needs and reactions of people. People deal with problems as they are used to. Nevertheless, when people are reminded of this dimension they can easily take these problems into account. It is easy because all of us have experience with understanding people, whether it is our wives, our children, our poker companions, or the boss. This experience, aided and abetted by what I call the mental health sciences, can be brought to bear on decision-making problems, with much to gain.

An engineer or planner responsible for laying out plans for highway construction is usually concerned with traffic flow, economic areas, work-home distances, locations of commercial and residential property, and so forth. There are other considerations which he rarely pauses to consider: congregational patterns of people; friendship networks; economically and socially segregated neighborhoods; human and animal ecology; and many others. These approaches to planning, reflecting a sociological or "mental health" concern with the people of the city, can easily be fed to the highway engineer or planner by social scientists, psychologists, and others who work in the "mental health" sciences. Most engineers, firmly fixed to their accustomed patterns of thinking in purely economic and material terms, could, if properly approached and educated, incorporate these many human concerns into their plans. Some people in city planning are attempting to do this very thing. Decision makers who consider all the implications of their decisions, human as well as economic, are likely to make the most successful decisions for their communities.

The problem of decision-making is, of course, complicated by the changing nature of our society. If anything can be said to typify the present, it is the state of constant change we see all about us. The changes in our society subject individuals, family groups, and even whole communities and nations to new crises. The atomic age, for instance, and man's first reachings out into space, put and will continue to put society under tremendous pressures. We feel, somehow, that we are far from being in control of the present situation, to say nothing of our ultimate destiny. The individual's ability to make decisions that will really make a difference to him and his family seems to be disappearing rapidly. National and international decisions which will affect all of us and, very likely, all our descendants, are made, and we, perforce, stand by and watch, impotent. Even on more local levels, the individual is being pushed further from the decision-making which profoundly affects him. I think it is up to local officials to try to reverse, or at least arrest, this trend.

Towns used to be relatively independent units, where decisions about roads, schools, housing and the like were purely local ones in which many could participate and see the impact of their work. Today more distant forces interact with local decision makers, and the power of making decisions is dispersed and distant. It is becoming increasingly difficult to make local plans, even in local institutions. In almost every field, national offices have set up total programs into which each locality must fit. School boards and state departments set up courses of study which, though subject to some individualization, must be adhered to in general. Whether, in the long run, this tendency is for good or bad I cannot say. But I can say that it does leave the individual with feelings of helplessness and impotence.

Let me quote Professor Nisbet: "Release man from the context of the community and you get not freedom and rights but intolerable aloneness and subjection to demonic fears and passions."

Sometimes men who have had the opportunity to make decisions taken away from them are given the chance to be heard on a single specific problem. What happens? I think that they concentrate on this one opportunity to make their will known; all the fears and trepidations—real and unreal—which have been built up in them by having to remain quiet and accept the decisions of others so many other times. I have a theory that this is what happens when a community holds a referendum about an emotionally loaded decision—a new highway near a city, for instance. I think that when citizens are permitted

to speak out on the highway they sometimes use this as a chance to rebel, to fight. I also think that what most of them are fighting is not the highway at all, but rather a much more diffuse—and more disturbing—thing, their overwhelming impotence. Here is their chance, in other words, to make up for their enforced passive role and do some decision-making with a vengeance. And they do. The reason I think this is so is the great amount and violent kind of criticism that some plans get. In other communities, where the new highway is not offered for public decision, the furor frequently does not occur, and what fury might be directed at it is directed at some other isolated opportunity the citizens get for making a decision.

Now, my plea is not to avoid trouble by not offering a highway plan for public discussion. It is, rather, to avoid the build-up of feelings which explode on issues like that of a new highway or an air base by working out means for involving the people to a far greater degree in the day-to-day decision-making process of the community. Permitting them a voice, and an inadequate one at that, on some isolated issues is frequently simply an invitation for the expression of pent-up hostility and resentment.

Poston, at the University of Southern Illinois, is a major proponent of this concept, and one who has put it into action. A national magazine once described Poston as a "psychiatrist for sick communities." He, in common with groups like the American Friends Service Committee, envisions his role as one of helping people help themselves. Utilizing techniques of social science and community organization, he aids communities in doing a careful self-examination of their problems and their assets. His technique, political in effect, but based upon concepts developed in the university, is to allow a true cross-section of a community's population to participate in the self-study and in making plans for their town. Needless to say, the cross-section he chooses is one not usually involved in community decision-making. Experts are available to advise, but not to plan for the people.

One important implication of Poston's work is that a community must be dealt with as an integrated whole rather than segment by segment. As another example of the need for an integrated approach to community problems we can consider delinquency. Delinquency involves individual psychopathology, community economics, social stratification, local business opportunities, education values, among others. The problem of delinquency cannot be attacked on any single front with any hope of success; every community phenomenon which is in any way related to the problem must be simultaneously studied and handled.

I mention delinquency here because an illustration that I have in this area has a direct relationship to highway construction.

In a town in the northeast, there was reported a sudden increase in juvenile delinquency. Police, judges, and parents reported excitedly and with some agitation on the increasing delinquency problem. All sorts of hypotheses were thrown into the hopper but the increase continued unabated. Quite parallel to this development was the planned construction of a new superhighway through the city. Some heated discussion was noted around town, but no reported contact could be made with the highway engineers to effect a change reflecting community wishes. The topic of the highway, like the topic of delinquency, was discussed in every household and at every gathering of but two people or more. The problem was simple, the highway would cut a town in two.

The limited access highway would cut neighbor from neighbor—children from schools previously attended, and friends from backyard gossip. Suddenly the decision was reversed; the highway plans were changed and the highway bypassed the city. Almost as if by magic the delinquency dropped off. I am not usually a believer in the thesis that if two things occur in the same period of time they are related as cause and effect. However, the evidence seems more than coincidence. The reason, as I see it, rests in the disruption of the human community's equilibrium. Communities, like people, tend to have an integrity. They have natural patterns of relationship, both social and economic, among others, which when disrupted cause increased symptoms of disorganization in the people directly concerned and in those in nearby areas.

Community self-study must treat every local problem in the same way. Problems of the school system cannot be solved by working alone with teachers, with administra-

tors, with school budgets, or with any other single factor. The schools of a community must be considered in the light of total community needs, values, and attitudes. If self-study shows that there are conflicts between these various needs, presenting them to public scrutiny can often lead to resolution. Incidentally, the longer and the less questioned any educational practices have been, the greater is the need for careful re-evaluation of them. Alfred North Whitehead wrote: "The doctrines which best repay critical examination are those which for the longest period have remained unquestioned." In community self-evaluations, neither education nor any other institution is a sacred cow—to remain untouched by progress or inquiry.

In studying a community we find, in addition to official structure and organizations, an unofficial structure and set of institutions which deserve equally thorough scrutiny. Official organizations do not always represent the true power structure of a community. Even the voluntary and unofficial organizations in a community frequently represent only segments of the total population, and not the many groups out of the mainstream of community life. Since very different mental health problems present themselves in different segments of a population, it is important to take cognizance of all groups and all people.

Just as there are in any community unofficial power structures which are able to bypass official functions, there are unofficial patterns of help for mental disturbances which have no contact with the community's more official mental health activities. I think it is important to understand that many decisions of the community in fact break up these unofficial channels, and either put tremendous burdens on the official agencies, or, perhaps more likely, leave problems unsolved.

One of the best examples of this is slums and slum clearance. Slums have long been recognized as sources of social ills and blights. Arguments for slum clearance claim that it will lead to delinquency prevention, lower costs for police, fire, and welfare services, and that it will permit a raising of the tax base and will beautify the community. All these are sound arguments. When slum clearance and redevelopment are final facts, after long and arduous work, a new so-called redeveloped area arises in the community. I wish the story could end here, but it does not. If we put aside for a moment the arguments in favor of slum clearance—valid arguments, I confess, but arguments concerned with money and material things—and look at the people, we see a long and sometimes unhappy conclusion to the story of slum clearance. First, we have no positive proof that slum clearance lowers crime and delinquency rates. But more important, we forget that to the people who live there, what we call slums is home. People find it hard to give up their homes. Contacts with familiar neighbors; chats through open windows in the summer; passing comments to the neighborhood grocer, cop, or bartender; are all part of a normal and comfortable day. Gangs in some places make up a world which is hard to give up. For what would the slum dwellers be giving up their way of life? For emotionally sterile, though clean, housing projects; for dispersion to the unfamiliar suburbs; for relocation in areas without friends and family? Dispersion can mean giving up the informal and unofficial supports vital to the preservation of life itself. Cold officialdom and sterile buildings are a poor substitute indeed for a known, warm, supportive environment. For many, you see, the slum has assets as well as liabilities. Loss of home can be as emotionally disturbing as loss of a member of the family. Relocated people can literally grieve and pine for the razed slum that was home.

As we have seen, the question of a highway going through the center of human habitation may have its human consequences. Erich Lindemann and his group of Harvard psychiatrists working at Massachusetts General Hospital have shown the importance to a community of the network of unofficial caretakers. Official agencies, swamped with work, are often unable to meet the somewhat intangible emotional needs of the people. It is amazing to me how frequently people are helped by these unofficial caretakers—the corner grocer, the undertaker, the bartender, the cop—without aid by a trained psychiatrist. Slum clearance frequently means the disintegration of a group of these caretakers, and loss by the people in the neighborhood of essential emotional supports. This, I think, is why, despite the best laid plans, so many slum clearance and redevelopment projects go awry. The people who have been relocated

often turn the new projects into slums, or move to other slums which have not yet been destroyed. Although the re-creation of the old environment may make some of the re-located people more comfortable, neither of these courses of action is really progressive or constructive in itself. Perhaps we may find our way out of this dilemma by working with people before important decisions are made, attempting to understand their needs, involving them in planning discussions, and making changes in official plans which allow for the preservation of the unofficial network of caretakers.

I am not against slum clearance nor am I against new much-needed highways. I am against slum clearance and highway construction that proceeds without attention to the social and emotional needs of the community, just as I am against any community planning project which disregards human needs. Zoning practices, school location plans, suburban development, and many more, too frequently proceed either in indifference or ignorance of the people who work, learn, and live in the community.

The tremendous growth of suburbs around every large city and along their major traffic arteries is a case in point. These bedroom communities—attracting people of a single socio-economic group, dictating uniform patterns of life and growth to their inhabitants—seem to me to lack some of the richness and variety of cultural and human resources which can be found in the city. Perhaps the answer is to concentrate, not on separate municipal and suburban planning or on highway construction alone, but on metropolitan planning, which will encompass the economic, cultural, education, and emotional needs of both the city, the suburbs, and the county at large.

The process of planning and the development of new programs bring many fears to the fore. People do not wish to be manipulated. A value system is involved in any program of change that recognizes needs, standards, culture, and ways of doing things of all segments of a community. True leadership involves motivating, guiding, and organizing activity without giving finite direction or setting the goals. True leadership gives people a chance to practice democracy by allowing them to participate in important decision-making. People, not things and money, should be the prime consideration in planning and in implementing programs.

I believe there is evidence of a relation between physical environment and mental health. Our understanding of this relationship can be an important factor in achieving our goals.

Urban Arterial Developments Which Benefit the Community

W. EARLE ANDREWS, Andrews and Clark, New York, N. Y.

● THE NEW YORK parkway system in the New York City area is the oldest and most comprehensive urban arterial development which benefits its community. Starting with the old Bronx River Parkway Commission in the Bronx and Westchester Counties more than forty years ago, and soon thereafter with the Long Island system, these two suburban systems on the outskirts of New York City in New York State finally were joined within the city itself to form an extensive urban network. The principles governing their establishment, extension, and development were adopted by the State Council of Parks in 1929, after wide experience in the initial development of this program. These principles were amended in 1955 to become effective January 1, 1956 by approval of the State Council of Parks headed by Robert Moses. They are repeated below:

1. Definition. A parkway is an elongated, restricted landscaped park with pavement for the exclusive use of automobiles classed and used as pleasure vehicles, running through it, with neither crossings at grade nor traffic lights, and with access only at specified public entrances.

2. Location. Parkway should be located so as to provide an attractive means of travel, to relieve existing congested trunk highways and to provide easy access to park and recreation areas.

3. Right-of-Way. The width of a parkway right-of-way should be liberal in order to provide for requirements of design and for protection. In the future, the minimum width of a parkway right-of-way should be at least 400 feet except in cases where extraordinary cost or damage would result. Where existing dwellings are affected by parkway improvements or extensions, homes should be relocated for the owners to new properly laid out sites whenever possible.

4. Crossings. No crossings at grade or left turns should be permitted. The question of whether a parkway should be elevated over a local or crossroad, or whether the local or crossroad should be elevated over the parkway should depend upon topography and cost. In flat country and especially in suburban centers every effort should be made to keep the parkway down. Other conditions being equal, the cost of elevating the parkway will be greater than the cost of elevating a narrower crossroad, but the damage to adjacent property may be greater in the latter case. Sufficient land should be obtained at crossings so that private property will not be damaged by the elevation and to afford adequate space for planting and landscaping and for entrances. Accelerating and decelerating lanes should be provided to facilitate access to and exit from the parkway.

5. Entrances. Public entrances and exits should be spaced a considerable distance apart and normally should be constructed only in connection with the elimination of important crossings. In heavily populated suburban areas, interchanges with full access are desirable where cross roads are of major importance, but the number of roads where access drives are provided should be kept to a minimum. Private entrances should not be permitted.

6. Pavements. Parkway should include two separate, hard-surfaced paved roadways, each with a minimum of two lanes, each designed for safe, uninterrupted traffic in each direction. Grades and curves on one paved roadway may be completely independent of those required on the other and generally the minimum curvature and maximum grade should be determined by local conditions and the established maximum speed limit. Steep grades and sharp curves should be avoided. The two paved roadways should be separated from each other by a dividing strip and from adjacent properties by a protective landscaped strip. Both such strips should be of varying width as may be deter-

mined by topography, land value, curvature and necessary connections to intersecting roads. Wherever the right-of-way is sufficiently wide and there is sufficient prospective use, bridle paths, bicycle paths and pedestrian walks should be considered.

7. **Bridges.** Bridges should be designed not only for strength but for appearance and minimum necessary maintenance. Architecture, appearance and landscape treatment are as important in the design of parkway bridges as structural features. Generally, bridges should have stone facing.

8. **Planting.** Planting and landscaping of parkway are fully as important as pavements and bridges, and should be designed to provide a scenic setting and wherever necessary to mask out glaring headlights and to screen out undesirable nearby developments. No state parkway should be constructed without assurance of adequate funds for planting and landscaping. To avoid excessive maintenance costs plant material indigenous to the site should generally be used in plantings and the areas of open spaces and of trees and shrubs should be properly balanced.

9. **Lighting.** Where traffic conditions make parkway lighting necessary, the poles and fixtures should be appropriately rustic, and should blend with landscaping and other parkway structures. The feed for the lighting system should be underground and no overhead wires should be permitted.

10. **Structures.** There should be no structures along a state parkway excepting those necessary to its normal use as a driveway and to incidental recreational facilities on its borders. Filling stations and other necessary parkway structures should be attractive in appearance and simply and appropriately designed in permanent materials.

11. **Zoning Restriction.** The area within 500 ft of a parkway should be zoned by appropriate authorities against commercial and industrial uses, and so as to encourage a high-class residential development. Such zoning should especially prohibit billboards and other forms of outdoor advertising.

12. **Signs.** Signs to guide and regulate traffic should be kept to a minimum and be simple, clear and large enough to be easily read at the regulated speed so that the flow of traffic will not be retarded by indecision.

The provisions of Section 675 of the Conservation Law which authorizes the state Park Commission to regulate signs within 500 ft of state parkways should be strictly enforced.

13. **Subdivision Planning.** Marginal roads should be required by local planning authorities in connection with their approval of plans for subdivisions abutting upon a parkway. Only in certain unusual cases where the topography, size of the tract or existence of previously filed subdivision maps preclude such marginal roads should exceptions be made, and in these instances the local authorities should require the developer to provide screen plantings, fencing and deep rear or side yards for all lots adjacent to the parkway.

14. **Public Utilities.** Public utility lines and pipes which must cross a parkway should be installed underground. The regional park commission should obtain the cooperation of local public utility companies in the placing of pole lines at least 100 ft distant from the parkway right-of-way line.

The urban expressways for mixed arterial traffic already constructed in New York City include many of these parkway principles. The rights-of-way necessarily were narrowed to landscaped shoulders but landscaping has been provided wherever there has been room for it. Stone bridges have been replaced by concrete, brick, and steel structures. The larger dimensions of the pavements for both truck and pleasure automobile traffic necessarily occupy a greater proportion of the rights-of-way but the structures have been attractive.

The wide right-of-way required by expressways is in itself a large and desirable open space in the normally congested urban area. The value to the community of this open space can be immeasurably enhanced by proper landscape treatment and marginal recreational development. The trees and grassed slopes of a properly landscaped

right-of-way, in addition to beautifying the community through which it passes and bringing a touch of the suburbs to the congested city, also provide an effective visual screen and noise buffer between the arterial traffic and the adjacent community.

Marginal recreational facilities which can become part of the arterial development include playgrounds, sitting areas, footpaths, bridle paths, promenades, overlooks, and even small beach developments.

Wherever possible, recreational facilities have been provided along the margin of the expressways in New York City. As the expressway curves across the normal grid pattern of city streets, it inevitably leads to the creation of many odd shaped remnants of property and provides opportunity for the construction of recreational areas varying in size from large neighborhood playgrounds to small sitting areas. The larger remnants are adapted as neighborhood playgrounds and include a comfort station, kindergarten play facilities, facilities for the younger teenage groups, a playfield and, where possible, facilities for court games. The smaller areas are adapted as sitting areas. Some are merely shaded areas with benches; others may contain a sand pit and some open space to which mothers may bring young children for safe play; still others contain game tables where the senior members of the community can enjoy a quiet game of checkers or chess. These playgrounds and sitting areas have been not only beneficial to the community for recreational purposes but have been valuable safety measures in keeping children from the side slopes and intercepting them from crossing arterial traffic.

Expressways in the neighborhood of housing developments have, of course, been coordinated with the housing authorities.

The expressways recently built in New York City have been constructed by a number of agencies including the New York State Department of Public Works, the Triborough Bridge and Tunnel Authority, and the Borough Presidents. Those built by the State Department of Public Works have been constructed with Federal aid.

In addition to the fundamental traffic relief for which expressways are primarily designed, their most important contribution benefiting the community is in opening up corridors through the city which inevitably end up with better marginal improvements, both public and private. The effect of this can be seen on every expressway recently built in New York City. For example, the great housing developments along the East River Drive would not have happened without the waterfront arterial improvement. Conversion of old private homes on Columbia Heights above the New York City harbor into boarding houses was stopped, and their return to first-class small apartments and private buildings came about following the construction of the Brooklyn-Queens Expressway. The recent construction of the Queens-Midtown section of the Long Island Expressway, built by the Triborough Bridge and Tunnel Authority through a heavy industrial area, has resulted, in a little more than a year, in junk piles being replaced by modern industrial and institutional buildings. Van Wyck Expressway has also made marked improvements to the community.

These are only a few examples of mixed traffic arterial expressways actually completed in the last few years in New York City. The marginal developments and neighborhood rejuvenations and improvements, following the construction of the network of parkways for pleasure traffic in and around New York City, have had tremendous impact over the last thirty years. Whole neighborhoods have been rejuvenated. Waste lands have been made accessible. Waterfronts, which were partly junk yards, have been replaced with parks along the Hudson River.

The vast developments of the previously inaccessible meadow lands of Jamaica Bay are attributable almost wholly to the influence of the Belt Parkway. Prior to the construction of the Henry Hudson Parkway and the Henry Hudson Bridge, the ridge known as Riverdale was pre-empted by large estates assessed by the acre and yielding only a modest revenue to the city. Today, property values have spiraled. This ridge is now the site of numerous suburban homes and large garden apartment houses which have enormously increased assessed values.

The construction of Shore Parkway has served and expanded residential use of adjacent areas. Large developments of apartment houses have been built along Shore Road farther south at Gravesend Bay, and in the area west of Ocean Parkway many of garden-

type construction. Intensively developed subdivisions of small private homes have been erected facing Gravesend Bay.

The privately owned land adjacent to Grand Central Parkway has become one of the most attractive residential areas of the entire city, with developments ranging from two-story garden-type apartment projects to medium-and high-priced private homes.

The principles which resulted in the successful development of the New York City parkway system should be applied, with modification, to the huge expressway and arterial program for mixed traffic. The corridors through which the mixed traffic arteries will pass will be, on the average, of less width because the vacant land seldom exists through cities where mixed traffic routes must be placed. Realism dictates modification from parkway architectural standards, but the niceties of design should not be ignored. The dimensions of the expressways will be different and parkway details need not be copied, but the effect on the neighborhoods through which the arteries will be constructed will be beneficial if comparable rigid standards are followed.

Visual Approach to Highway Planning and Design

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● VISUAL DESIGN as used in this paper is intended to have a very broad meaning. One way of indicating the breadth of this meaning is to note the several kinds of concerns about visual aspects of highways which would all be dealt with within the general phrase "visual design." The areas of concern are as follows:

1. Pleasure and satisfaction.
2. Safety and convenience.
3. Economic values.

Pleasure and Satisfaction

The concern with achieving pleasure and satisfaction and reducing ugliness and dreariness is, of course, not limited to the highways. This is a concern which extends to most aspects of urban and regional development. Nonetheless, the highways increasingly are becoming corridors along which people pass, spending a major portion of their waking and observing time in looking through car windows. The significance of what they see in terms of personal satisfactions can hardly be exaggerated in its cultural significance. All aspects of ugliness and dreariness in the urban and rural scene cannot be dealt with effectively unless highway planning and design gives major attention to achieving pleasure and satisfaction for the driver and passengers.

Safety and Convenience

A significant aspect of dreariness or monotony in highway driving is its effect on safety, but concern with safety and convenience is not limited to an interest in maintaining the alertness of the driver. There is equal concern with the driver's being able to perceive and act on signals, signs, and other guides. Confusion resulting from improper design within the right-of-way or from interference of activity outside the right-of-way may inconvenience the driver at the least, and may at the worst lead to injury or death.

Economic Values

There is increasing concern with the effect of a major new transportation unit on the economic value of surrounding properties. The elevated railroad met a transportation need, but it had a serious blighting effect on the value of property along its right-of-way.

There also is equal concern with the effect of adjacent development upon the traffic artery. Present construction of limited access highways results from experience with ordinary highways, built at great expense, whose traffic capacity was rapidly diminished by conflicting development along the margins of the road.

In both cases, there was economic waste through lack of consideration for the interacting effects of highway development and adjacent land development. By contrast, a concern for these relationships, including visual relationships, can enhance the values of both the highway and adjacent development.

Illinois Highway Commissioner Babcock has stated this total concern by declaring: "A highway is not an engineering accomplishment alone but is a tool of civilization. It is high time we considered it in the light of its over-all value."

There are many approaches to highway design which require research study and the development of applied techniques. The University of Illinois has an interdepartmental highway research committee, which represents many disciplines and which is concerning itself with such diverse questions as the following:

1. The relationships between highway patterns and the journey to work for new industrial plants.

2. Improved techniques and additional uses for origin-and-destination surveys.
3. Problems of farm value appraisal for right-of-way taking.

But among the subject areas of significant concern is the approach to visual design of highways.

The research proceeding at various points, including the Massachusetts Institute of Technology and the University of Illinois, is based on the premise that visual design principles can be developed and applied to certain problems in highway design so as to minimize ugliness and dreariness and maximize safety and convenience. It is further asserted that these same principles applied to alignment location and other aspects of highway planning would contribute toward maintaining and enhancing economic values by fitting the highway into its environment.

PROPOSED WORKSHOP ON VISUAL APPROACH TO HIGHWAY PLANNING AND DESIGN

The independent experimental studies which have been identified have proceeded to the point that a workshop of a few days' duration is advantageous. The workshop should be limited in attendance, but it should comprise, in addition to those working in various aspects of highway visual design, individuals who can contribute because of their activity in highway design and construction, in visual design, and in highway impact analysis.

The workshop technique would permit development and refinement of ideas for appropriate research approaches, including the application of techniques or procedures in other areas of research, to these visual design questions.

From a first testing workshop in this research area, a series of workshop or conference sessions over the next two years would stimulate interest in participation in such research, aid in the definition of research needs and opportunities, and strengthen independent research activities by facilitating exchange of experience and viewpoint.

EXAMPLES OF RESEARCH IN PROGRESS

For some time now, members of the Department of City Planning and Landscape Architecture at the University of Illinois have been active in formulating and exploring, with graduate and undergraduate student assistance, several interrelated aspects of research on environmental design. Although these studies serve other purposes as well, they are of immediate value to those concerned with highway design.

M. I. T. Study

Simultaneously, Professor Kevin Lynch, of the Department of City and Regional Planning, Massachusetts Institute of Technology, has devoted much attention to the problem of environmental analysis and design of the highway in the urban scene. He has summarized the scope and intentions of his program as it relates to highway planning and design as follows:

The M. I. T. study began in a preliminary way in the spring of 1957 and is to continue in its first phase through June 1958 and perhaps the following summer. The problem set was the nature of the perceptual experience received while driving or being driven on the high-speed urban highway, and the means by which this experience might be made more pleasant and meaningful. The study arbitrarily excluded both the consideration of the rural highway and the impact of the highway on the non-driving observer. The principal premise underlying the work is that movement on the highway takes a major segment of the time of many individuals, that this time might be enjoyable as well as functional, and that the highway experience will be one of the major ways in which citizens will be able to grasp the form of their extended metropolitan regions.

Two explorations have been made thus far, as follows:

1. A general inquiry into the sensations of an observer in motion, including studies in psychology and esthetics, as well as general speculation.

2. Case studies of several existing urban highways: Route 2, Boston; Fairmount Parkway, Philadelphia; and the East River Drive and New Jersey Turnpike in the New York region. These case studies were made by two observers in a car, who recorded their momentary impressions as well as making on-the-spot sketches. These recorded impressions were transcribed, then plotted on time scales and analyzed for content and interrelation in many different ways.

These experiences are now being summed up in a first-round discussion of the elements involved in this process, according to their significance and interrelationships. These include such items as perception of the spatial envelope, of motion, and of accompanying traffic; or the imageability, level of communication, or melodic character of the experience.

A study is now being planned of separate elements, such as motion perception or imageability. One part of such studies will be development of a means of representing the experience, so that the quality of any given proposal can be judged, and design alternatives can be pursued.

The conclusions will be illustrated, as far as possible, by hypothetical highway designs. These designs will attempt to deal with the sequential and temporal nature of the highway trip, and may be expressed in diagrams, movies, abstract models, or flip cards.

At the same time, a quick reconnaissance will be made of outstanding examples of highway design in the United States. This reconnaissance will produce material for the theoretical studies, and may possibly lead into a more systematic survey.

Subsequent studies may then go on to interrelate the separate perceptual elements, and to develop a technique for the complete perceptual design of a highway.

University of Illinois Visual Design Research

The Illinois studies begun in the fall of 1956 have concerned themselves with pedestrian and slow-moving vehicle situations as well as fast-moving vehicle situations on rural highways and toll roads. Urban case studies have comprised small- and medium-sized cities rather than the major metropolitan areas mentioned in the M. I. T. studies.

Attention has been directed first toward methodology for inventory and recording of visual and other perceptual elements of the street or highway environment. Secondly, attention has been concentrated on development of a "vocabulary" of words and graphic symbols to identify perceptual elements and their visual relationships (see Fig. 1).

After some preliminary studies (as varied as the central square and business streets of an Illinois county seat town and the approach to the Grand Canyon at Grand Canyon Village) analysis was concentrated in the Spring of 1957 on the main street of an Illinois town and on the 30-mile stretch of US 150 across Champaign County.

Bement Study. The first program dealt with the farming community of Bement, Ill. (under 2,500 population), typical of Illinois and small enough to allow detailed examination of its one main shopping street. Twenty-two second-year design students recorded this particular environmental situation comprising a street scene three blocks long, including pedestrian movement and subdivided by the main street and vehicular traffic. The analytical sheets recorded colors, textures, patterns, space flow, objects in space, odors, weather, and kinetics (see Fig. 2).

The second phase of the student problem dealt with redevelopment solutions which were in proportion with the funds and requirements of such a community. It is certain that the variety, invention, and the understanding of the nature of the problem was greatly improved by this method of initial analysis and by the critical selection of what was important in the scene, and why.

Route 150. Whereas the Bement studies dealt with the inter-mixture of pedestrians and vehicles, the other problem was limited to the scene as witnessed from behind the steering wheel. Twelve graduate students from architecture, city planning, and geography participated in this recording of the visual elements on US 150 as it crosses Champaign County, Illinois. (This highway is now in the process of being re-aligned and constructed as a part of the new Interstate System.)

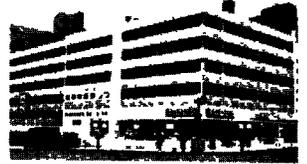
US 150 is a typical Illinois highway running through the flat corn fields, penetrating

PARKING Ground space devoted to the temporary occupation of vehicles, usually close to a building. Ornamental landscaped areas.

Salor

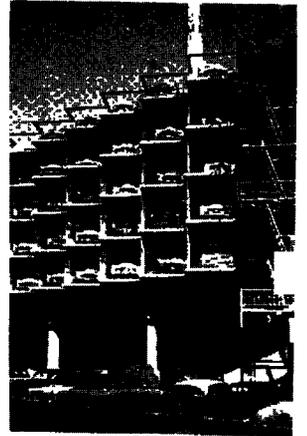
GARAGE

A building for temporarily housing automobiles, usually in congested areas, where more than one vertical level of parking is economically justifiable.



MECHANICAL

A parking structure or garage in which the motor vehicle is stored with the aid of machinery.



MULTI-LEVEL

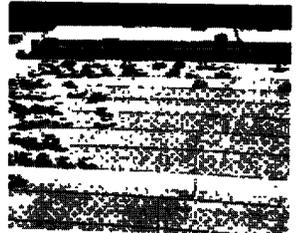
Many levels, in an upward rising direction for the temporary storage of motor vehicles.

VERTICAL

More than one level, in an upward rising direction for the temporary storage of motor vehicles.

LOT

A specific type of off-street parking, usually an area without enclosure or structure.



OFF-STREET

Areas provided for the temporary storage of motor vehicles other than the outer lanes of streets.

METER

A meter installed at the curb in congested urban areas to charge for automobile parking time. A coin inserted in the meter sets a clock mechanism in motion. A flag shows until the time purchased has run out, at which time the flag disappears.

Reifer



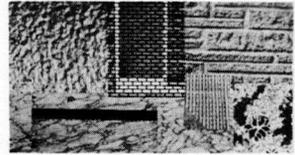
Figure 1.

TEXTURE the characteristic composition of the surface of a material or thing acquired naturally, or through a peculiar processing method, or both.

SCHNITZIUS

the interrelation of parts, manner of structure, structural quality.

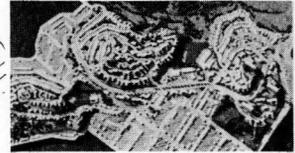
WEBSTER



TOPOGRAPHY

the surface features of a given piece of land or the description of such surface features.

NATIONAL HIGHWAY
USERS CONFERENCE



TOWER

a building or structure designed primarily to rise above its surroundings.

SCHNITZIUS

ELECTRICAL a vertical structure designed to carry or support electrical lines or wires, often of a skeletal framework.

SCHNITZIUS

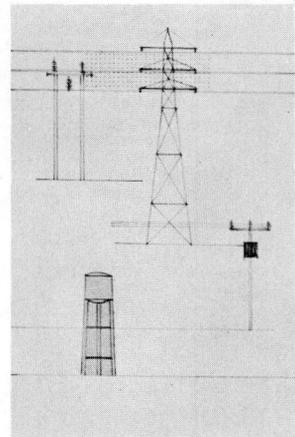
TRANSMISSION (Antenna) a vertical structure designed to support that portion, usually of wire or wires, of a radio station used for radiating and receiving signals.

Radio
T.V.

WEBSTER

WATER a tower or standpipe serving as a reservoir to deliver water at a required head, as to a fountain, etc.

WEBSTER



TRAFFIC

the flow of all types of conveyances and pedestrians along a street or highway.

WEBSTER

FLOW to move in, as in a stream; specifically in reference to vehicles and pedestrians.

WEBSTER

LANE a unit width of road surface adequate to accommodate a moving vehicle.

NATIONAL HIGHWAY
USERS CONFERENCE

LIGHT one of a set of signal lights used on highways and streets, especially at intersections, to regulate the movement of traffic.

WEBSTER

SIGNAL any device, whether manually, electrically or mechanically operated, by which traffic is regulated and controlled.

SCHNITZIUS

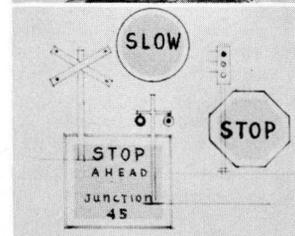
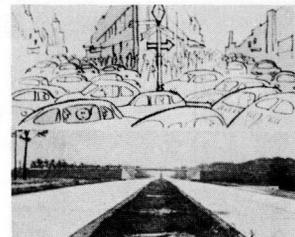


Figure 1. (continued)

PERCEPTUAL ANALYSIS

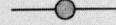
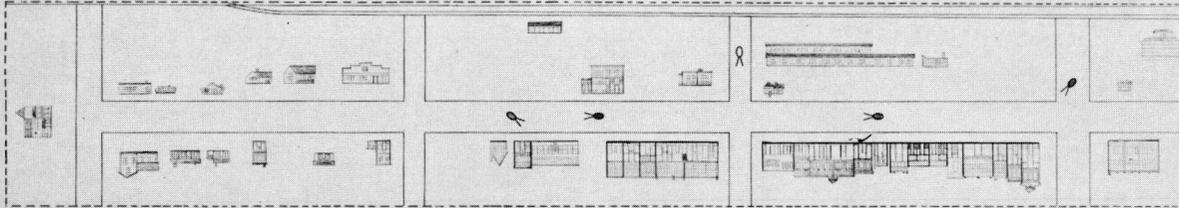
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UNIVERSITY OF ILLINOIS

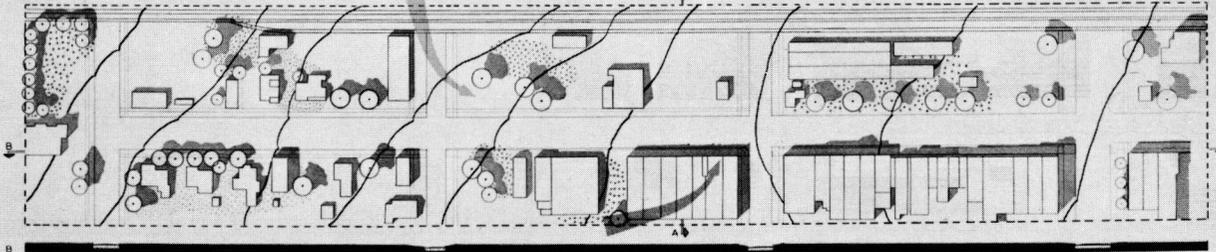


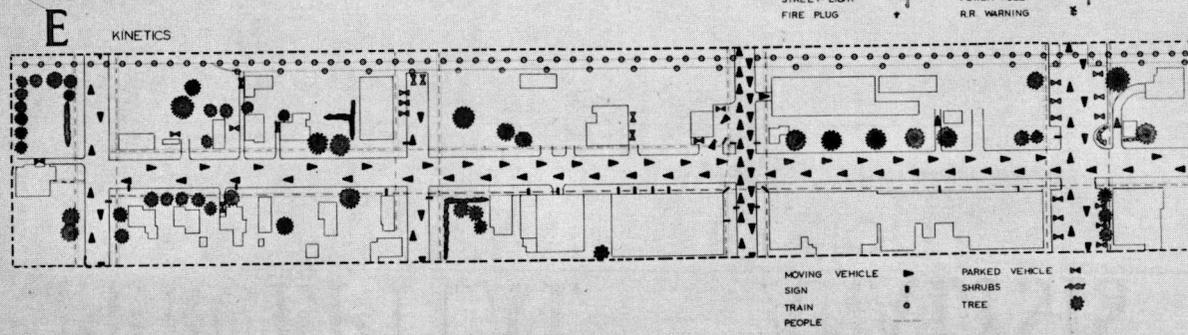
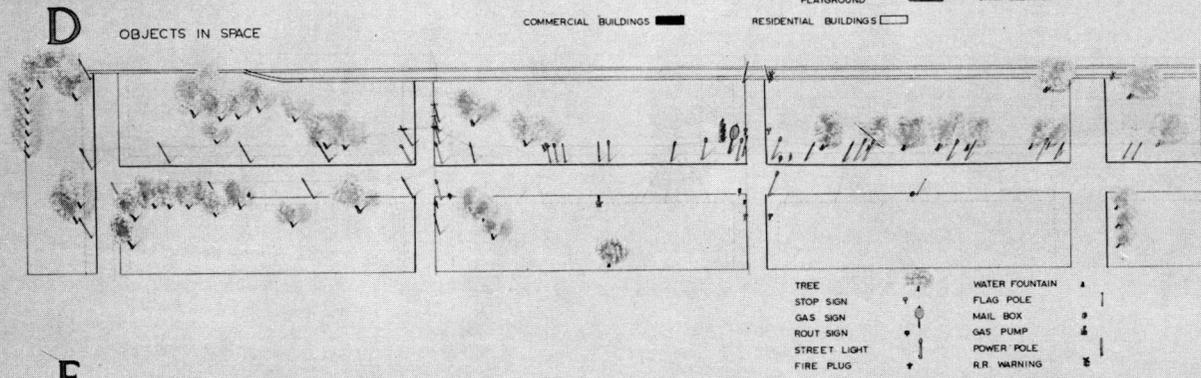
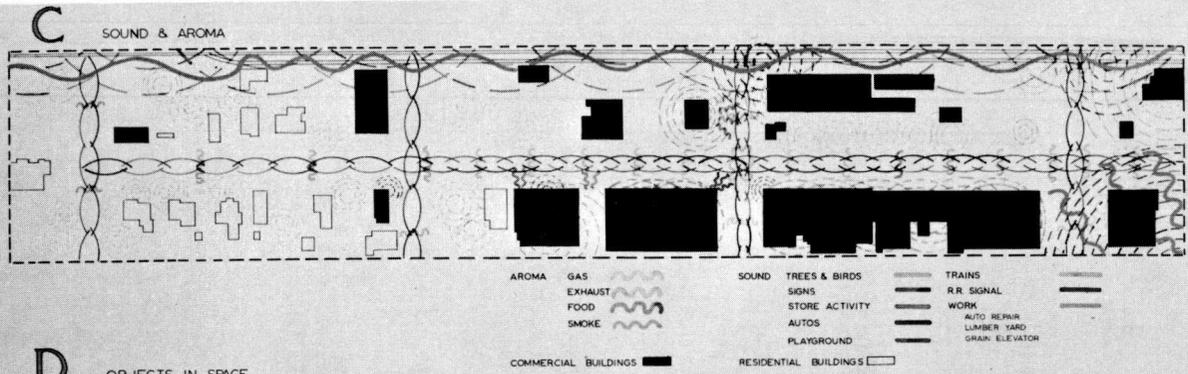
A WALLSCAPE



B WEATHER & TOPO

SUMMER PROTECTION  N W WINTER WIND 
 WINTER "  S W SUMMER " 
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DAVE GEHRIG

Figure 2.

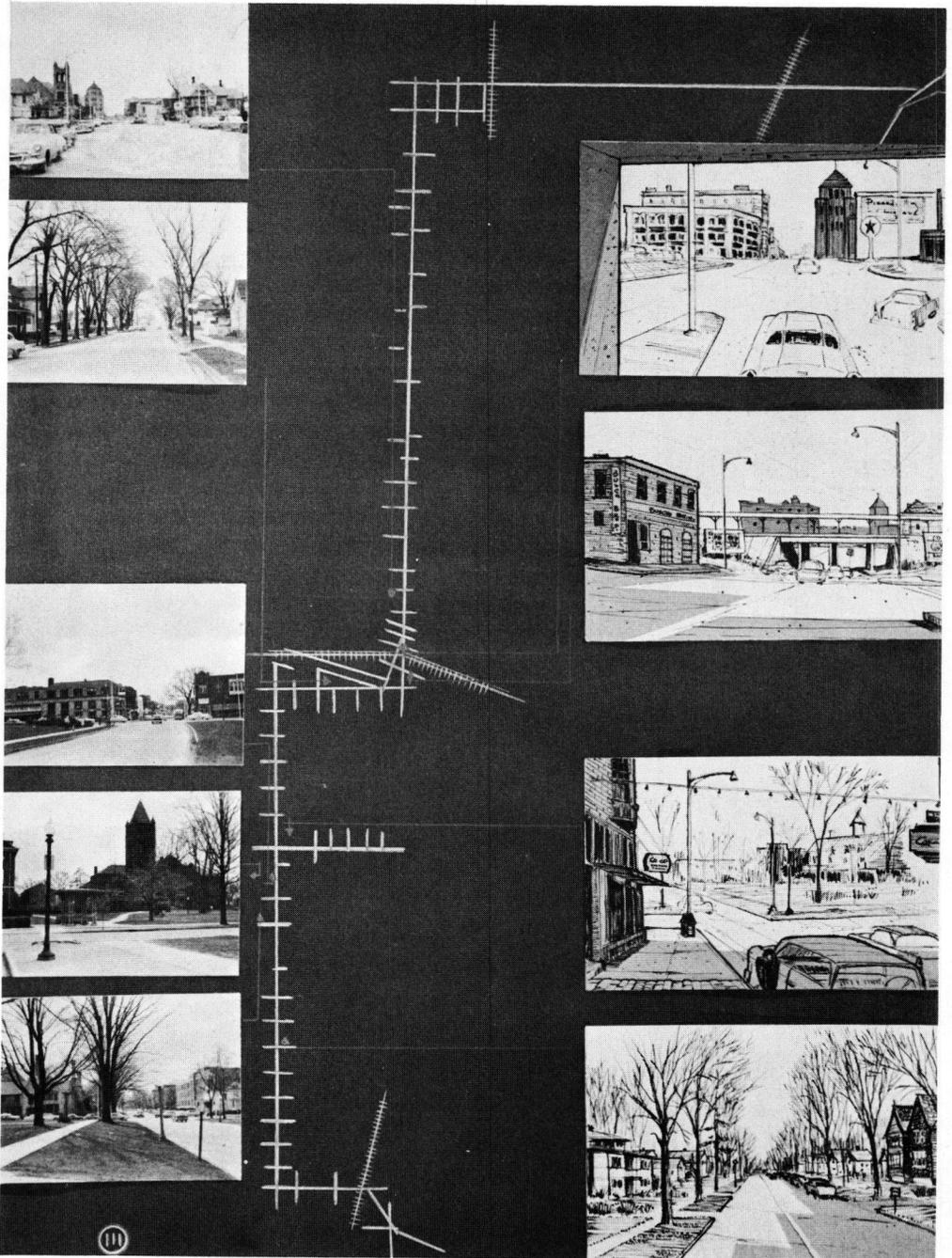


Figure 3.

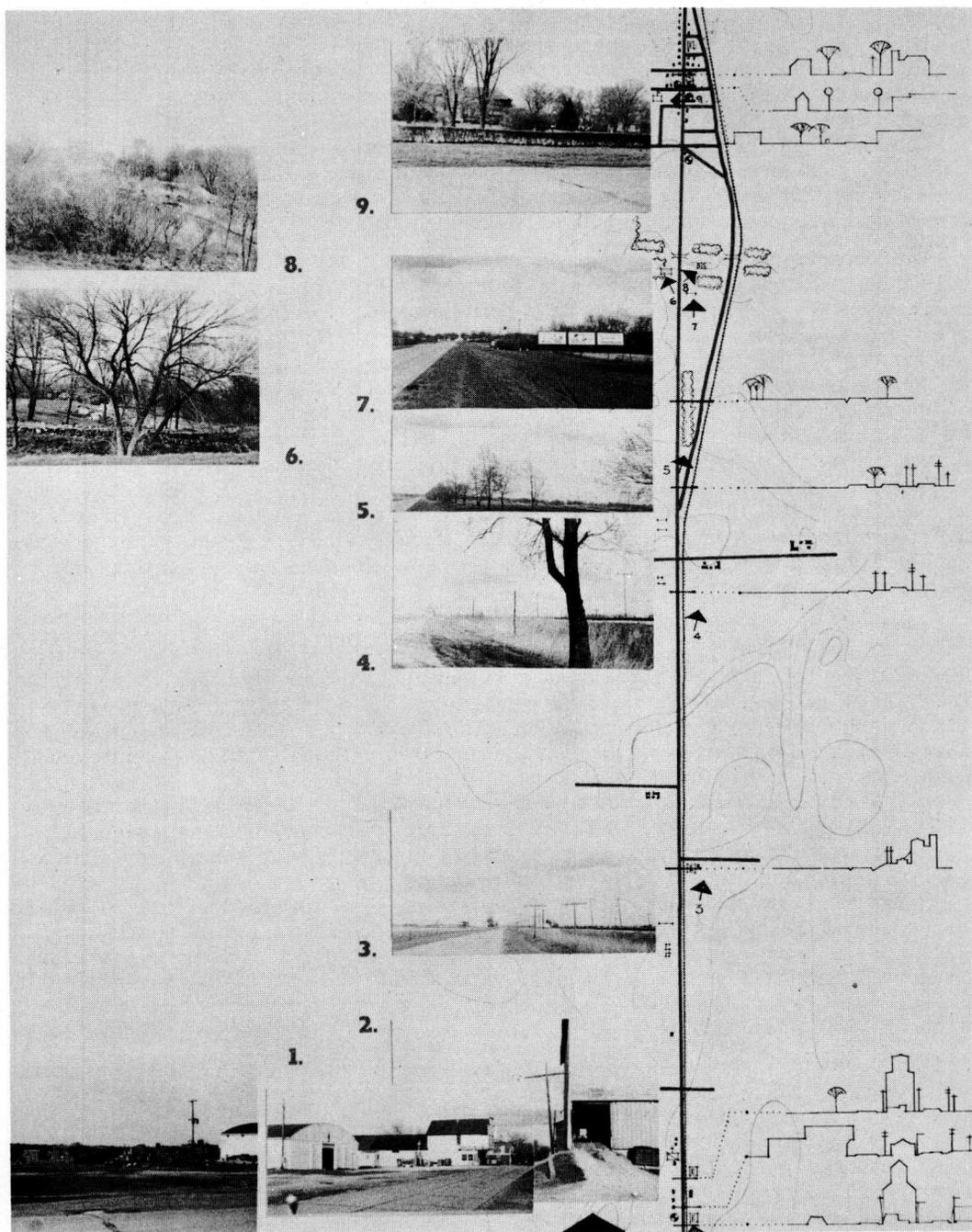


Figure 3. (continued)

such cities as Champaign-Urbana with a combined population of 70,000, St. Joseph with a population of 941, and Mahomet, 1,017.

The visual elements were recorded in both directions, thus providing two distinct visual sequences of the same route. These recordings dealt with the open country, apparently isolated objects, objects in succession, repetitive objects, the effects of perspective, and also the highway as it becomes enclosed by and winds through a substantial city. Significant elements were illustrated by both photographs and sketches in a series of cross-county studies along a mapped route line at constant scale (see Fig. 3).

The aim of this exercise was not primarily to gather evidence upon which to re-design the route, but to develop powers of observation and selection of such objects as are relevant at speed. Another important feature of the analysis dealt with the problem of describing accurately in both words and symbols these same recorded objects.

The foregoing exercises re-emphasized the fact that any conscientious study of visual values, which are becoming so vital to successful environmental design, including highway design, will reveal the limitation of terminology and that the problem of description and vocabulary must be tackled simultaneously with that of elemental analysis. The many problems involved in the preparation of a much needed international planning dictionary have been examined with groups in the United States and abroad in the hope of finding sympathetic understanding, talent, and support for the research to be undertaken. Action on such a dictionary is essential as the whole range of planning and design activities becomes more complex; otherwise, the professions will be permanently hampered for lack of a clearly established language.

Research at Illinois is being continued with additional case studies directed at testing and refining recording techniques. Special attention is being given to the methods applied to linear survey, recording, and analysis by other disciplines, such as the geographer's "traverse."

IMPROVING THE LANDSCAPE

Visual control cannot be recommended in vacuum. It is implicit that before any such control can be fully effective, the whole subject of highway environment must be continuously reviewed by a permanent research organization where the changing demands and conflicting circumstances can be analyzed in the interest of an improved landscape.

Such an organization could, of course, serve a wider need than just that of highway design. The whole inhabited scene is in need of a more harmonious environment. "Omnitecture," the study and art of artificial as opposed to natural landscape, has a very particular application to the problem at hand.

Things seen, and their significance in movement, have been the subject of scattered and spasmodic research; but the time has come when the need for collective and consistent assessment upon which recommendations and action can be taken is now a matter of pressing urgency.

Verticals, and Urban Confusion

In referring to the urban confusion, it may be useful to turn again to the contrasting visual imagery which develops, and point out some of the conditioning factors which, when better understood, can become both conscious and subconscious elements at the service of the "omnitect."

The overriding impression gained in most cities is that of vertical lines combined with limited lateral visibility. This impression prevails even though the structures may not be very tall; but the combination of corners, posts, poles, towers, monuments, and trees whose trunks are bare of foliage, all in close proximity, tend to lift the attention upwards, notwithstanding the confusion of trivial detail which robs the scene of comprehensible unity and repose.

Diagonals, and Suburban Anonymity

On leaving the urban area lateral visibility broadens and the vertical impression gives way to diagonals. Roof slopes, eaves lines, and the converging of wires in perspective become significant, and the effect of these diagonals is to deflect the attention from side to side instead of up and down.

Horizontals, and Rural Monotony

With the approach of open country, speed becomes the chief preoccupation rather than a general awareness which is so necessary and so hard amid the distractions of the city. The long horizontals of the pavement become transfixing, and only the most strident advertisements succeed in registering upon the attention. These "dazzlers" and other items, emerge in isolation as a series of targets or advancing blobs poised around, but clearly related to the weaving ribbon of the pavement ahead.

Here, then, are three visually distinct but consequential developments in vehicular progress, impressions which need analysis so that better use can be made of contrast, diversity, and the impact of the scene in general, so that particular messages can be conveyed en route with greater certainty.

HIGHWAY DESIGN POTENTIALLY A NEW FORM OF ART

Such abstract descriptions as are now necessary in highway design are difficult to convey in words; a simplified kinetic language is obviously needed. The film and animated diagrammatic representation is the logical medium for this purpose of relating static objects momentarily visible and in apparent movement; that is, objects floating along the beam of sight, pierced by the line of consciousness and leaving an intelligible impression upon the mind.

Subtlety Required

Apart from the feats of engineering, the outstanding characteristic of a successful and invigorating highway is its subtlety. The duller the country through which the highway passes, the more essential does artifice become. But the distinction between artifice and artificial must be immediately comprehended. Any over-emphasis and self-consciousness of design will turn subtlety into affectation. Engineering along—sheer calculated logic—is not enough. The forces at play in the design of a spare and elegant bridge are not the same as those affecting highway design. A bridge is a dramatic climax, a daring incident which compels attention. It is in the sharpest contrast with its surroundings, often appearing to be in conflict with the elements. The highway, however, should be in conformity with its land-form if it is to give any visual satisfaction.

The visual aspects of highway design must therefore be regarded as a justifiable, independent and respected facet of any Highway Design Department. It is an art form of the very highest order, especially since it plays a vital role in sustaining interest in safety, in soil stabilization, and in conservation. Lastly, and only because of the fulfillment of the earlier conditions, conscious design of the highway environment ensures a double beauty, both for the traveler and for the local inhabitant, two clearly defined visual conditions forming one environment.

There is, of course, nothing new in these proposals. Historic references show that what is now proposed is a continuation of past traditions of triumphant environmental design.

Because of what has already been achieved, the highway systems of the United States are the envy and admiration of everyone. What has been done, however, is not enough. Greater highways are now under way, and there will be more to come. It is inconceivable, therefore, that is the face of such greatly extended programs the vital role of visual design and environmental control will still be ignored. It is imperative that the problem be fully recognized and that visual research be established as an indispensable part of highway design teams.

There can be no real comprehension of "enviria" without the deepest appreciation

of landform and the significance behind each folding of the ground, each rise and fall, and of the actual substance itself, earth, rock, water, the accompanying ecological coverage, and the prevailing climatic conditions. If this basic material is not understood, none of the dependent details can be properly understood.

The composition of elements in repose is, like any other art form, a matter of technical mastery as well as of inspiration. Landscape design is in need of fresh impetus. Highway designing provides the opportunity for exploration of new directions of thought and invention to those practicing in this profession.

As previously pointed out, landscape designed to be seen while progress is maintained from incident to incident is nothing new. While speed of movement has changed, subtleties in design have been lost; while scale of composition has changed, kinetic artistry has also been lost. The great parks have given place to suburban gardens, and the creative capacity of the professional designers has been employed accordingly.

Now, however, the financial resources, the scale of operations, and public demand, make possible, once more, the development of the high art of kinetic landscape design.

ACKNOWLEDGMENTS

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THE NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL is a private, nonprofit organization of scientists, dedicated to the furtherance of science and to its use for the general welfare. The ACADEMY itself was established in 1863 under a congressional charter signed by President Lincoln. Empowered to provide for all activities appropriate to academies of science, it was also required by its charter to act as an adviser to the federal government in scientific matters. This provision accounts for the close ties that have always existed between the ACADEMY and the government, although the ACADEMY is not a governmental agency.

The NATIONAL RESEARCH COUNCIL was established by the ACADEMY in 1916, at the request of President Wilson, to enable scientists generally to associate their efforts with those of the limited membership of the ACADEMY in service to the nation, to society, and to science at home and abroad. Members of the NATIONAL RESEARCH COUNCIL receive their appointments from the president of the ACADEMY. They include representatives nominated by the major scientific and technical societies, representatives of the federal government, and a number of members at large. In addition, several thousand scientists and engineers take part in the activities of the research council through membership on its various boards and committees.

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The HIGHWAY RESEARCH BOARD was organized November 11, 1920, as an agency of the Division of Engineering and Industrial Research, one of the eight functional divisions of the NATIONAL RESEARCH COUNCIL. The BOARD is a cooperative organization of the highway technologists of America operating under the auspices of the ACADEMY-COUNCIL and with the support of the several highway departments, the Bureau of Public Roads, and many other organizations interested in the development of highway transportation. The purposes of the BOARD are to encourage research and to provide a national clearinghouse and correlation service for research activities and information on highway administration and technology.
