
TRANSPORTATION RESEARCH RECORD

528

Transportation Serving Community Needs

**7 reports prepared for the Social, Economic and
Environmental Factors Section meeting held in
conjunction with the 7th Summer Meeting of the
Transportation Research Board in Jacksonville,
Florida, August 1974**



**TRANSPORTATION
RESEARCH BOARD**

**NATIONAL RESEARCH
COUNCIL**

Washington, D. C., 1974

Transportation Research Record 528
Price \$2.40
Edited for TRB by Joan B. Silberman

subject area
15 transportation economics

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LIBRARY OF CONGRESS CATALOGING IN PUBLICATION DATA

National Research Council. Transportation Research Board. Social, Economic and Environmental Factors Section.

Transportation serving community needs.

(Transportation research record; 528)

1. Roads—Location—Congresses. 2. Roads—Economic aspects—Congresses. 3. Highway planning—Congresses. I. National Research Council. Transportation Research Board. II. Title. III. Series.

TE7.H5 no. 528 [HE332] 380.5'08s [388.4'1] 75-12625

ISBN 0-309-02375-0

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FOREWORD

The papers in this RECORD reflect the serious efforts being made to ensure that transportation serves community needs. These papers deal primarily with community and land use improvements that need to be made when highways are built and with changes that can be made outside the right-of-way.

Jones describes a citizen participation experiment in highway planning in Atlanta, as seen through the eyes of a citizen who is also a transportation planner. He considers the experiment a failure primarily because of mistrust among citizens, the study design team, and the decision-makers; however, he believes citizen participation offers much support for transportation planning if the proper mechanism can be created.

In his discussion of Jones' paper, Boulineau admits there were several errors: the large public meeting format, inaccessible sites for meetings, inadequate prestudy publicity, and inadequate and inexperienced staff for citizen participation activities. But Boulineau, a design team leader in the experiment, credits the study with (a) evolving into a broader concept called subarea planning, (b) coalescing community interests, (c) stopping further work on the Westside Freeway project, (d) changing attitudes within the agencies, and (e) providing a focus for developing Georgia's Action Plan.

Kriken, Bottiny, and Thiel describe techniques for identifying fragile neighborhoods that should be avoided in locating highways. The technique uses census or other available information on household size and income, automobile availability, population, age, ethnic composition, and the length of time in the current residence. Preliminary use of this approach suggests that low-density, suburban neighborhoods can tolerate freeways better than neighborhoods with higher than average percentages of poor, old, young, or carless people or minority groups.

Dale evaluates a traffic engineering improvement of an intersection in terms of road user benefits and cost of the improvement. The results indicate a benefit-cost ratio of 1.9 and improved air quality.

Kulash looks at the role of parking in trip making and at motorist responses to parking price changes. He concludes that parking taxes would have little effect on problems of automobile use.

Blackburn and Oster analyze ways of dealing with impacts of transportation. The authors propose measures to improve social and environmental quality, equity (by reducing uncompensated losses), and the technical efficiency of transportation (by expanding ameliorative measures available to transportation agencies).

Engelen examines why transportation and land use decisions are still made largely independent of each other. He concludes that progress in joint development is based on new institutional mechanisms such as increased powers for transportation agencies, multifunctional public corporations, private corporations, and land banking.

Sloan examines ways to increase the public share of highway nonuser benefits. Methods considered include zoning bonuses for special performance, transferable development permits, public acquisition of affected land, and a one-time tax on benefited land. Taxes on benefited land may serve to increase the public's share of benefits and to restrain development, as in the case of Vermont's tax on land-value gains.

—Floyd I. Thiel

CITIZEN PARTICIPATION IN WESTSIDE TRANSPORTATION PLANNING

Paul S. Jones, Georgia Institute of Technology

This paper describes an experiment in citizen participation in Atlanta, Georgia, as seen through the eyes of a citizen who is also a professional transportation planner. Communication difficulties are identified among the three stakeholder groups—the citizens, the study design team, and the decision-makers. These difficulties are attributed to strong feelings of mistrust, which were reinforced as the citizens attempted to create a citizen-dominated executive board that could participate in policy-making at the highest level.

•IN 1972 and 1973, a program was launched to involve citizens in transportation planning for a major portion of metropolitan Atlanta. Although some benefit was gained from the program, it failed because of mistrust among the major participating groups: the citizens, study design team, and the decision-makers.

This paper traces the development of mistrust among the three stakeholder groups, and it is hoped that the conclusions will have some value for others planning programs of citizen participation. As a citizen with a professional background in transportation planning, the author became involved in the process in a major way. Whatever insights are offered result from an ability to communicate with the citizens and the study design team. Unfortunately, this role was not developed sufficiently well to turn failure into success.

STAKEHOLDER GROUPS

The three stakeholder groups were as follows. The citizens were a heterogeneous group varying in income, education, occupation, and race. They were interested in the transportation problems of the study area and attended a series of public meetings. Most of them lived in the study area; a few were outsiders who had strong areawide transportation interests.

The study design team was drawn from professional planners at the sponsoring agencies: the Atlanta Regional Commission (ARC), the area's comprehensive planning agency; the Georgia Department of Transportation (GDOT); and the Metropolitan Atlanta Rapid Transit Authority (MARTA), the public transit agency. There were also five citizen members and some consulting support. The planners seemed to be dedicated to achieving their purpose. The citizen members were appointed from candidates known to the other members of the design team. (Later, there was some friction between the citizens-at-large and the study design team over the rather arbitrary method used to select citizen members.) Most of the study design team was absent from the later stages of the work because there was not sufficient money to support their continued participation.

The decision-makers were never really identified. Supposedly they were officials who had the authority to implement a transportation program and to commit funds to support continued study. Some members of the study design team discussed decision-makers as though they were a formally constituted body. When a decision-maker was asked for, some senior staff from the sponsoring agencies who did not have decision-making responsibility were produced.

The questions to be decided on were not clear. Many citizens were concerned only with what would affect their lives and homes; the design team seemed more concerned with planning decisions. The decision-makers were never clearly defined and did not play an active role in the process; nonetheless, their presence was always felt by the

other two stakeholder groups, particularly the citizens. Only one official of a sponsoring agency made an effort to deal with the other two stakeholders.

LOCATION

The Westside, or southwest Atlanta, has a population of about a quarter million. The Westside is bounded on the north by the Southern Railway, on the east by the major north-south urban freeway, and on the south and west by the perimeter freeway that circumscribes the Atlanta metropolitan area. In the Westside are Hartsfield International Airport, Fort McPherson, and a major part of Atlanta's industry. It includes three smaller communities—East Point, College Park, and a part of Hapeville (Tri-Cities)—and a portion of unincorporated Fulton County. There are a few affluent neighborhoods, a moderate number of middle-class areas, and many low-income and public housing communities.

STUDY DEVELOPMENT

The Westside study was partly motivated by the recent work of the Urban Systems Laboratory at M.I.T. (1, 2). A representative from M.I.T. served as an advisor to the study design team throughout the study planning phase. The implied objective of the study was to involve citizens in the design of a Westside transportation evaluation plan. The plan would then be executed by a professional design team with some form of continuing citizen input.

The plan for the program had four steps:

1. Organization of a study design team;
2. Preparation of working papers for use with citizen participants;
3. Public meetings to discuss, evaluate, and modify the working papers; and
4. Reduction of the working papers to a study design report.

The study design report was to specify the tasks, participants, organizational relationships, and a schedule for a comprehensive transportation plan for the Westside.

The plan erred in its perception of a citizen-professional dialogue and in omitting the professional from the dialogue. The first two steps proceeded on schedule and produced a set of working papers, carefully selected reference materials that were placed in several libraries that served the study area, and information about the design team and the program. The working papers reflected a desire to engage in a serious dialogue with interested citizens; however, they were a bit vague, too general, and not action-oriented. These are faults common to many writings about citizen participation in transportation planning. The tone of the papers was optimistic:

In response to public consciousness... a new direction in transportation planning in Georgia. This process will involve the community substantially and effectively at every stage of the planning process to insure that the final transportation decisions accurately reflect a basic community understanding of, and an agreement on, the course of action to be followed.

PUBLIC MEETINGS

The public meetings were to actively involve the attendees in reviewing and revising the working papers. The public meetings, however, developed in a very different way that reinforced the mistrust already felt by many of the citizen participants.

Many of the invited groups and interested individuals attended the first meeting. There was a general misconception among the citizens that the meetings would deal with transportation plans that had already been proposed. Design team speakers tried to make the point that a fresh start would be made in planning transportation for the Westside; however, many citizens were familiar with previous studies (e.g., GDOT plans for a Westside freeway) and did not believe that they had been discarded. The poor handling of questions and challenges reinforced the initial mistrust felt by the citizens.

At the second meeting a résumé of past planning studies and summary of the trans-

portation planning process were presented. Although the information was undoubtedly useful to many, the presentation was not well-received. The description of the planning process was particularly troublesome because of the complexity of the process. It was meaningful to only a few of the best informed citizens. For the balance, it served merely to widen the gulf between the citizens and the planners and to detract from the communication process.

The planners were uneasy because no basis for a dialogue had been found. The citizens were becoming hostile because no active citizen role was emerging, and they were not interested in discussing a study design plan but wanted to begin formulating policy.

To this point, citizen activity was nonparticipative (3). As a result, a mechanism was proposed and adopted to facilitate more effective citizen participation: A small citizen ad hoc committee was formed to focus on citizen input.

The design team planners, at the third meeting, attempted to focus on issues that could be discussed by the citizens. This appeared to be successful; however, the gap widened. The first report of the ad hoc committee focused on means for assuring adequate citizen participation in the decision-making and implementation processes. The committee was not willing to accept either a passive or a planning role. It wanted full partnership (3) with the decision-makers: control over the transportation facilities built in their neighborhoods. The planners seemed to feel that the citizens were exceeding the scope of the prescribed activity: to prepare a study design plan, not to make policy. Furthermore, they felt good decisions could not be made without benefit of the necessary planning.

In spite of a lack of agreement between the ad hoc committee and the study design team, a study design draft report (4) was distributed for review by the sponsoring agencies' personnel and the citizens. It is a loose collection of planning essays and does not set forth a logical procedure for executing a transportation planning study. It gives lip service to some citizen input, but, to the citizen, it seemed the study design team gave the decision-makers in the sponsoring agencies what they wanted. The need for a decision-making body, as advocated by the ad hoc committee, was overlooked.

Figure 1 shows the organization chart proposed by the citizens (4). Most of the report recommends a citizens' advisory committee similar to the ARC. The report emphasized the wasted citizen effort; this seemed to confirm the mistrust already felt.

The ad hoc committee's proposal was in direct opposition to the citizen advisory structure at ARC, which has a system of citizen advisory committees that are made up of representatives from citizen organizations throughout the Atlanta metropolitan area. The ARC advisory committees have no power and do not participate in decision-making. Their principal functions are to interact with ARC staff.

The ad hoc committee felt that all policy level decisions concerning transportation on the Westside should be made by an executive board with a majority of citizen members who would be elected and responsibly represent their neighborhood constituencies.

At the last public meeting, participants were encouraged to review the draft study design report and communicate their comments to the study design team.

AD HOC COMMITTEE

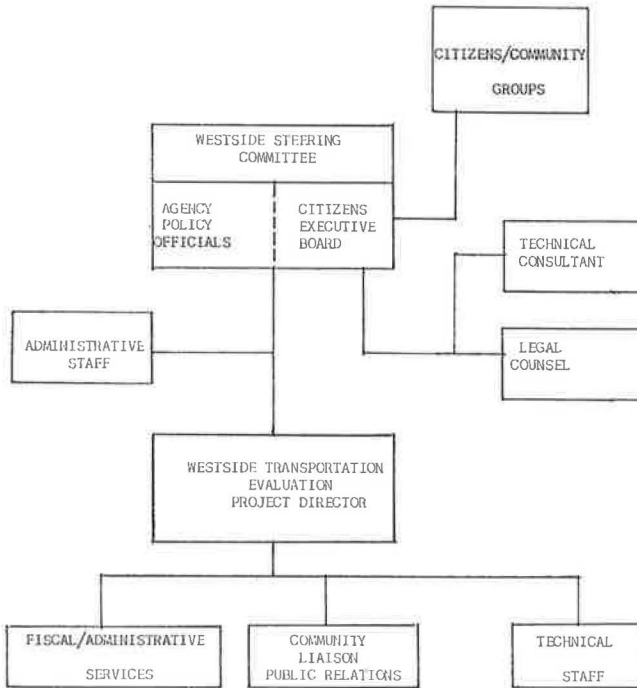
Several members of the ad hoc committee were determined to continue with a formal organization. Time and money would be needed to properly elect the citizen members of an executive board; however, in the interim, the ad hoc committee was voted to represent the citizens.

The last public meeting ended the formal dialogue between the citizens and the study design team; however, GDOT assigned one staff member to work with the ad hoc committee who provided invaluable coordination and support.

The ad hoc committee had not, to this point, received any encouragement from anyone concerning its radical executive board concept. The ad hoc committee members felt that to gain support they would need to develop a complete proposal for the decision-makers.

The committee's principal effort was directed toward districting and election pro-

Figure 1. Organization of Westside transportation evaluation project.



cedures. Public relations activity was not active, and a revised outline of the study design report was prepared but not revised. The proposal for an executive board was the most significant contribution of the ad hoc committee and deserves careful development. It was based on three premises.

1. The decision-makers are not to be trusted. In the past, they have favored the politically strong and moneyed interests at the expense of ordinary citizens.
2. Ordinary citizens have a right to participate in decisions that directly affect them and their life-styles, and, if properly instructed, they are capable of making good decisions.
3. Formal planning does not consider local (neighborhood) needs.

In defense of present procedures, one must acknowledge that many of the abuses rankling citizens are based on decisions made without the benefit of planning or made counter to planning recommendations. Problems usually begin with a political decision to build a transportation facility and subsequent changes in zoning (also politically motivated) that allow traffic to grow to the point of disruption and congestion. Transportation facilities can be and are built with minor disruption if zoning is carefully controlled. Unfortunately most of the good experiences occur in affluent parts of cities.

Disaffection is not restricted to citizens. Planners often are not held in high esteem by decision-makers. Mistrust between planners (with their computers) and decision-makers (with their politics) is not too evident because of their subordinate-superior relationship; however, I feel that mistrust does exist.

The majority of the committee members maintained that citizen input can be effective only at the highest level. Advisory committees, the ARC norm, are not heard; therefore, citizen power would have to be wrested from the decision-makers.

The mechanism for citizen participation was considered. Many persons outside the ad hoc committee recommended that existing elected officials be on the executive board. This view was ultimately rejected for the following reasons:

1. The heterogeneous nature of the Westside makes uniform representation by existing officials impossible;
2. District boundaries cut across rather than conform to neighborhood boundaries, and elected officials are given heterogeneous constituencies;
3. Districts are too large, and they contain more than one homogeneous neighborhood;
4. During their 4-year terms, elected officials often overlook the views of their constituencies; and
5. Elected officials are generally occupied with other duties and cannot spend much time on transportation, particularly at the neighborhood level.

The ad hoc committee opted to divide the Westside into about 10 uniform, homogeneous neighborhoods. Each neighborhood would elect two representatives to the executive board. These representatives would serve staggered 2-year terms subject to recall. (If elected executive board members are to make policy decisions about transportation matters, they must understand the consequences of these decisions as well as the desires of their constituents. This, in turn, requires effective interaction among citizens, citizen groups, and professional planners.)

Some committee members felt it was impossible to generate enough interest in future transportation matters to get a representative electorate in each district. There was a need for educational and public awareness programs. Eventually, a specific election proposal was drawn up by Economic Opportunity Atlanta (EOA) and submitted to the ad hoc committee. EOA proposed to use its field staff to canvass, hold meetings, and conduct elections. The cost of the election process necessitated direct dialogue with the decision-makers.

The success of the dialogue would depend on good, prompt answers from the planners and agreement among the citizens on values and neighborhood goals. Most serious conflicts in the entire transportation planning process would probably occur between citizens during the goal-forming process. Citizens would not agree on what they want their neighborhood to be. Once the goals had been accepted by all or a majority of the citizens, a constructive dialogue with the planners could take place. Nonetheless, this dialogue would need better, more flexible, and faster responding tools than today's transportation planning models (5).

The committee decided first how the citizens were to participate in the decision-making. Next, the committee had to identify the decision-makers. The formal decision-makers were as follows. GDOT selects highway projects for funding but is not generally concerned with design or specific routing. MARTA makes binding commitments for public transportation, but is also not concerned with details. ARC must approve all federally funded transportation projects in their comprehensive planning area. Local governments must approve projects within their jurisdictions.

The committee met with ARC staff for guidance. This was a mistake; ARC's senior staff had no intention of granting power to the citizens.

The ad hoc committee then met with ARC's transportation policy subcommittee, the committee that reviews all transportation matters before they are presented to the ARC board. This committee is made up of top officials from GDOT, ARC (Fig. 2), and MARTA. This also was to no avail. It seems that the only course available to the ad hoc committee is to bring political pressure on ARC (the funding agency for the committee) through the Atlanta area's elected officials. To date, this has not been done.

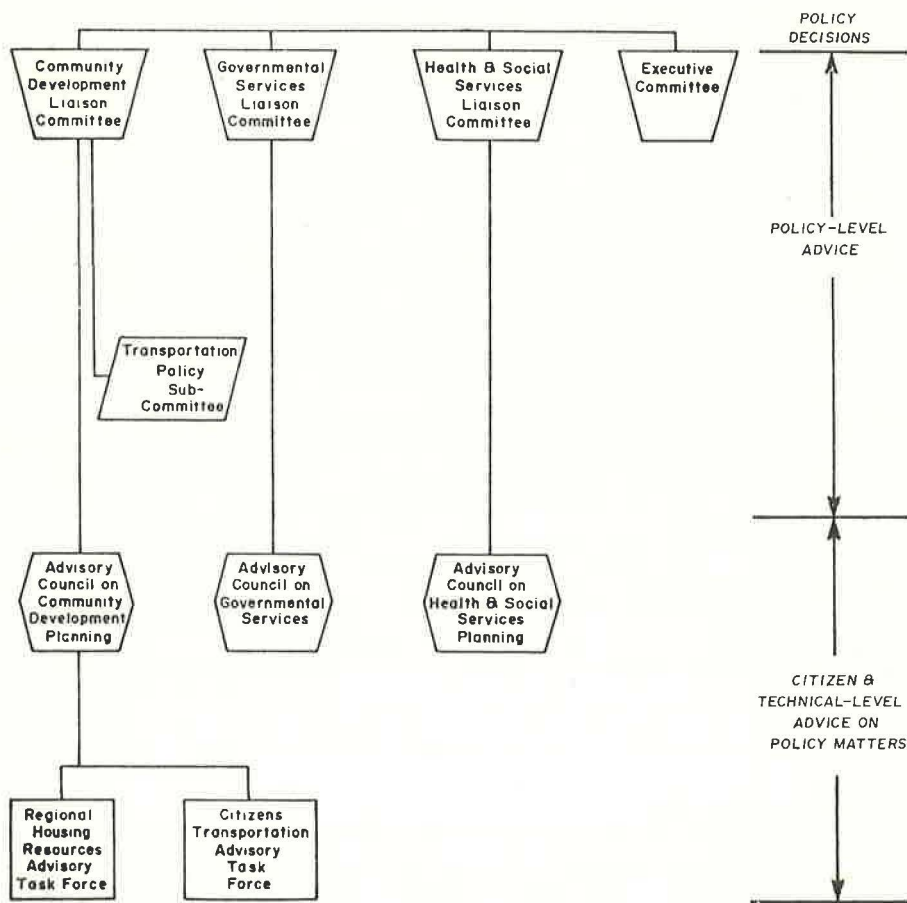
CONCLUSIONS

During the past 2 years, two major freeway projects in Atlanta have been either blocked or seriously delayed largely as a result of massive citizen protests. Millions of dollars have been lost in these projects alone. A tiny fraction of the lost funds could be used for an effective citizen participation program.

Despite failure of the Westside citizen plan for effective transportation, some ideas have evolved that are worthy of further development.

1. Citizens mistrust both transportation planners and decision-makers and are unwilling to accept a passive role in the transportation planning process.

Figure 2. Policy and advisory structure of Atlanta Regional Commission.



2. Citizens have a strong desire to deal with their transportation problems in a decision-making capacity and want elected representation at the policy level.

3. The transportation planning process with its emphasis on large cumbersome models is not suited to citizen interaction. There is a great potential for citizen participation (6, 7, 8) in transportation planning and development, and new techniques are needed to encourage use of it.

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DISCUSSION

George Boulineau, Georgia Department of Transportation

Most public agencies at the state and local levels are created and funded for a specific and usually narrow purpose. The authority and legal responsibility for developing and funding programs is mandated to them by law, and there is a complex of federal, state, and local laws, regulations, policies, and practices governing both the development of programs and the application of funds for implementation. In addition most public agencies have policy-making officials or boards either elected by popular vote, appointed by higher (usually elected) officials, or set by law. Plans and programs almost always require some form of political endorsement from local elected representatives before public money is spent. Therefore, unilateral decisions in this context are almost impossible. If they sometimes appear to be, then it is likely due to default.

Furthermore, as long as we continue to perceive decision-makers as a narrowly constituted group, they will be demons who have invaded our midst. Note that Jones admits no pressure has yet been brought on Atlanta's politicians. He seems to say that agencies should assume the role of intercessors between the citizen and the politician he elects and that citizens should only pressure their elected officials as a last resort.

If I could restate Jones's thesis, it would be that confusion over goals and objectives, disunity among participants, strategic and tactical errors, an unfavorable climate, an experimental approach, part-time staff, and inexperience produce unpredictable, limited, and sometimes negative results. Most human problems can be laid to mistrust. It is too abstract to deal with directly and only its manifestations can be dealt with effectively.

Jones failed to mention that the effort he describes was almost aborted 3 months before any citizens were involved at all. Confusion and disunity were prevalent, and several participants were ready to forgo involvement in the study. A midstream change in management rekindled some interest but did not resolve the underlying problems.

In view of all this, it is amazing that the public was ever involved at all in this project, and when they were, several tactical errors were made:

1. The large public meeting format was selected as a primary form of citizen involvement. This was probably a bad choice because it had become recognized and established for citizen protest and opposition in other parts of the Atlanta region.
2. Only a limited number of meetings held at a reasonably well-known but not too accessible site were scheduled. Although the original intent was to use these to generate smaller community group meetings, this was not completely successful.
3. There was inadequate prestudy publicity explaining the need, purpose, and scope of the study.
4. There were no full-time and separate public involvement staff to handle the day-to-day communications and follow-ups with citizen groups. The active full-time staff of the design team was limited to about five to seven people. The others divided their time among different, and often unrelated, duties. Few of the members had any training in public involvement; none were experts. The result was that fewer than eight full-time, untrained staff were ministering to a quarter million people.
5. There were no active and visible agency policy-makers or decision-makers

lending authority and status to the effort. This was only one among a number of concurrent projects requiring policy level decisions.

Despite this and the feelings of rebuff and defeat, the study accomplished more than Jones admits. The study has been transformed into a broader concept of subarea planning, which has become an integral part of Atlanta's current Regional Development Plan. It contributed to coalescing community-based interest groups in Atlanta and to appointment of the leader of the ad hoc committee to the advisory council of ARC. It stopped further work on the Westside Freeway project, changed attitudes on community involvement within the agencies, provided a reference point for development of Georgia's Action Plan, and led to more prepublic hearing involvement of community groups on major projects.

ESTIMATING COMMUNITY EFFECTS OF HIGHWAYS

Anne G. Kriken, Marshall Kaplan, Gans, and Kahn, San Francisco; and
Walter H. Bottiny and Floyd I. Thiel, Federal Highway Administration

Techniques to identify and estimate community effects of highways are needed to make good location decisions. If the effect of a highway on a community can be known before it is built, areas that may be harmed by highway proximity can be avoided in favor of areas that can be benefited. Efforts to identify neighborhoods that may be suitable or unsuitable for highway locations have included both objective social indicators (e.g., residential stability) and subjective indicators (e.g., attitudes of affected residents). In the middle and late 1960s efforts to develop and test objective indicators contributed to communication between citizens and highway agencies seeking to improve highway location procedures. Citizen participation has since overshadowed other techniques of identifying and estimating community effects. The social feasibility model described uses neighborhood characteristics such as household size and income, proportions of young and old people, automobile availability, length of time at current residence, and ethnic composition to determine the community effect of a highway. This procedure attempts to locate highway corridors where they are socially feasible by using mainly secondary data in a three-phase process.

•EFFORTS to foretell highway effects and, in this way, to optimize highway locations have typically relied on housing or population characteristics of the affected neighborhoods. These efforts have varied from easily managed methods with few characteristics that may be sensitive enough to indicate general effects to more complicated methods with several characteristics. Initially several neighborhood characteristics are used to determine the effects; later only selected indicators are recommended.

SELECTED SOCIAL INDICATORS

Mobility Index

One effort to estimate community effects has involved analyzing the residential stability of a neighborhood. The stability of a neighborhood can indicate its quality or ability to function as a neighborhood. This indicator was developed by the California Division of Highways to evaluate neighborhood effects of freeways in California and Washington. The indicator, in the form of a numerical index, was made up of the percentage of (a) owner-occupied houses, (b) single-family residences, and (c) people in the same houses over 5 years. The index can be calculated by using secondary data such as the U.S. census or city directories (1).

The California approach was extended and tested further by a Texas A&M study of 152 neighborhoods and 47 control neighborhoods in Austin, Dallas, and Houston. This study tested both a three-variable index and a simplified index that relies only on the percentage of residents in the same house for 5 years (2). This single-variable index, termed the mobility index (MI), yielded results similar to the three-variable index. It is simpler and less expensive to use. Index values are calculated by $MI = 200 - 2R$ where R = the percentage of households in the same dwelling unit in the base year as there were 5 years earlier.

MI appears to be a good indicator of neighborhood solidarity or stability. Experience shows that MI is more likely to increase in freeway-segmented neighborhoods than in others, suggesting that these neighborhoods may become less stable.

The California and Texas A&M studies also developed and tested a neighborhood index which delineates neighborhoods. The components of this index are proportion of owner occupants, condition of dwelling units, proportion of crowded units, and number of rooms per dwelling unit.

The neighborhood index was useful for defining neighborhood boundaries for some purposes because it describes the character of a residential area. But the neighborhood cohesion or strength of interaction patterns is not defined by this index. Instead, similar housing areas are simply grouped together and considered a neighborhood. Using the neighborhood index as a predictive device for freeway effects was not feasible.

Neighborhood Social Interaction Index

Another effort to measure and predict neighborhood changes due to highways involves social interaction. This approach relies on neighborhood behavior (e.g., neighboring, use of local facilities, and participation) and neighborhood perception (e.g., identification, commitment, and evaluation). A neighborhood social interaction index has been developed that can be estimated by using residential mobility, percent of residential land, and housing units per acre. Mobility is so important that it alone can be used to provide rough estimates of social interaction changes that might be associated with highways (3). In this emphasis of the importance of residential mobility, the neighborhood social interaction index (by Burkhardt) agrees with the earlier studies of Hill and Frankland in California and in Washington and of Adkins and McLean in Texas.

SOCIAL FEASIBILITY MODEL

The method used for estimating neighborhood effects is based on neighborhood characteristics such as household size and income, proportions of young and old people, automobiles available, length of time at current residences, and racial and ethnic composition.

The tentative procedure is a social feasibility model (4), a method for locating highway corridors where they are socially feasible and acceptable to affected neighborhoods. By using mainly secondary data, a three-phase process examines in sequence physical constraints, activity patterns, and pedestrian dependence in a study area.

The social feasibility model is based partly on empirical data about the social effects in four distinctly different types of neighborhoods adjacent to two different freeways: I-290 in Worcester, Massachusetts, and the Grove-Shafter Freeway in Oakland, California. It suggests that low-density, suburban types of neighborhoods can tolerate freeways. These neighborhoods ordinarily depend on very little walking, have many automobiles, and have most of the activity locations for residents outside the neighborhoods. This approach to locating highway corridors relies mainly on existing information such as the U.S. census or city records. Some use has been made of the model recently to analyze alternative highway locations in California.

The first phase of the model examines topography, streets, buildings, and other structures. Sources for this include maps prepared by the U.S. Geological Survey, urban transportation planning groups, and local planning agencies. Figure 1 shows only the physical constraints (e.g., hills and big buildings) in the study area.

The second phase examines the extent to which various facilities (e.g., stores, schools) are used by neighborhood residents. An area surrounding a facility at which the pedestrian population is most highly concentrated is called a service area. Businessmen, school administrators, local agencies, and institutions are potential sources for information about these service areas. Figure 2 shows the study area with the neighborhood activities and physical constraints. Community facilities (e.g., colleges and hospitals) are marked C. Neighborhood facilities are designated 3 if they provide vital services, 1 for low vitality, and 2 for medium vitality.

The third indicator, the level of neighborhood pedestrian dependence, reflects low, medium, and high neighborhood dependency in walking to stores, schools, social institutions, and activity centers. The walking indicator is developed by analyzing census tracts that lie in the corridors under consideration. Characteristics examined include household size and income, proportions of young and old people, automobiles available,

Figure 1. Physical constraints in study area.

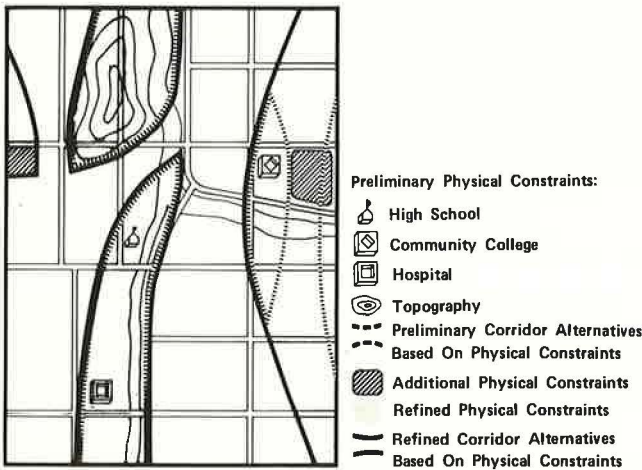


Figure 2. Physical constraints and neighborhood activities in study area.

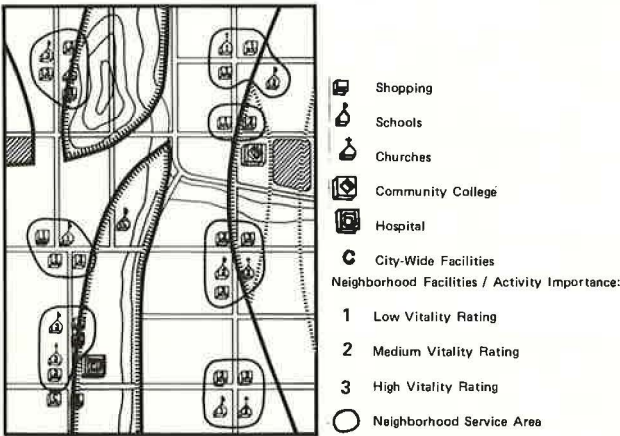


Figure 3. Physical constraints, neighborhood activities, and pedestrian dependency in study area.

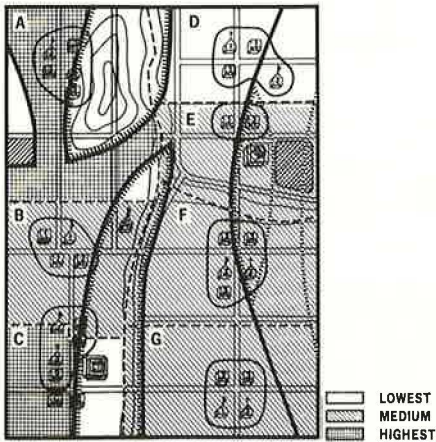
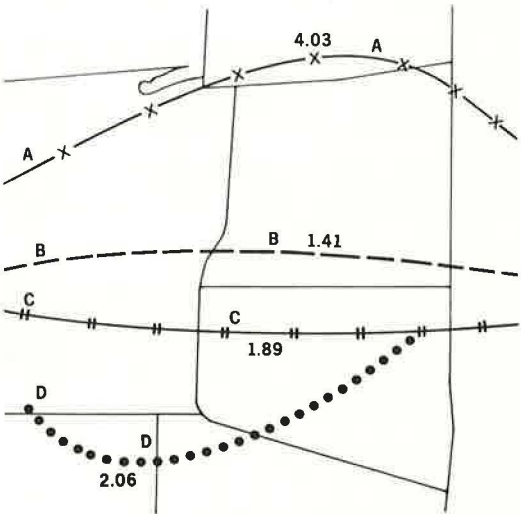


Figure 4. Pedestrian dependency scores for census tracts crossed by proposed routes for I-40 in Memphis.



residents in the same house 5 years, and ethnic composition. Published reports and computer tapes of the U.S. Bureau of the Census are the sources for data and maps required to develop this social indicator. Figure 3 shows the study area with pedestrian dependency, physical constraints, and neighborhood activities. One possibility for a highway corridor that would not disrupt the study area (based on the characteristics analyzed) appears to be generally along a path where census tract labels D, E, F, and G appear on the map.

MODEL APPLICATION

The potential use of the social feasibility model can be demonstrated by applying a simplified version of the model to a current location problem. This involves comparing the feasible route location identified by using the model with the route location recently selected for I-40 through an urban area in Tennessee. Figure 4 shows four alternate routes recently analyzed for I-40 and census tracts A, B, C, and D, which are directly affected by these routes.

In this partial testing, pedestrian dependency scores for four census tracts that would be crossed by the four suggested routes are calculated. Pedestrian dependency scores for the four tracts result from comparing scores for

1. General pedestrian dependency (GPD),
2. School pedestrian dependency (SPD),
3. Local shopping pedestrian dependency (LSPD), and
4. Social institution pedestrian dependency (SIPD).

These scores can be compared individually or combined in some way for overall comparison, e.g., by simply adding them. An unresolved problem in any combination is the weighting to be given to the individual scores for SPD, LSPD, SIPD, and GPD. (Efforts to combine scores to achieve proper weighting of ingredients are being continued primarily by Mingo.)

Additional information about the ingredients of pedestrian dependency follows.

General Pedestrian Dependency

GPD depends on neighborhood characteristics such as percentage of households without cars, number of people per household, and median household income in the neighborhood compared with income in the city. The higher the number produced by this formula is, the higher the dependence on walking is, and, supposedly, the more disruptive a freeway would be. GPD can be calculated by using

$$GPD = \frac{(h\% \times p \times I)}{i}$$

where

- $h\%$ = decimal percentage of households without automobiles,
- p = average number of persons per household,
- I = median household income for the city, and
- i = median household income for the census tract.

For the census tract touched by A route (Fig. 4): $h\% = 38$, $p = 3.8$, $I = \$7,000$, and $i = \$4,900$. Thus, $GPD = (38 \times 3.8 \times \$7,000)/(\$4,900) = 2.06$.

School Pedestrian Dependency

SPD shows the dependence of the study group or neighborhood on walking to school. It is simply the percentage of the local population made up by grade school children. The more children there are, the higher the dependency on walking will be, and the more vulnerable the neighborhood will be to disruption by a freeway. SPD can be calculated by the formula:

$$SPD = \frac{s}{N}$$

where

s = the number of elementary school children, and
N = number of people in the area or tract.

For tract A containing route A: s = 1,700 and N = 7,800. Thus, SPD = 1,700/7,800 = 0.22.

Local Shopping Pedestrian Dependency

LSPD indicates the importance to the study group of walking to local shopping and accounts for cars available and ages of the people involved. LSPD relates to the need and the ability of local residents to do their shopping while walking. It depends on the number of households without cars, the number of people per household, the number of people 65 years and older. Local shopping, especially grocery shopping, often involves packages that are serious problems for the carless or infirm. LSPD can be calculated by

$$LSPD = \frac{(h \times p + e)}{N}$$

where

h = number of households with no automobile,
p = average number of persons per household,
e = number of people over 65 years, and
N = number of people in the area.

For tract A crossed by route A: h = 770, p = 3.8, e = 600, and N = 7,800. Thus, LSPD = (770 × 3.8 + 600)/(7,800) = 0.45.

Social Institution Pedestrian Dependency

SIPD refers to the tendency of the group to walk to social institutions such as churches, clubs, libraries, community centers, and meetings. SIPD relies on the number of people in the same house for 5 years, the number of black people, and the number of foreign stock (people born abroad or with at least one parent born abroad). The presence of these groups or some of them may indicate a close-knit community where walking, visiting, and other interaction among residents may occur. SIPD is calculated by the formula:

$$SIPD = \frac{(t + f + b)}{N}$$

where

t = number of people in same house 5 years,
f = number of persons of foreign stock,
b = number of black people, and
N = number of people in the tract.

For tract A: t = 3,100, f = 150, b = 7,300, and N = 7,800. Thus, SIPD = (3,100 + 150 + 7,300)/(7,800) = 1.35.

CONCLUSIONS

Pedestrian dependency scores, as stated previously, consist of the sum of general, school, local shopping, and social institution pedestrian dependency scores. For tract A containing route A, GPD = 2.06, SPD = 0.22, LSPD = 0.45, and SIPD = 1.35; therefore PD = 4.08.

This pedestrian dependency score of 4.08 for tract A is relatively high, compared with the pedestrian dependency for the city and for the other study tracts. Pedestrian dependency scores are 1.41 for route and tract B, 1.89 for C, 2.08 for D, and 1.58 for the entire city (Fig. 4). The relatively high pedestrian dependency score, though only one of many considerations, suggests that tract A crossed by route A may not be suitable for a highway location. At least tract A seems less suitable (or socially feasible) than the other tracts analyzed. It is interesting that route A is not the current choice for I-40 in this area. (Route C and tract C in this exercise, the route that apparently has been selected based on all considerations, ranks second among the four tracts in this partial analysis of social characteristics.)

Locating highways where they will minimize disruption to residential neighborhoods is basic. Recent research has resulted in several methods for evaluating the relative sensitivity of neighborhoods to freeways. The methods attempt to predict the effects of highways on neighborhoods nearby by using primarily housing and population characteristics.

Limited use of these methods or indexes and other experience suggest that neighborhoods that may be particularly vulnerable to freeway disruption and therefore should be avoided are high-density, pedestrian-dependent neighborhoods with few automobiles available and strong racial or ethnic ties. Testing is needed to determine the extent to which these or other methods can predict what effects a highway will have on a neighborhood.

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EVALUATION OF A TRAFFIC ENGINEERING IMPROVEMENT

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Traffic engineers need to evaluate the effectiveness of traffic engineering improvements. Procedures for the evaluation are described in the literature, but few applications are available. This paper discusses the combination of road user consequences, including the effects on air quality, and the procedures for the evaluation of one traffic engineering improvement—a Traffic Operations Program for Increasing Capacity and Safety improvement of an intersection. The evaluation of the intersection improvement indicated that the benefit-cost ratio was 1.9 and that the air quality was improved.

•IN November 1971, a number of improvements were completed at the intersection of Harry and Oliver Streets in Wichita, Kansas. The intersection geometrics before and after the improvements are shown in Figure 1. Funds for the improvements were partially obtained through the Traffic Operations Program for Increasing Capacity and Safety (TOPICS), a cooperative federal, state and local program to improve traffic operations and safety.

Before construction, both Harry and Oliver Streets were four-lane undivided streets with channelized right-turn slots on the west and east approaches. The intersection was controlled with a fixed-time controller and was signalized with 8-in., pedestal-mounted indications on all four corners and an 8-in., four-way signal suspended over the center of the intersection. The speed limit on all approaches to the intersection was 35 mph before and after the improvement.

The construction project included widening 600 ft of each approach to the intersection to provide two through lanes and separate left- and right-turn lanes. The right-turn lanes were designed for continual flow under yield control with the exception of the southbound to westbound movement, which had to move with the southbound movement through the traffic. The signalization was upgraded to provide full traffic actuated control, 12-in. overhead signal indications, and separate signal phases for the left-turn movement. The cost of the construction project including installation of the traffic signals was \$274,155.

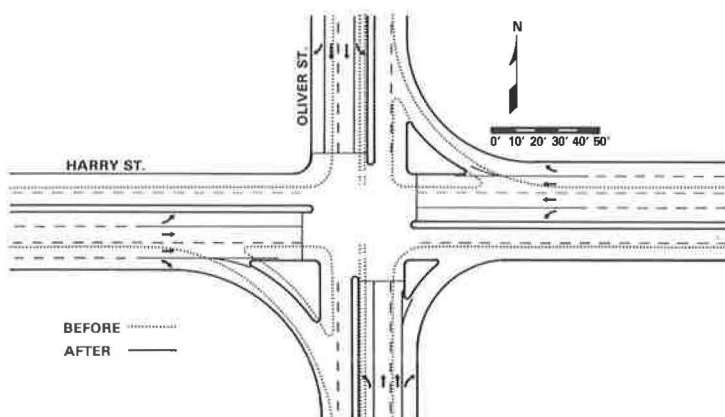
This paper discusses traffic volumes, intersection capacity, vehicular delay, traffic accidents, and air pollution at the intersection before and after the improvements. An analysis of the economic worth of the improvement concerning road user costs and benefits is also discussed.

TRAFFIC VOLUMES

Peak-hour turning movement and 24-hour traffic volume counts were taken at the intersection before and after the improvements. The total 24-hour volume of traffic approaching the intersection was approximately 8 percent greater after the improvement. The increases were approximately equal on all approaches with no single approach exhibiting an increase greater than 10 percent.

Peak-hour volumes increased considerably more than the 24-hour volumes—23 and 29 percent increases in the a.m. and p.m. peak-hour traffic respectively. This is attributed to the congestion at the intersection during the peak periods before the improvements, which encouraged a certain number of motorists to seek alternative routes to their destinations, even though the route through the Harry and Oliver Streets intersection may have been shorter.

Figure 1. Geometrics of intersection of Harry and Oliver Streets.



INTERSECTION CAPACITY

A capacity analysis (1) was conducted to determine the level of service and service volumes (at level of service C) provided by the intersection both before and after the improvements. Table 1 gives the results of the capacity analysis. After the improvements, all approaches were operating at level of service A with the exception of the westbound left turn, which was operating at level of service C. Service volumes after the improvements increased (by approach) approximately 120 percent over the conditions before—from 67 to 222 percent.

VEHICULAR DELAY

Vehicular delay was measured on all approaches to the intersection before and after the improvements. The p.m. peak from 4:00 to 6:00 p.m. was selected for the delay surveys. The before surveys were taken on Thursday, May 27, 1971, and the after surveys were taken on Thursday, April 27, 1972. Because of the limited staff available to conduct the surveys, a sampling procedure was used. Data were collected for three 5-min intervals per hour on each approach and were assumed to be representative samples for the entire hour.

The procedure used to measure delay (2) provides stop-time delay only and does not include time delays due to deceleration and acceleration. The results of the delay surveys indicate that the reduction in average vehicular delay was approximately 48 percent after the improvement. The maximum average vehicular delay observed during one of the 5-min sampling intervals before the improvement was 173.8 sec per vehicle; after the improvement it was 41.7 sec per vehicle.

Figure 2 shows the average vehicular delays by approach. It is interesting that the average vehicular delays were considerably more uniform after the improvements. This is probably attributable to the fully traffic-actuated control system. The increase in average vehicular delay on the east approach was not unexpected because the previous fixed-time control was not able to allocate a green signal in proportion to the traffic demand; therefore, excess green time was given to the east approach before the improvement.

Inasmuch as the delay procedure provided only stopped time, the time delays due to deceleration and acceleration of a vehicle to and from a stop were obtained from another source (3, table A-9) in which the additional time required for passenger cars to stop from 35 mph and regain that speed was 3.94 hours per 1,000 stops.

TRAFFIC ACCIDENTS

The accidents occurring during 1970 and 1972 were studied so that the relative safety of the intersection before and after the improvements could be compared (Table 2).

Table 1. Level of service and service volumes by intersection approach.

Approach	Movement	Level of Service		Service Volume ^a		
		Before	After	Before	After	Change (percent)
North	Thru	—	A	—	850	—
	Right	—	A	—	325	—
	Left	—	A	—	150	—
	All	F	—	429	1,325	+208
South	Thru	—	A	—	850	—
	Right	—	A	—	950	—
	Left	—	A	—	150	—
	All	F	—	606	1,950	+222
East	Thru	A	A	631 ^b	650	—
	Right	D	A	416	950	—
	Left	—	C	—	150	—
	All	D	—	1,047	1,750	+67
West	Thru	C	A	559 ^b	650	—
	Right	D	A	425	950	—
	Left	—	A	—	150	—
	All	C	—	984	1,750	+78

^aService volume at level of service C.

^bIncludes left turn movement.

Figure 2. Average vehicle delay by approach during p.m. peak period.

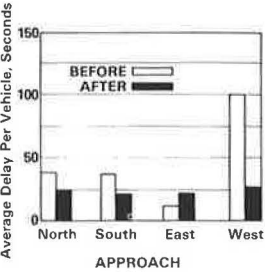


Table 2. Frequency and cost of accidents.

Item	Before	After	Reduction
Annual accident frequency			
Personal injury	16	6	10
Property damage only	22	15	7
Total	38	21	17 ^a
Annual accident cost, \$ ^b			
Personal injury	49,600	18,600	31,000
Property damage only	9,680	6,600	3,080
Total	59,280	25,200	34,080

^aThe change is statistically significant at the 5 percent level of probability with the χ^2 test.

^bBased on National Safety Council unit cost figures for 1971 of \$3,100 for each personal injury accident and \$440 for each property damage only accident.

Table 3. Traffic volumes and vehicular delays by approach.

Item	Approach				Total or Average
	North	East	South	West	
Daily approach volume ^a					
Before					
2-hour a.m. peak	889	856	642	632	3,019
2-hour p.m. peak	1,077	1,039	1,488	1,127	4,731
Other hours	5,689	5,821	5,122	5,508	22,140
Total	7,655	7,716	7,252	7,267	29,890
Volume stopped, percent					
Before					
2-hour a.m. peak	(80)	(52)	(71)	(85)	(72)
2-hour p.m. peak	95	67	86	100	87
Other hours	(70)	(50)	(61)	(75)	(64)
After					
2-hour a.m. peak	57	50	49	73	57
2-hour p.m. peak	72	64	68	67	68
Other hours	(50)	(50)	(50)	(55)	(51)
Average delay per stopped vehicle, sec					
Before					
2-hour a.m. peak	(30.2)	(14.1)	(30.8)	(73.4)	(37.1)
2-hour p.m. peak	41.4	19.3	42.2	100.5	50.9
Other hours	(27.7)	(12.9)	(28.3)	(67.3)	(36.5)
After					
2-hour a.m. peak	23.7	27.3	28.5	5.1	21.3
2-hour p.m. peak	35.7	35.1	31.4	41.2	35.9
Other hours	(23.9)	(23.5)	(21.0)	(27.6)	(24.0)

Note: Parenthetical figures are derived based on field observations.

^aBased on traffic recorder counts and field observations. The traffic stream is assumed to be 100 percent passenger cars.

Table 4. Additional daily motor vehicle operating costs and travel time required (3).

Item	Before	After	Change
Number of vehicles stopped			
2-hour a.m. peak	2,143	1,721	
2-hour p.m. peak	4,116	3,217	
Other hours	14,170	11,291	
Total	20,429	16,229	4,200
Additional travel time required			
Due to stopping, hours ^a	80.5	63.9	16.6
Due to idling, hours			
2-hour a.m. peak	22.5	12.3	
2-hour p.m. peak	62.0	31.6	
Other hours	142.9	75.9	
Subtotal	227.4	119.8	107.6
Total	307.9	183.7	124.2
Additional vehicle operating costs, \$ ^b			
Due to stopping	250.05	198.64	51.41
Due to idling	26.12	13.76	12.36
Total	276.17	212.40	63.77

^aFrom 35 mph, the additional travel time required to stop is 3.94 hours per 1,000 stops (3, Table A-9).

^bFrom 35 mph, the additional cost to stop is \$12.24 per 1,000 stops (3, Table A-8); and the cost of an idling engine is \$114.86 per 1,000 hours (3, Table A-41).

Table 5. Annual costs and benefits of improvement.

Item	Before	After	Benefit or (Cost)
Annual cost of improvement ^a	—	36,379	(36,379)
Annual additional user costs			
Travel time (25 cents per hour) ^b	28,096	16,763	11,333
Vehicle operations	100,802	77,526	23,276
Accidents	59,280	25,200	34,080
Total additional user costs	188,178	119,489	68,689

Note: Benefit/cost ratio = $\frac{68,689}{36,379} = 1.9$.

^aCalculated by multiplying the construction costs (\$274,155) by a capital recovery factor (crf). The crf is determined by an interest rate (8 percent) and a period of time (12 years). This results in a crf of 0.132695.

^bFrom Thomas, T. C., and Thompson, G. I. The Value of Time Saved by Trip Purpose. Stanford Research Institute, Menlo Park, Oct. 1970.

Table 6. Additional daily amounts of air pollutants due to stopping and idling of vehicles.

Item	Before	After	Change
Hydrocarbon (HC) emissions ^a			
At uniform speed (0.71 lb/1,000 vehicle-miles)	4.82	4.82	
Additional HC emissions			
Due to stopping (0.04 lb/1,000 stops)	0.82	0.65	
Due to idling (0.0087 lb/hour)	1.98	1.04	
Total reference HC	7.62	6.51	
Total 1972 HC ($\times 2.3$) ^b	17.52	14.97	2.55
Carbon monoxide (CO) emissions ^a			
At uniform speed (25 lb/1,000 vehicle-miles)	170	170	
Additional CO emissions			
Due to stopping (22 lb/1,000 stops)	449	357	
Due to idling (1.19 lb/hour)	271	143	
Total reference CO	890	670	
Total 1972 CO ($\times 2.3$) ^b	2,047	1,541	506

^aProcedures for Estimating Highway User Costs, Air Pollution, and Noise Effects. NCHRP Rept. 133, 1972 (Figs. 18, 20, and 23).

^bThe factor (2.3) is used to convert reference year emissions to average emissions in 1972 and takes into account expected future emission standards, vehicle maintenance practices, and the mix of new and old vehicles expected to be on the highway each year.

During 1970 (before the improvement) of the total 38 accidents, there were 16 personal injury and 22 property damage only accidents. During 1972 (after the improvement), of the total 21 accidents, personal injury accounted for 6 and property damage only for 15: a significant reduction statistically.

Because traffic volumes increased after the improvement, the reduction in the accident rate was even greater with nearly a 50 percent reduction from 3.48 to 1.78 accidents per million vehicles entering the intersection.

ECONOMIC EVALUATION

Traffic volume counts and the vehicular delay study provided the data (or the basis for making the necessary assumptions) for making road user economic evaluations of the improvement.

Table 3 gives the percent of the ADT stopped and the average delay per stopped vehicle before and after the improvement. These data were based on the results of the vehicular delay study described and were determined for the 2-hour a.m. peak period, the 2-hour p.m. peak period, and the remaining hours of the day. Then, by using published unit vehicle operating costs and travel time data the daily motor vehicle operating costs and travel time required were calculated (Table 4).

Table 5 gives a summary (on a yearly basis) of road user and accident costs. Estimated road user benefits are \$68,689 per year. With a calculated annual capital cost of improvement of \$36,379 per year, the benefit-cost ratio for the improvement is 1.9.

ENVIRONMENTAL CONSEQUENCES

Traffic engineering improvements affect the environment principally through their impact on air quality and noise levels. However, the most extensive research (4) on noise levels concluded that it was not possible to model the interrupted traffic flow that would be experienced at an intersection controlled by a STOP sign or traffic signal. Hence, no attempt was made to measure the effects of the improvement on noise levels, although it is expected that noise levels will decrease because fewer vehicles are stopping (approximately 4,000 fewer stops per day).

There is more research available that permits an estimation of the effects of a traffic engineering improvement on air quality. A recent study (5) recommends that emission levels be used as an interim measure of air pollution consequences.

An estimate was made of the amounts of hydrocarbon and carbon monoxide emissions that could be expected if the traffic stream operated at a constant speed of 35 mph. To these amounts were added the emissions resulting from the stopping and idling of vehicles before and after the improvement. As given in Table 6, the improvement reduces hydrocarbon emissions about $2\frac{1}{2}$ lb per day (15 percent) and carbon monoxide emissions about 500 lb per day (25 percent).

ACKNOWLEDGMENT

Thanks are extended to the personnel of the city government of Wichita, Kansas, who provided much of the data used, and to R. W. Bruggeman, Director of Public Works, Wichita, Kansas, who supervised construction of the project.

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CAN PARKING TAXES HELP?

Damian J. Kulash, Jack Faucett Associates

Parking taxes have been advocated by many as a way to reduce automobile use and some of the unwanted side effects that accompany it. This paper looks at the role of parking in trip making and at motorist responses to parking price changes. It concludes that parking taxes would have little impact on problems stemming from automobile use because paid parking is associated with a small minority of all automobile trips, and motorists using such parking are not highly sensitive to its price.

●PARKING TAXES and surcharges have been advocated recently for a variety of purposes: They would help reduce peak-hour traffic congestion; restore users and extra revenues to public transportation systems; replace or defer additional highway construction; raise revenues for municipalities; and reduce problems of noise, air pollution, and fuel conservation, which are aggravated by heavy use of private automobiles. The degree to which a parking tax or surcharge can aid in achieving these goals appears to be exaggerated in much of the public rhetoric on this issue. This paper discusses experience to date with parking price policies and attempts to provide some empirical guidance on what their impacts are.

Although parking industry receipts totaled \$500 million in 1967, this is a miniscule part of the economy derived from the automobile—only about one-fourteenth the size of the automobile service and repair industry and only one-fiftieth that of the automobile manufacturing industry. This is the case because few automobile trips made use paid parking.

In larger metropolitan areas, fewer than 1 trip out of 20 is made to or from the CBD where most commercial parking is concentrated (1). Consequently, most trips do not require that motorists pay for parking. Even trips to work generally escape parking fees. Only 7.3 percent of persons driving to work have to pay for parking (2).

Because not all paid parking is under municipal control, it is impractical to use parking facilities that currently charge fees as a basis for limiting automobile use. Table 1 (3) gives the percentages of paid parking under commercial control in some of the largest metropolitan areas. The commercial segment is from half to over 90 percent of all paid parking, and it may be more difficult to control than parking facilities owned and managed by local governments themselves.

THROUGH TRIPS

Trips passing through an area without parking would not be subjected to any form of parking control, even one affecting parking spaces that are currently free. This gap in parking controls tends to be a worrisome point when such policies are discussed, and it will be helpful to get some idea of exactly how large this loophole is.

The number of through trips is clearly tied to the size of the area in which parking controls are being applied. A metropolitan area as a whole may have few through trips, whereas travel in the downtown area may consist mainly of through trips. Through trips have long been thought to comprise about 50 to 75 percent of all vehicular traffic. Similar estimates have been cited in many places, but most of them date back to a series of about 100 parking studies sponsored by the Bureau of Public Roads (BPR) from 1945 to 1955 (4, 5, 6). These studies, however, were based on the restrictively defined CBDs, which were usually less than one-third of a square mile.

Table 2 gives several measurements of through trips based on larger CBDs than those used for the BPR studies. As expected, the through-trip percentages for these

Table 1. Percentage of commercial parking for selected U.S. cities.

City	Parking Spaces		1970 Population ^a
	Total	Commercial (percent)	
New York	395,973	80	7,895,000
Detroit	35,002	50	1,511,000
San Francisco	55,950	54	716,000
Washington, D.C.	51,995	82	757,000
Boston	42,536	59	641,000
Pittsburgh	36,439	50	520,000
Newark	8,245	61	295,000
Dallas	24,354	88	844,000
Seattle	24,839	56	531,000
Milwaukee	24,710	59	717,000
Atlanta	33,280	94	497,000

^aCorrected by reference to the original tabulations.

Table 2. Percentage of through trips for large metropolitan areas.

City	Area of Measurement Zone (miles ²)	Through Trips as Percentage of Vehicular Traffic
London	6.0	20
New York City	7.0	50
Washington, D.C.	4.0	14
Boston	2.5	47
Newark	23.5	16

larger areas are smaller than the BPR-based estimates. Most proposed traffic restraint measures would apply to areas much larger than those given in Table 2 (7, 8, 9, 10, 11). Consequently, through traffic may not be a major problem. Assuming a traffic restraint zone about four times the area of the CBD, it would appear that through traffic makes up about 15 to 30 percent of all vehicular traffic in the zone.

MOTORIST RESPONSE TO PARKING PRICE CHANGES

Price elasticity is a convenient measure for describing how responsive parkers are to price changes. It is defined as the percentage change in the amount of parking that results from a 1 percent increase in price. Thus, a price elasticity of -0.1 would imply that one-tenth of 1 percent of patronage would be lost as the result of a 1 percent price increase.

This paper concentrates on three types of experience from which parking price elasticities can be measured: (a) before and after impacts of parking price changes, (b) cross-sectional differences related to parking price variations, and (c) surveys of hypothetical motorist reactions to parking price changes.

BEFORE AND AFTER EVIDENCE

New York City, Pittsburgh, and Baltimore are among the U.S. cities that have parking taxes. These taxes have generally been applied and raised gradually so that sharp before and after differences in travel patterns are not apparent. Probably the only place in the United States where a dramatic, areawide parking price increase has occurred is San Francisco. In October 1970, the city and county of San Francisco enacted a 25 percent parking tax that remained in force until it was reduced to 10 percent on July 1, 1972. Data from a number of city-owned garages indicate that a price elasticity in the range -0.38 to -0.20 (12) was descriptive of parker response there. This range describes both price increases (when the tax was enacted) and price reductions (when the tax was later reduced).

The elasticity suggests that parking volumes are fairly insensitive to price changes. For example, a price elasticity of -0.30, roughly in the middle of the range observed, would imply that a doubling of parking charges would only reduce patronage by 30 percent. However, there is also evidence of a considerable shift to cheaper, shorter term parking, which followed the imposition of the tax. As a result, garage revenues fell by far more than would be predicted by using the above price elasticity estimate.

An extreme example of the shift in duration of parking after there were price changes can be found in Washington, D.C. When meters were introduced in a part of Washington, the number of parkers rose by over 250 percent (5). Hence, the assistance of meters in policing parking time limits overshadowed the price increase that accompanied their introduction. The San Francisco findings may reflect a similar phenomenon at work: If commuters were filling facilities early in the day before the tax became effective, the imposition of the tax may have forced more space into use for short-term shopper parking.

CROSS-SECTIONAL EVIDENCE

At the Civic Center in Los Angeles, county employees are given free parking, but federal employees pay about \$15 a month to park. About 275 employees of the two governments were surveyed to see how their parking behavior varied (13). Forty percent of the federal employees and 72 percent of the county employees drove cars. From these figures, one can estimate that the parking price elasticity is -0.29, which closely agrees with the San Francisco findings.

Results of an extensive home interview survey were combined with parking price data to produce a comprehensive look at parking patterns in Washington, D.C. (14). A modal-split model was fitted to these data and was then used to predict the response to various levels of parking charges. These results lead to a parking price elasticity estimate of -0.41.

PARKING SURVEYS

There have been several surveys in Great Britain in which motorists were asked about how their parking behavior would differ with various price or availability conditions. Answers to such hypothetical questions are probably biased by the way the respondent thinks his responses will be used; however, they provide a type of data that would be difficult to measure directly.

Table 3 (15, 16) gives the parking price elasticities found in two of these surveys, which suggests that elasticities become greater (in absolute value) as the magnitude of the changes increases. For a survey in Liverpool (15, 0 to 1s. range), parking price elasticities by trip purpose were for work, -0.332; for shopping, -0.391; for other things, -0.272; and for all purposes, -0.273. Work trips were not as elastic as shopping trips—a result that agrees with earlier findings.

Table 3. Parking price elasticities based on survey results.

City	Parking Price Range	Elasticity
Liverpool (15)	0 to 3d./hour	-0.074
	3d. to 6d./hour	-0.259
	6d. to 1s./hour	-0.357
	0 to 1s./hour	-0.273
Oxford (16)	0 to 30d./day	-0.30 to -0.50
	30 to 50d./day	-1.22 to -1.54
	0 to 50d./day	-0.56 to -0.74

CONCLUSIONS

Forces promoting restrictions on automobile use are growing in their diversity and strength in the United States. Environmentalists are concerned with the volume of pollutants released in the air by automobiles, and the recent surge of interest in energy conservation has added further momentum to measures that curb travel.

There is also the continuing dissatisfaction with highways—the problems of dislocated families, the ugliness that has accompanied much new highway construction, and the reluctance to lose more land from the tax roles. These forces together have led to a climate in which traffic restraint measures are being given more serious attention.

Parking taxes, in particular, have been widely advocated in response to this new climate. They are easy to implement and administer. The mechanism for collecting them is largely in place. Because of the relative ease of implementing and dismantling parking taxes, government agencies trying to control automobile use for whatever

reasons will likely consider them. However, it is apparent from public discussions and editorial positions advocating parking taxes that such taxes are seen as a panacea for urban problems and those of congestion, pollution, and energy consumption.

Most of this popular discussion overlooks two facts apparent from the experience reported here: (a) few urban automobile trips make use of paid parking, percentage-wise; and (b) those that do are not highly sensitive to the price of parking.

Suppose that an area levied a 100 percent parking tax on all paid parking and that parking facilities were prohibited from absorbing any of this tax themselves. The immediate response to such a step would be for prices to double and parking patronage to fall by 18.2 percent. [This result follows from the definition of elasticity: $\eta = (\Delta Q \bar{P} / \bar{Q} \Delta P)$ where η is the price elasticity (-0.3), ΔQ is the change in patronage (-18.2 percent), ΔP is the change in price (100 percent), \bar{Q} is the average before and after patronage (90.9 percent), and \bar{P} is the average before and after price (150 percent).] But all traffic does not use paid parking, and the drop in street traffic would be much lower than the loss of parking patronage. Inasmuch as under 10 percent of all automobile round trips use paid parking, the areawide reduction in traffic would be under 2 percent; this offers little relief to air pollution and fuel conservation problems.

The congestion effect would be somewhat greater, because most paid parking is concentrated in the CBD where many of the worst traffic snarls occur. In this paper, however, through traffic is high—50 to 75 percent—in downtown areas. In addition, 29.3 percent of downtown automobile trips are able to use nonmetered street parking or private lots and garages (17). Allowing for through traffic and exempt parking, the traffic reduction in the CBD would fall between 3.6 and 8.7 percent. Although such a reduction may be noticeable, it is not likely to be significant. Furthermore, it must be remembered that the force needed to motivate this reduction is an unprecedented 100 percent parking tax, and that the smaller taxes typically advocated would have correspondingly less effect.

The lack of parking tax effectiveness in reducing traffic volumes points to the need for a broader base of control. Fewer than 1 automobile trip in 10 uses paid parking. Clearly, this makes a poor level for trying to shift automobile usage generally. On the other hand, taxing all parking (not just paid parking) poses severe practical problems. How do you charge in shopping center parking lots or how can you bill for suburban street parking? Certainly there are some measures, such as more widespread use of parking meters, which can increase the scope of economic controls. But trying to extend that scope too far can become extremely clumsy and expensive. It is doubtful if there is any practical way of instituting parking charges that apply to more than half or even more than a quarter of all trips in a metropolitan area.

Parking taxes have been overrated by many as solutions to some problems of the automobile age. They may well have a role to play, along with other traffic restraint policies, in the reduction of congestion, but they promise very little help in alleviating the other unpleasant consequences of widespread automobile use.

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TRANSPORTATION IMPACT ZONE POLICY

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Several policies to decrease adverse impacts of transportation facilities are analyzed. The primary purposes of the proposed transportation impact zone policy are to improve social and environmental quality, equity (by reducing uncompensated losses), and technical efficiency of transportation (by expanding ameliorative measures available to transportation agencies). Secondary goals are to internalize costs and increase community acceptance of proposed facilities. The proposed policy involves three strategies: (a) regulation, (b) funds for recipients provided they treat adverse impacts, and (c) unrestricted funds for those damaged. Only noise seemed subject to satisfactory regulation—a two-tiered standard with more stringent standards for new facilities than for those existing and with variances across transportation modes depending on cost-effectiveness. Funds for affected recipients, if they ameliorate adverse impacts, provide an incentive for carrying out certain desired activities such as soundproofing, noise barrier construction, neighborhood planning grants, bikeway and pedway construction, and property acquisition. Unrestricted funds for those damaged are most efficient at increasing equity because they can be used for whatever the individual thinks is best. These funds would be payments for value losses for residential property, loans for short-term losses to small businesses, and for compensation to municipalities for significant (over 2 percent) losses in their total tax base for impact remedies provided outside the right-of-way.

•THE current transportation system represents the final product of a process that contrasted construction and operation costs of particular facility types and locations with the benefits of increased mobility expected to result from those alternative facilities. Only a partial set of transportation costs and benefits have been used: Social and environmental impacts of transportation were largely ignored. Primary attention was devoted to measuring aggregate costs and benefits of transportation; the distribution of those costs and benefits among different population groups was little considered.

The persistence of uncounted costs and benefits in transportation decisions and the relative inattention to distribution have had several consequences. The inattention has resulted in a socially inefficient distribution of transportation facilities. Because the transportation agency was not held accountable for any deterioration in levels of social and environmental quality resulting from its decisions, facilities were sometimes built that overly compromised the community environment. Furthermore, the transportation system's inattention to distributional issues resulted in uncompensated economic losses to particular individuals.

The National Environmental Policy Act of 1969 has made some progress in mitigating these problems. In particular, the act requires that the social and environmental impacts of new transportation facilities be reported on prior to project approval: an attempt to broaden the set of costs and benefits included in the project. It, however, does not provide any means of ameliorating identified impacts. Current transportation legislation largely limits adverse impacts identified with facility design and location changes. Outside the right-of-way action is seriously circumscribed. Neither current transportation legislation nor environmental initiatives provide for programs to reduce uncompensated economic losses associated

with transportation system development. The transportation impact zone (TIZ) policy developed and analyzed in this report is intended to fill this gap: to present a systematic program for promoting outside the right-of-way action to mitigate the adverse impacts of transportation facilities.

POLICY OBJECTIVES

In an attempt to develop a policy to deal more comprehensively with the adverse impacts of transportation facilities, the problem is not finding a mechanism that will work; it is molding an optimal strategy by choosing from the many tools, or combinations of policy components, that have been identified or proposed. These tools differ in terms of both their costs and effectiveness.

Criteria are necessary for choosing among alternative policy components. To have criteria, one must have goals. Much literature on the treatment of the impacts of transportation facilities and possible means of treating them leaves underlying policy objectives unspecified. The first task in choosing among the plethora of available treatment programs is to identify relevant policy objectives.

Three distinct, legitimate goals for any policy initiative in the field of impact zone treatment are (a) improvement of social and environmental quality, (b) elimination of uncompensated economic welfare losses (equity), and (c) improvement of technical efficiency in transportation. Several other derivative objectives will also be served by this policy.

PRIMARY POLICY OBJECTIVES

The improvement of national, social, and environmental quality is an explicit goal of a broad range of public policies; the requirement for environmental impact statements is one example of the pursuit of this objective in transportation. Current legislation, however, does not express the potential public concern over the indirect impacts of transportation facilities. In this TIZ proposal, a series of actions has been identified that would further reduce the adverse impacts of key transportation facilities (including highways with four or more traffic lanes, elevated surface and subsurface facilities for the mass movements of passengers or goods, and airports designed for scheduled passenger service or major general air traffic) by expanding the set of ameliorative actions eligible for funding by transportation agencies.

The TIZ policy initiative is intended to accomplish more than improvement of social and environmental quality of transportation facilities. It will also reduce the uncompensated economic welfare losses currently associated with the development of transportation systems.

Even in the case of transportation facilities that have net benefits for the community, many individuals and institutions may suffer real economic welfare losses as a result of the externalities produced by these facilities. These losses will be only partially eliminated by the improvements in community social and environmental quality generated. In many cases, complete elimination of all of the adversely experienced impacts of transportation facilities would be prohibitively expensive. The persistence of differentially distributed adverse effects from transportation facilities, however, violates the principle of equal sacrifice that has long guided the formation of public policy in the area of taxation. Fundamentally, this principle reflects a measure of political agreement: The governmental cost should be defrayed by a system of taxation that requires equal sacrifice from each individual. Although there have been varying interpretations of the equal sacrifice principle in developing schedules of progressive taxation, there has been no disagreement on the basic premise that individuals in equal economic circumstances should be treated equally. When, however, residual externalities persist in constructing and operating transportation facilities, those adversely affected absorb a disproportionate share of the total burden of these facilities. The inequities introduced by this system are particularly severe when the adversely impacted individuals are geographically concentrated. The TIZ proposals will, in addition to improving the social and environmental quality of transportation facilities, also help serve the equity principle of public finance.

Finally, the TIZ policy will promote technical efficiency in transportation. By allowing, as part of project costs, the costs of ameliorating adverse transportation impacts outside the right-of-way, the policy effectively expands the opportunity of transportation planners and increases the total net benefits potentially realizable from transportation facilities. A simple example will help clarify this point. Assume (a) there is a transportation facility that creates total benefits of \$100 and (b) this facility will cost \$70 to build and will create some additional social costs. If no action is taken, these additional social costs, e.g., in property value losses from noise, will equal \$20; therefore, the net social benefit is \$10.

The transportation agency can, however, make some inside the right-of-way design changes: Assume these add \$5 to construction costs and reduce residual social costs to \$10. The net social benefit for this option is \$15 ($\$100 - 75 - 10$). Clearly, this second option is preferred.

The policy proposed provides the planner with still a third option: outside the right-of-way amelioration. In the case described, such action (e.g., soundproofing) might increase project costs to \$75 and reduce residual social impacts to \$5, yielding a net social benefit of \$20. It is in this sense that the TIZ policy provides a means of increasing the range of economic welfare possibilities.

SECONDARY GOALS

There are two additional policy goals that will be, at least indirectly, served by this initiative: allocative efficiency and community acceptance.

Allocative efficiency, in the transportation area, requires only that the full private and social costs and benefits of a project be included in the initial project calculation: Externalities should be internalized. Allocative efficiency does not require that any compensation be paid to adversely impacted individuals or that any action be taken to ameliorate the adverse social and environmental effects of transportation facilities. Strict allocative efficiency requires only that all costs and benefits be counted. Nevertheless, whereas the payment of compensation or physical treatment of impacts is not a necessary condition for the achievement of allocative efficiency, it is a sufficient condition. One way to ensure that all social costs are considered (as is demanded by efficiency) in project calculations is to require that action be taken and funded to reduce those costs. Thus, although this policy was not designed as a direct response to problems of allocative inefficiency, it will nevertheless help to reduce these problems.

Finally, there is a final policy goal implicit in each of the other goals described: encouraging an increase in the level of community support for planned facilities. Neutralizing the community opposition that effectively blocks the introduction of socially worthwhile projects can be soundly based in the principles of public policy. Nevertheless, in developing this policy, the goal of increased community support was addressed only indirectly: Community support for a project will be promoted only to the extent that it is produced as a result of actions taken in other major goals of this policy.

ANALYSIS OF PROGRAM COMPONENTS

There are three basic types of program mechanisms available to any public agency in discharging its legislated mandate: It can regulate, it can make funds available based on certain actions by the recipient, and it can make funds available without restrictions. The TIZ policy proposed uses all three mechanisms to address problems produced by externalities in transportation. The rationale for choosing particular strategies to remedy particular types of adverse impacts and the analysis underlying the choice of administrative structures to implement this policy are discussed.

REGULATION

The federal government can elect to deal with the adverse impacts of key transportation facilities by regulation. For this, the government must be able to develop

standards of social and environmental quality that are unambiguously defined and that may be measured accurately. The level of standards set should reflect a careful and considered judgment of the trade-offs between the public benefit and the public and private cost of meeting the standards. Finally, the government must determine which categories of facilities should be regulated and how the standards should be set for each. Three basic issues for the selection of regulatory mechanisms can, therefore, be identified:

1. Which adverse impacts should be regulated?
2. Which facilities should be subject to regulation?
3. At what level should standards be set for each category of regulated facility?

Selection of Impacts To Be Regulated

Three criteria were identified for the selection of impacts that could appropriately be regulated: (a) significance, (b) measurability, and (c) accountability. These criteria were applied to the full range of impacts produced by transportation facilities in an attempt to identify those impacts susceptible to regulation.

In an earlier review of transportation facilities (1), 11 dimensions of social and environmental quality effects were identified: noise, air pollution, water pollution, vibration, electromagnetic interference, light, accessibility, neighborhood disruption, crime, safety, and aesthetics. Of these, only noise, air pollution, water pollution, accessibility, neighborhood disruption, crime, safety, and aesthetics were significant enough to warrant concern for at least one major facility category.

Review of these impacts in terms of their suitability for regulation found that only noise, air pollution, and crime lent themselves to reliable measurement. Of these, only noise satisfied the remaining criterion of accountability within the current state of the art.

Thus, careful analysis suggested that for the purposes of this policy only noise should be subject to regulation. The remaining transportation impacts were dealt with through the other policy mechanisms.

What Kind of Regulation?

Once it was found that only noise was appropriate for regulation, the kind of regulation needed had to be determined.

Highways, airports, and public transit were potential sources of significant noise, and thus, all are covered by the regulatory provisions of this policy.

The key issue in the choice of facilities for regulation lies in the distinction between the regulation of new facility development and the regulation of both new and old facilities. The case for regulating new facilities only has some appeal because regulation, through internalization of costs, may exert a beneficial influence on route or site selection. This can only be effective in the case of facilities still in the planning phase. Furthermore, it may be much cheaper to meet the standards at new facilities than at existing facilities.

The case for regulating existing as well as new facilities is not without some merit because regulation is intended as a means of achieving health and welfare goals (the concern is with the individual and not with the source). Thus, in that noise abatement is viewed as a preeminent objective, the regulation of existing facilities may still be appropriate.

A related issue arises when one tries to determine whether or not standards should be uniform across modes. Intermodal differences in the costs of noise abatement argue for a differentiation in permissible noise levels across modes. Equity considerations suggest that individuals subjected to equal noise levels should be compensated equally regardless of whether the noise is produced by an airport or a highway.

Both the problem of new versus old facilities and cross-modal distinctions have been resolved in the proposed policy through a two-tiered standard.

The Secretary of Transportation is required by the proposed policy to establish a minimum health standard for noise, which is applicable to all facilities; this standard

is to be uniform across modes and across vintages of facilities. The requirement that a single lower bound standard be applied uniformly across facilities reflects the minimum health and safety nature of the standard. Uniformity is required because the costs to impacted individuals of exceeding the health standards are gross.

Under the proposed policy, the Secretary of Transportation is further required to establish a second tier of more stringent noise standards applicable only to proposed facilities and varying across modes according to cost variance.

There is one final issue that must be addressed in establishing federal transportation noise standards. Should standards be absolute or keyed to the type of land use under exposure? In the TIZ policy, the latter approach is used (e.g., a noise compatibility standard, similar in principle to the California noise law). It designates a maximum level of noise to which individuals living in the area may be subjected; if no one lives in the area, no regulatory action is required.

The use of a standard keyed to land use appears to be particularly appropriate for noise. Unlike air pollution and water pollution, noise has little effect on the overall ecosystem; it primarily affects the health of individuals. Thus, the absence of overriding ecological considerations makes the tying of standards to people affected most sensible.

TIED ASSISTANCE PAYMENTS

During the last 30 years, enormous growth has occurred in the federal grant-in-aid system, not only in transportation but also in education, health care, welfare, urban renewal, waste treatment, water supply, low-income housing, and so on. Generally, the categorical grant system serves federal policy objectives by reducing the cost to state and local government agencies associated with developing public facilities or providing public services. In short, it provides an incentive for carrying out certain desired activities.

Use of assistance payments tied to certain activities is particularly relevant to the treatment of transportation impacts. Transportation facilities are subsidized by the federal government through formula matching grants. Because expenses are incurred in treating areas impacted by those facilities, they should be included in project costs on the same basis as construction and other costs incurred within the right-of-way. This argument (internalization of costs) applies primarily to new facilities, inasmuch as cost internalization serves little allocative purpose for existing facilities.

TIZ policy uses tied assistance programs in two ways. First, they are used as a method for defraying the costs of complying with federal noise regulations at the state level. Thus, certain actions taken outside the right-of-way to achieve noise regulation are made eligible for federal funds. Second, several adverse social and environmental impacts exist that are not susceptible to regulation but that are still sufficiently significant to warrant concern. The incentives provided to localities by federal matching contributions provide the only real measure of dealing with these impacts.

Assistance Payments for Noise Abatement

There are four abatement methods that can be exercised outside the highway or public transit right-of-way or outside the airport boundary: These actions are designed

1. To reduce exterior noise levels for a given pattern of land use (construction of berms, absorbing barriers, etc.);
2. To reduce interior noise levels of structures for given exterior noise levels and a given pattern of land use (soundproofing);
3. To eliminate incompatible land uses (acquisition and demolition of incompatible structures); and
4. To prevent incompatible land use development subsequent to facility development (preemptive land use acquisition, condemnation of development rights, zoning, etc.).

In the TIZ policy, actions taken to achieve compliance with federal noise regulations in any of the four ways listed are allowed as part of normal project costs. The choice among techniques is discretionary; the optimal choice of noise abatement method varies across facilities for cost reasons and in response to variations in local law and policy.

Reflected in the allowable costs provided by TIZ policy is the view that all activities undertaken to achieve higher levels of noise compatibility must be made eligible for federal grants-in-aid on the same basis. Failure to do this would effectively distort the prices that a state or local agency faces and would result in an overuse of techniques for which grants are available. An inefficient use of abatement techniques would therefore be promoted.

Assistance Payments for Impacts Other Than Noise

Noise is by no means the only, or the most important, adverse impact of key transportation facilities, and although other impacts do not lend themselves to federal regulation, actions designed to deal with those other impacts can be made eligible for computing the federal matching contribution.

In determining which additional impacts should be dealt with by means of assistance payments, the key issue is accountability. If it is not possible to determine the extent to which the transportation facility is or is not accountable for experienced levels of social and environmental quality impacts, it is not appropriate to use transportation use charges for treating those impacts. Indeed, such use would be a direct violation of the antidiversion provisions of trust fund legislation. Of the seven social and environmental impacts significantly important to warrant concern (not including noise), only accessibility, neighborhood disruption, and aesthetics passed the test of accountability.

The aesthetic impacts of highway development are currently dealt with in the Highway Beautification Act of 1965. The aesthetic impacts of highways seem to be of much greater importance than those of airports or public transit facilities. There is little opportunity in any grant for outside the right-of-way aesthetic improvements for public transit or airport facilities. Aesthetic questions relate far more to rural than to urban environments where most airports and all public transit facilities are located. For these reasons, assistance payments for aesthetic improvements beyond those already provided for in the 1965 act did not seem particularly necessary.

Although neighborhood disruption is hard to define with any precision and impossible to measure, it is significant as an impact of transportation facility development and must correctly be addressed in the environmental impact statement for all new developments. It is extremely difficult, however, to identify a set of discrete activities that can be undertaken to offset or ameliorate those disruptive efforts. For this reason, the TIZ policy suggests that neighborhood disruption be treated by making special corridor or sector planning grants available to the appropriate areawide planning agency; e.g., in those cases in which the environmental impact statement finds that significant neighborhood disruption will result from facility development and generation. Corridor or sector planning grants are not permitted under this policy in those instances in which neighborhood disruption is trivial because this would constitute an unwarranted burden on the trust funds.

Accessibility within a neighborhood may be threatened by a new transportation facility, either by the physical division of the community by the facility or by increased traffic volumes on feeder roads. Access disruption may be particularly severe in communities with high levels of pedestrian dependence. Where it can be demonstrated that such a threat exists (2) and where investments outside the right-of-way can be shown to offer compensatory improvements in local access, the policy includes such investments as part of eligible project costs, e.g., the construction of pedestrian walkways, street widening, and so on.

Thus, in the policy, the transportation project costs eligible for federal funding have been expanded to include costs of outside the right-of-way noise abatement, selective planning grants to minimize neighborhood disruption, and investments designed to minimize local access disruption.

UNTIED PAYMENTS

Implementation of regulatory and tied assistance provisions of the TIZ policy will result in a substantial reduction in the adverse impacts of transportation facilities. Nevertheless, some residual adverse impacts will remain. In particular, regulatory and tied assistance programs are directed toward amelioration only of noise, neighborhood disruption, and local accessibility; other transportation impacts are not directly addressed. Moreover, even these impacts will be, of necessity, incompletely remedied. Thus, some uncompensated economic welfare losses from transportation facilities may still persist. In TIZ policy, untied or unconditional compensation payments are used as a device to reduce these losses.

Note that payments made without restriction on the recipient are appropriate only because the underlying policy objective is to increase the recipient's economic welfare. If the policy objective were exclusively to improve some aspect of social or environmental quality, the payment should always be conditioned on the recipient taking appropriate action. Thus, the inclusion of an untied payment provision in the proposed policy reflects the belief that adverse transportation effects exist, which cannot be entirely remedied through direct regulation or tied assistance, and that the economic losses generated by these impacts should be reduced to promote equity.

There are three categories of potential claimants on compensation funds:

1. Owners or occupants of residential property subjected to adverse transportation impacts,
2. Owners of commercial property that declines in value or renters of commercial property who suffer business losses, and
3. Municipalities that suffer losses in tax revenues without offsetting reductions in the cost of municipal services.

The design of a cash payment program to compensate any one or more of these potentially injured groups is not without its difficulties. These relate principally to the identification of injured parties and the determination of the cash payments required to compensate them.

Compensation to Owners or Occupants of Residential Property

Compensation to owners or occupants of residential property is the most important category in terms of the legitimacy and magnitude of potential claims. Residential property is often at least somewhat incompatible with transportation facilities; empirical evidence, though fragmentary and to some extent conflicting, suggests that under some circumstances serious economic welfare losses may accrue to this group.

There are two basic approaches to compensating for transportation impacts on residential property. The first simply ties a cash payment to specified reductions in one or another dimension of environmental quality. This approach encompasses formula arrangements (i.e., dollars for decibels) as well as less structured arrangements such as time-limited easements. A second would tie cash payments to measured or estimated changes in residential property values.

Cash payments linked to an environmental quality measurement is perhaps the simpler of the two to administer; it has, however, several serious flaws. First, the determination of the trade-off concerning environmental quality is necessarily arbitrary: Is \$100 or \$1,000 paid per 1 percent increase in area noise levels? Second, such a scheme cannot embrace those impacts that do not lend themselves to reliable measurement; yet it is toward those precise impacts that cash payments are most appropriately directed. Finally, in those cases in which a facility confers offsetting benefits, such as improved mobility or employment opportunities, cash payments linked to environmental quality measures may lead to substantial overcompensation and inequity among individuals who differ with respect to the level of offsetting benefits.

In the TIZ policy compensation payments to individual owners of residential property are determined by the property value losses that accrue as a result of the facility. Thus, based on the extent that an individual's property depreciates in value as a result of the construction and operation of a transportation facility, the government will

absorb some part of this loss (the proposed property value loss compensation is essentially equivalent to the payments for "injurious affection" currently available in Great Britain under the Land Compensation Act of 1973).

Keying compensation payments directly to property value losses avoids most of the problems implicit in the dollars for decibels approach, without simultaneously introducing other unmanageable problems. First, the property value approach is considerably less arbitrary than the general environmental quality approach in deciding the money due for certain physical impacts. Second, changes in property values resulting from the development and operation of new transportation facilities reflect not one or two measurable impacts but all the impacts of transportation, including some which would be impossible to assess in any other way. Therefore, the method of cash payments for property value loss, which compensates only for net effects of transportation impacts, avoids the problem of selective overcompensation implicit in cash payments linked to an environmental quality measurement.

TIZ policy, inasmuch as it focuses on property values as a basis for compensation, does not do much for renting occupants directly; however, this is not considered to be a serious problem. Most leases are considerably shorter than the planning period of transportation facilities. In that the net impact of the new facility on the value to renters is negative, this should be reflected in rental prices. In short, the normal operation of supply and demand in the housing market should by itself compensate renters.

The proposed policy limits eligibility both temporally and spatially by carefully defining an impact zone. Only those individuals who owned impacted property before the introduction of the transportation facility are eligible for pavements. Once a facility is introduced into an area, property values will adjust to reflect the impact of that facility; thus, individuals who purchase homes in the impacted area after the facility is introduced will already have been implicitly compensated by the market through the reduction in the price they must pay for that home. In short, if an individual with full knowledge chooses to purchase a home next to a highway, the government is in no way obligated to compensate that individual for having made that choice.

Limiting eligible recipients of compensation funds to individuals who owned residential property before the inception of the facility suggests a second eligibility limit. Only transportation facilities for which federal aid applications have not yet been submitted will be responsible for paying compensation. In the case of existing facilities, the convoluted history of property transfers makes the identification of preproject landowners far too difficult.

Compensation will be paid only once and must be requested after the facility is in operation but before 2 years has elapsed from the opening of the facility. The single compensation payment is designed to reduce administrative load and avoid perverse double counting. The requirement that compensation payments be delayed until after the facility is in operation is to avoid the payment of short-term property value losses generated by construction impacts. Finally, the 2-year limit on compensation claims is designed to reduce administrative load and to minimize problems of calculating land inflation over long periods.

TIZ policy further circumscribes eligibility for compensation payments spatially. When the facility in question is constructed, the transportation agency responsible will provide noise contours. These contours will be used to define an impact zone within which homeowners are eligible for compensation. Under this provision noise is being used as a proxy for the whole range of anticipated impacts; this provision assumes that residential areas most severely impacted by noise will simultaneously be most severely impacted by other, less easily measured, impacts. Thus, even though geographical eligibility is being keyed to noise effects, the compensation program itself goes far beyond simple loss payments based on noise impacts.

Compensation to Owners or Renters of Commercial Property

The impact of transportation facilities may also appear in changes in the value of units of commercial property and reductions in the earnings of (usually small)

businesses. Inasmuch as commercial losses may extend well into the period in which the transportation facility is in full operation, the problem of who to compensate is potentially significant.

There are other questions about the propriety of compensating for the impact of transportation facilities on commercial asset values. Generally, the overall impact of new transportation facility development on commercial values is significantly positive. In those instances where individual businesses are hurt, the evidence suggests that this is the result of changed traffic patterns and not of reduced environmental quality. It is not clear that public agencies should be made liable for commercial losses resulting from the improvement of transportation facilities when they have no current means of appropriating the benefits. Furthermore, in most cases where losses exist, they are incurred not close to the new facility but at a distance and in an area in which traffic flows have been reduced.

It can be argued that although locational decisions are critical in the success or failure of single commercial enterprises, the outcome of these decisions is a normal business risk. If this is true, it would not only be of doubtful value to compensate for losses, but it would also reduce the incentives for making sensible and cautious decisions about future location. However, businesses experiencing losses may be eligible for income tax rebates.

The TIZ policy does not provide blanket coverage for all impacted businesses. The policy does, however, provide for minor coverage for a special class of impacted businesses. In particular, certain small businesses in the area surrounding the facility may suffer temporary increased costs or revenue losses from the social and environmental effects of a new facility. This situation is particularly common during the construction phase of the project. A real economic loss is imposed by small firms that drop out of the area because they have no capital in reserve to see them through temporary disruptions. (Clearly, this problem would not exist if capital markets were perfect; they are not.)

TIZ policy deals with this temporary disruption problem by providing short-run loans to impacted small businesses. Eligibility for these short-run loans is seriously circumscribed. In particular, only businesses within the impact zone, as defined by modal agencies under the residential compensation plan, are eligible. Moreover, loans are available only to small business concerns, as defined by the Small Business Administration. Finally, the burden of proof in demonstrating a transportation-related profit loss is on the business and requires

1. Demonstrating a difference in profit rates during the study period and the average profit rate experienced by the business during the 5 years before facility construction.

2. Showing, through comparisons with similar businesses in the region, that this profit differential does not simply reflect trends exogenous to the facility. The maximum loan available would be equal to the 1-year profit loss demonstrated. Claims must be made before the end of the first year of facility operation.

Compensation to Municipalities

Regulatory and tied assistance provisions of the TIZ policy will, in some cases, require the condemnation and demolition of taxable property outside the right-of-way. Because municipalities cannot effect immediate offsetting reductions in the costs of services (1), there is a negative impact on the taxpayer.

It is frequently argued that the long-run effect of new transportation facilities is to increase municipal tax revenues; however, this increase in property values is realized over a significant time period, but the loss of revenues from condemned property is immediate. This temporary loss may devolve an extraordinary burden in rural towns with already limited tax bases.

TIZ policy provides a time-limited (3-year) payment to municipalities for revenues lost. The payment is available only for large tax losses: 2 or more percent of the taxable town property must be taken. Thus, this provision is designed to deal primarily with extraordinary losses.

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NEW INSTITUTIONS FOR JOINT DEVELOPMENT

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The need for coordinating development of transportation and land use has long been recognized by professional planners and engineers. Such recognition is now becoming more widespread. We must now give more serious consideration to establishing institutional mechanisms that could be effective in implementing the concepts for coordination that have evolved. We should especially give attention to developing legislation that would permit, facilitate, and perhaps even require joint development.

•TRANSPORTATION and land use decisions are made largely independently of each other. Little effort is exerted to control or guide land use and relatively few concessions are made to land use plans in the design and construction of transportation facilities. It appears that planners and engineers who know better have largely given up trying to implement concepts such as coordinated interchange planning, multiple use of rights-of-way, and joint development (1). Even in the area of transit station location and design, i.e., where coordination is essential to efficiency and effectiveness, relatively little real coordination is being achieved. Much of what passes for coordination is little more than cosmetic design. Seldom are functional changes made in either transportation facilities or land use.

There are many reasons why we have not been more successful in achieving joint development: a lack of a sense of (a) urgency, (b) understanding about the levels at which coordination must be achieved, and (c) the concepts to be applied. However, the main reason that we do not make more progress in the coordination of transportation and land use is probably that the institutional tools that would increase the potentials for accomplishing joint or coordinated development are not well developed.

Joint development at a corridor scale is not being pursued because no agency or coordinated group of agencies has the resources required to deal effectively and comprehensively at this level. State highway departments and regional transit authorities are normally concerned with only one transportation mode and have no official responsibility for land use. Regional planning agencies and councils of government may have the necessary comprehensive concern, but they seldom have jurisdiction over either transportation or land development.

Aside from new towns, we have not devised ways of achieving joint development at the community scale. Even at the project scale, the problems of joint development often seem overwhelming. Thus, although joint development is theoretically possible and is sometimes achieved, it is far from commonplace. Its potentials for the solution of urban problems are hardly being scratched. If we are to move forward with joint development, more effective institutions and arrangements must be created.

We must be serious in developing legal and institutional ways to carry out joint development at all levels. We can point to some important precedents. Much of the extension of the railroad system through the West was accomplished through a form of joint development. Railroad companies were encouraged to and did establish settlements along their new lines. Later, the barons of the electric utility industry built electric railways and established strings of communities along them, e.g., Cleveland and Shaker Heights. Sweden and other European countries also provide examples of joint development at a corridor scale. And in the United States, from time to time, proposals (if not definite plans) are made for building new towns or major employment complexes in conjunction with the extension of highway and transit facilities.

Another precedent exists in the history of river basin development. A number of fairly successful programs have been carried out, and, in many respects, the issues involved are as complex as those found in transportation and land use. Probably the most famous river-related joint development is that carried out by the Tennessee Valley Authority (TVA). For many years, the TVA was pointed to as a model of how to approach a complex set of economic, social, and environmental problems that can only be resolved through joint and coordinated development. Unfortunately, the TVA experience has now been all but forgotten, but we should try to find out what lessons from the TVA might be applied to the problems of urban transportation (2).

Some conditions that should be achieved to help in accomplishing joint development and that are inherent in some of the historical precedents are

1. Agencies responsible for stimulating joint development must have flexible use of funds. Although one purpose may predominate, it must be possible to allocate moneys to stimulate and help secondary activities that are related to the primary objective.
2. Entities responsible for joint development should have a relatively broad charge. This charge should go well beyond building or helping to build a route from point A to B. Rather, it should recognize the interrelated nature of various systems and of transportation, land use, and other significant facilities or activities.
3. Programs for joint development at the corridor or sector level should probably work through existing institutions as much as possible. Joint development at these levels requires mainly mobilizing and organizing programs and activities already under way. There is no need, and it may be harmful, to create superagencies to achieve joint development objectives. Rather, it may be best to develop ways of using gentle but strong incentives to obtain the coordination and action required.
4. The corporation concept should be used as one model or point of departure for the organization of joint development agencies, at least at the project scale. Such corporations should be held publicly accountable but should be permitted latitude comparable to that of private companies in important matters such as buying and selling land, generating income and profit, and charging for services rendered.

What are some of the ways in which the conditions and organizations that will be effective in joint development can be achieved? No one technique or device will be adequate. There are many different situations that must be met with different approaches. In almost every case, special legislation is needed to establish the necessary mechanisms and to permit the actions required.

A number of possible models or formats should be considered and several should be available for use in every state or region. The most obvious of these include the application of zoning and other regulatory power. Although such devices may be valuable in some situations and necessary in most, they do not provide the levels of coordination required. Other measures are needed. These must involve more significant ability to acquire rights to and to allocate the use of land and money. Some of the possibilities for achieving joint development are discussed.

POWERS OF TRANSPORTATION AGENCIES

Broadening the responsibilities and powers of transportation agencies to include various aspects of land development should be used in many situations where opportunities for joint development are limited, scattered, and intimately related to the functioning of the transportation system. This is the technique involved in rather major ways in the development of most air and sea ports and in minor ways in the development of roadside stops along freeways and newsstands in transit stations. Major port authorities usually have the broadest responsibilities and powers.

There are obvious advantages and disadvantages to using this technique. Where a particular land use or activity is clearly necessary for transportation system operation, it may be provided for quite well. However, where the advantage to the transportation function is less clear, it is unlikely that suitable provision will be made for the land use in the construction or operation of the transportation facility. This is

particularly true if there is some risk of opposition or failure or if the effort to obtain coordinated development is not clearly matched with a potential return.

Because most functions (e.g., housing, commerce, education, recreation) are perceived in view of the responsibility of other institutions or agencies, there is likely to be opposition to the efforts of transportation agencies to provide for facilities or services beyond transportation. Nevertheless, in many situations, the best potential for achieving effective joint development will be through expansion of the responsibilities and powers of such agencies. They are often best equipped to expand to meet new requirements, and they must be involved in the achievement of joint development objectives; however, care must be taken to expand the vision and understanding of the broader missions to be achieved as grants of power are increased.

MULTIFUNCTIONAL PUBLIC CORPORATIONS

The New York State Development Corporation, British new town corporations, and the TVA are examples of multifunctional public corporations. Local redevelopment authorities also have often been effective in planning and implementing somewhat limited joint land use and transportation projects and programs.

Such corporations probably offer some of the greatest potentials for achievement of effective joint development; however, they too have often suffered from limitations in financing and in the way their missions are defined. Thus, if maximum potentials for coordination are to be achieved, roles must be more broadly defined and necessary financing, particularly of transportation facilities, must be channeled into and through such organizations.

The public corporate model could be applied in many ways. For example, a corporation could be created to take the initiative in joint development projects throughout a state or a region on an open-ended basis. Or it could be established with objectives limited to a specific corridor, area, or project. The New York State Urban Development Corporation is one example of the first type; the typical British new town corporation is an example of the second. Such corporations are sometimes formed to achieve narrow objectives, such as the construction of new public office and parking facilities, and they then expand their role to include the construction of a wide range of public facilities (e.g., public building commissions in Indianapolis and Chicago).

One of the chief limitations of public corporations is that they are frequently restricted in the amounts and types of nonpublic development that they can include in their projects and in the ways in which they can cooperate with private investors and operators. Redevelopment agencies are usually free to work with private investors and developers; however, they can usually participate only in projects involving land that is either slum and blighted or that is needed for other public purposes. Thus, to be most effective, adjustments will be required in the models available.

PRIVATE CORPORATIONS

Another concept to encourage joint development is to commission or charter private corporations to plan and implement joint developments. Major joint developments, often with little public participation, are carried out by many private companies in the form of new towns, shopping centers, or large industrial developments. However, these are rarely at a scale that permits the most coordination with major freeway, highway, and transit facilities. Opportunities for joint development are limited by the ability of private developers to obtain land in locations where such development is possible and needed.

It is possible to cloak private corporations with some of the powers needed; e.g., in some states private redevelopment corporations are established and given some of the powers of eminent domain. Other precedents, from the Hudson Bay Company to cable TV, show that there are effective ways to direct and use private corporations to achieve combinations of public and private objectives. Much more creative work is needed in this area.

LAND BANKING

Another concept that could facilitate joint development and the coordination of land use and transportation is land banking, a technique for dealing with problems such as reserving open space and facilitating orderly development.

The value of land banking as a tool for joint development stems primarily from its potential use in assembling and disposing of land. Even when several entities are involved in construction, coordination can be achieved through the careful planning and control of development rights.

One technique suggests that a single entity be created to buy and manage lands needed for all public purposes within an urban area. If the term public means land needed to achieve joint development objectives, this land banking entity could do much to help in the coordination of transportation and land use (3).

DEVELOPMENT DISTRICTS

One characteristic of joint development is the necessity or desirability of singling out an area for special investment control. One way of doing this is to create special development districts in which various financing and control techniques can be applied, apart from those of the larger community. Development districts could be fully compatible with the other concepts described. They can serve as interim or special-purpose government or management units that provide ways to plan and raise money for joint improvement.

Development districts have been suggested as devices for obtaining better coordination and planning services for suburban areas. They have been used with tax increment financing for renewal projects. They have also been used to provide the infrastructure needed to permit new urban areas to be created in places like Disney World. (Florida widely uses such districts; other states use them on a more limited basis.)

They provide a way of giving special attention to land that might be the subject of joint development without necessarily involving or penalizing other areas. They also provide ways of capturing some of the values and impacts that might be generated by transportation investments.

CONTRACTS

An easily overlooked tool for coordination is the contract. Contracts are obviously required at many stages in any large program or project; however, where major coordinative actions are required, master contracts may be needed.

In a redevelopment program, the redevelopment or renewal plan serves as a master contract. In federally aided new communities, the project agreement is such a contract. In one of the most complex joint developments, the (Chicago) Illinois Central Air Rights Project, the 100-page Lakefront Ordinance serves as the master contract, which binds the city, the landowner, and several developers into a common plan. Efforts to facilitate and promote coordination of land use and transportation should make full use of contract potential.

LEGISLATIVE ACTION

Although these and many more techniques (including simple cooperation) must be used for achieving joint development, it would be helpful to clarify and focus power and responsibilities through legislative action that clearly states objectives, powers, and protective guidelines. Article 5 (3), which governs land acquisition, provides one point of departure. The need for legislation is described in a commentary on the code (3). Much of this rationale applies to joint development as well.

The commentary (3) also indicates that many states are reviewing their laws of eminent domain and that the National Conference of Commissioners on Uniform State Laws is coordinating activities in this area. Thus, at least in the area of land acquisition, opportunities exist for the development of legislation that might favor joint development.

However, much more than land acquisition is involved in joint development; therefore, legislation to support joint development must go beyond the models now being proposed. It must provide answers to a number of institutional, fiscal, and procedural questions.

What Organizational Structures and Arrangements Should Be Established?

Specifications for organization should be related to the structures of each state government. They should stem from existing legislation governing renewal, building of highways and transit, and other public facilities. Ideally, several ways should be provided for conducting joint development; maximum flexibility should be allowed. Entities desiring to undertake joint development should be permitted to choose one or several organizational forms, from role expansion of existing agencies to creation of new agencies.

It should not be necessary to create new organizations; rather, cooperative arrangements between existing entities should be possible. Safeguards and restrictions will be required. These should be obtained through requirements for observing certain procedures and auditing techniques rather than through rigid organizational specifications.

What Are the Definitions of Joint Development?

It will be important to carefully define joint development in any legislation drawn up. If special authority or powers are to be granted, some limits to their application must be established. When coordination is to be between two or more public utilities, problems of definition are less complex. However, when joint development entails major private involvement, the definition and limits of the public purposes that warrant use of joint development powers become quite critical.

What Are the Purposes and Issues To Be Resolved With Joint Development?

A strong, clear basis should be established before joint development is undertaken because joint development may be required, and probably will be useful, in achieving social, economic, and environmental objectives.

Joint development should be permitted in any situation where it is the best or most effective way of achieving some significant public purpose. In the American Law Institute model code (3), land acquisition and disposition are primarily discussed; however, where joint development does not involve taking land by condemnation but is confined to the pooling of financial resources, a more flexible set of guidelines than that described in the code could apply.

OTHER LEGISLATIVE QUESTIONS

There are several other legislative questions that should be answered to varying degrees concerning implementation of joint development.

What Powers and Responsibilities Should Be Granted and Exercised?

The powers and responsibilities would include the authority to do everything required to accomplish the basic public purposes involved with additional powers to permit joint efforts and to enable achievement of secondary or supporting objectives.

What Finances Should Be Provided?

Entities responsible for joint development should receive moneys for any public purposes involved; also, funds to facilitate joint development (through planning and coordination) for accomplishing supporting objectives should probably be provided. Possibly some bonus moneys might be made available to encourage joint development and to reflect the added values expected therefrom.

What Decision-Making Processes and Requirements Should Be Imposed?

Demonstrating a need for the feasibility of orderly and democratic procedures must be done, but any requirement should be kept simple inasmuch as the main objective is to facilitate joint development. If possible, the planning and procedural requirements for joint development should reflect accumulated experience and should be permitted to replace overly complex or otherwise inadequate guidelines now associated with individual functional areas.

There are, of course, other subjects that must be covered by legislation governing joint development; however, most of these will be related to the characteristics of individual states or cities. Some would be developed in the process of drafting a model code.

We do need to consider how we can increase our ability to undertake joint development through institutional change. Hopefully, this discussion will move us toward this goal.

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ENHANCING THE PUBLIC SHARE OF HIGHWAY BENEFITS

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Ways to increase the public share of highway nonuser benefits are examined. Methods include zoning bonuses for special performance, public acquisition of affected land, and a one-time tax on benefited land. Taxes on benefited land may have broader purposes than to increase the public's share of benefits, for example, to restrain development as the Vermont tax on land value gains.

• "THERE is going to be a new highway through here in a couple of years." This phrase, which has been heard countless times across the United States during the past three decades, sets in motion a series of forces that almost always changes the nature of the surrounding community and natural environment. The changes will be valued differently by different people in the community: change that will benefit some and disrupt others.

Highway and other transportation facilities are built primarily for the benefit of their users. There has been no widespread practice of attempting to realize, for the general public, some of the other benefits, the nonuser benefits that are possible as a result of providing transportation facilities. Most of these benefits are associated in one way or another with the land surrounding the particular transportation facility. The most common benefit to the land is improved access, and if land is in demand, the improved access may create the highest valued property in areas immediately adjacent to the transportation facility improvement. Normally, private market forces determine who will benefit from this improved access and value and what kinds of benefits there will be. The general public will benefit through increased property tax revenues or from a wider availability of services or jobs, but these benefits are indirect, and, except for the tax revenues, they usually occur by happenstance or coincidence, or they may not occur at all.

This paper examines methods and techniques for increasing the ability of the general public to share in the nonuser benefits of transportation facilities. It is designed to open up a new area of exploration useful to citizens and public officials at the local, state, and federal levels who want to take advantage of these particular benefits.

The problems under study are complicated because the subject matter touches on the fundamental issues of property rights, the exercise of public power over private property, the basic systems of land economics and development and jurisdictional responsibility of public agencies, and fundamental issues of equity and fair play. For this reason, our study has put as much emphasis on exploring the basic concepts and situations where increasing benefits may come into play as on methods and techniques for increasing the public involvement in these benefits.

BENEFITS AND THEIR REALIZATION

When a highway of other transportation facility is built or improved, there are a number of nonuser benefits that can occur: those associated with the creation of accessible sites and locations for development and with increases in property values, and those achieved through the protection or conservation of land under increased pressure for development and through a transfer of development rights from one property to another.

For this paper, we illustrate these benefits through three brief hypothetical cases (based on real situations) around which these benefits occur. In this way, we hope to

focus attention both on what the potential benefits are and methods through which they can be realized.

Case 1

Case 1 (Fig. 1) is a common situation. An Interstate (I-63), built along the northern edge of a town where urban development ends and farms begin, changes the dynamics of most of the property in the neighborhood. The owner of tract A has had his land cut off from town; it is also too far from the intersection to be desirable for any new development. On the other hand, the owner of tracts B, C, D, and E had some of his land condemned by the state for the interchange, but he has already sold tract C for a service station at a price per acre close to 10 times greater than what he bought his farm for 20 years ago and can expect similar price rises on the remaining tracts.

On the south side of I-63, the neighborhood is in turmoil. Tract I was recently sold for a major motel-restaurant complex. On tract H, a national fast-food chain has built a drive-in stand. A developer who has options on tracts G and F has been trying to get the zoning designation for these tracts changed from R to C so that he can build a shopping center, but the Balek Road neighbors are objecting strenuously because they feel that their neighborhood would be ruined if there were a shopping center. The Board of Education, which originally wanted to purchase tract I for a new elementary school, is now eager to get tracts F and G for the school, even though they are not as desirable as tract I. The environmental interests in town and present residents of Lovely Acres are concerned that tracts J, K, and L will now be developed and wipe out much of the amenity of Townville Park. In this situation, there may be winners and losers among those several interested parties, depending on the existing zoning, ability to get zoning changed, development pressures, community views, and environmental pressures.

The basic question, however, is how might the general public fare? The answer is somewhat complicated because the following groups are involved:

1. Users of I-63 benefit—They now have access to convenience services at the intersection.
2. Taxpayers of Townville benefit—Their tax base has been increased substantially by I-63.
3. Neighborhood residents do not benefit—The neighborhood is a less desirable place to live because of more traffic, and residential land values may decline. Potentially, residents will be hurt most by I-63.
4. School children and their parents may not benefit—They may be disadvantaged by the problems of finding a site for a new school as a result of I-63.

It is hard to tell whether the general public can come out ahead in this situation; however, one could ask whether there is a better way in which certain aspects of this laissez-faire situation could be managed:

1. Could not some of the money received for all the land sold (for which the owners did nothing) have found its way back into public coffers? Obviously the owners would have to pay income and capital gains taxes on the revenue generated by these transactions, but does this reflect a just situation, particularly because some owners' situations are worsened by the highway construction?
2. Could not the school board have had access to tract I? Could the highway department or town appropriately have acquired tract I at the same time land was acquired for the interchange so that it was reserved for an important public use?
3. Do not the residents of Balek Road have a legitimate reason to object to what has happened to the neighborhood and does not the highway department have a legitimate worry about the impact all the development going on around the area will have on the operation and safety of the interchange?
4. Is not tract C a good location for a park-and-ride facility for downtown-bound commuters, now that a bus line can be provided to the new industry nearby? Is it not in the public interest and consistent with the investment in I-63 and the interchange to have a park-and-ride facility in that location in place of or in addition to the gas station?

Figure 1. Interchange development, case 1.

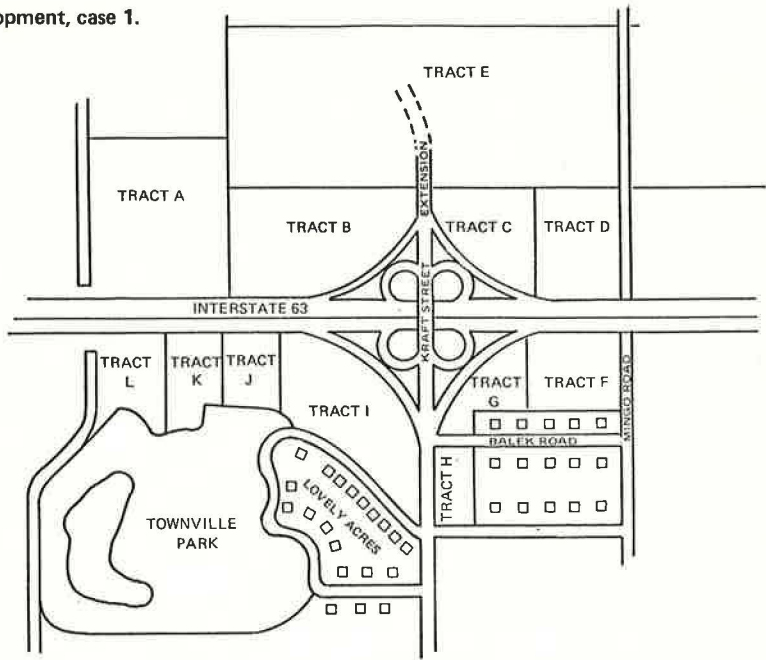


Figure 2. Town development as a result of new highway, case 2.

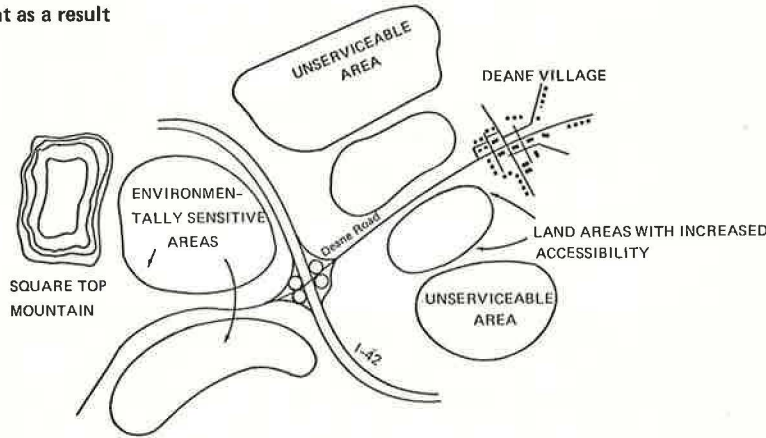
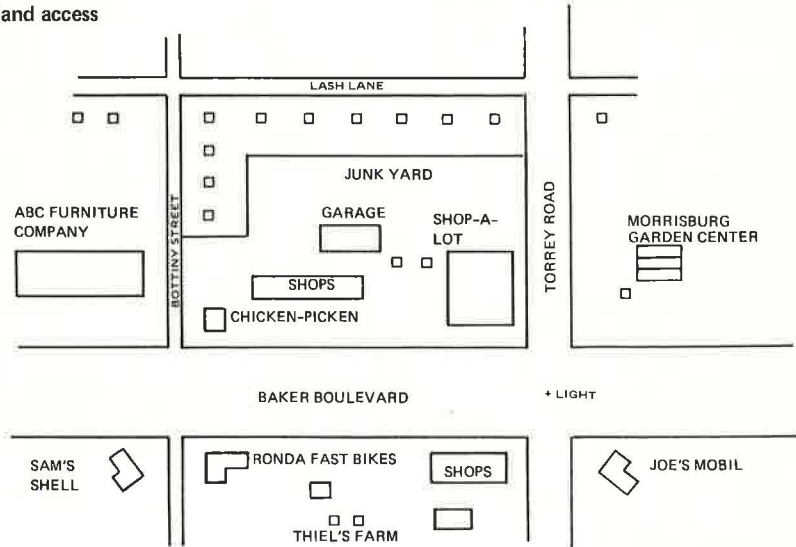


Figure 3. Before change in land access arterial, case 3.



Case 2

Case 2 (Fig. 2) shows that the new highway affects a larger geographic area than was influenced in case 1. Interstate 42 has opened a beautiful region of mountains, lakes, and small farms and villages to a metropolis only an hour away. In Deane, half of the villagers expect I-42 to bring economic opportunity to their rural community in the form of some small industry that would locate near the village and provide jobs for those who have had to move to the metropolis to find work. Many farmers in Deane hope I-42 will stimulate a new interest in their property. The other villagers have come to Deane to escape the metropolis and are against I-42. They have tried hard to prevent the interchange from being built near Deane. They fear that the rural charm of the area will be spoiled with an influx of second home developments, motels, and the other accoutrements of a weekend recreation area. Until now at least, county officials have refused to consider planning and zoning.

The village governing body is in a quandary. It can do nothing about I-42; most of the road has been built. Although industry located in the village would be a benefit, second home developments on the other side of the interchange would not. There are other considerations: public services; potential water pollution, further development, tax rate change; and possible need for zoning.

So that the village will benefit from the highway some measures will have to be taken to prevent excess development that might cause a major strain on the township's limited tax resources. New industry should be encouraged as long as the village can handle the growth. The land to the east of the interchange is the best place to encourage new development, but should people with property on the east side be the only ones to benefit? What about the land owners whose property should stay natural to protect the beauty of the area? Can they share in the monetary benefits of growth without selling all their land to developers? Is it fair if just a few land owners have to pay the price of protecting the natural beauty while others gain from profitable land deals? What about the acquisition of all or part of the environmentally sensitive areas between I-42 and Square Top Mountain? The state parks department has no funds for such acquisition, but the highway department might, except it cannot use funds for park purposes unless they somehow relate to the highway.

Case 3

Case 3 represents a much more complicated situation that has been and will be occurring more frequently: a major arterial widening and intersection construction necessitated by continuing increases in population and traffic. Figure 3 shows the area before the arterial is built. The highway department has developed a plan to (a) widen the boulevard, adding a median barrier (Fig. 4), (b) build an overpass to carry Torrey Road over it (Fig. 4), and (c) build a jug handle with a traffic light at Bottiny Street to allow eastbound traffic to move north onto Bottiny Street (Fig. 5).

In this complicated situation there are many competing interests and ideas about the best way to redo the design of the commercial area. For instance, the owner of the farm on the south is under pressure (of instant riches) to sell his land for development, but he wavers because his specialty crop provides him adequate monetary rewards and psychological satisfaction. Supporting this preference for retaining the low density and open space a farm provides are arguments of land use planners, environmentalists, nearby residents, and, until they have to vote to rezone, some of the city council. The highway department planners also would like to back a hold-the-line decision because they feel they should bear some responsibility for maintaining the integrity of the investment for traffic improvements by controlling the amount and location of commercial land use in the area. (Figure 5 shows our bias about the way things are, and this is the reason for the study.)

What are the nonuser benefits of this kind of highway improvement project that can be realized for the public? A more safe and functional boulevard and rational land development in adjacent areas are the most important public benefits that could be obtained. Cleaning up a rather unsightly and economically marginal commercial strip,

Figure 4. Ideal change in land access arterial, case 3.

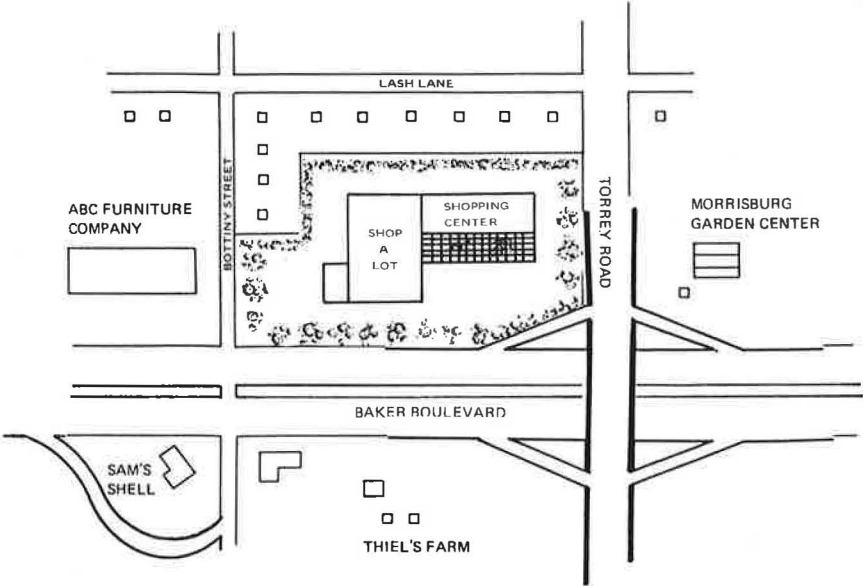
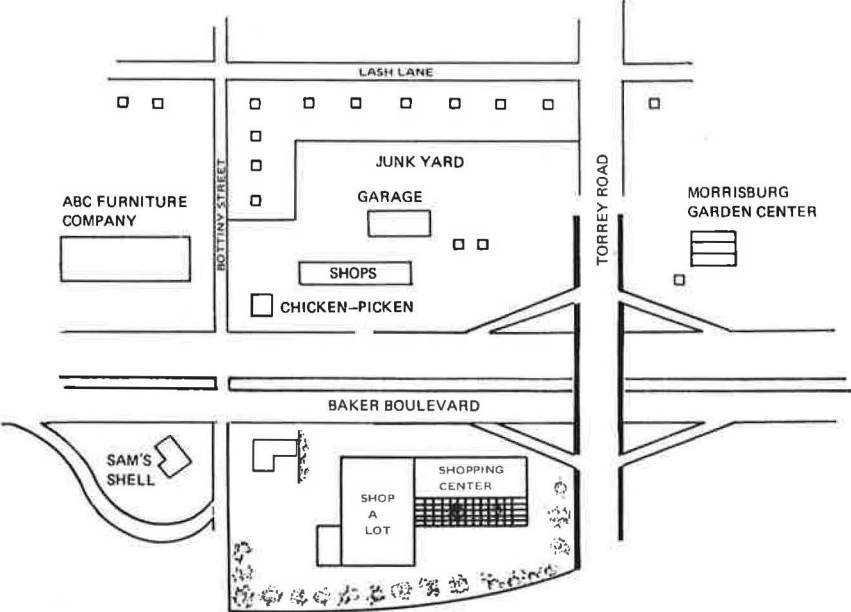


Figure 5. Likely change in land access arterial, case 3.



without doing damage to or putting pressure on the value of agricultural land, but with equity to existing businesses, appears to be in the public interest.

Different nonuser benefits created by some highway (or other transportation facility) improvement activity have been discussed in cases 1, 2, and 3. Note, however, that in most instances where these benefits might occur, they are not usually realized for or shared by the general public.

METHODS AND TECHNIQUES FOR BENEFIT ENHANCEMENT

There are many techniques and methods for achieving benefit enhancement: (a) land use and development (zoning) techniques, (b) development permit techniques, (c) taxation methods, and (d) public acquisition and development. These broad categories include techniques such as bonus zoning, special zoning districts, exactions and dedications, capital gains taxation, and expanded public development. Each situation in which benefit enhancement is possible involves variables such as the desired benefit; existing zoning; existing actual land uses; development pressures; and the institutional, political, and legal framework.

Grand Rapids, Michigan, was faced with an upgrading of an existing highway, and from the resultant controversy grew a cooperative solution involving the land owners, local entities, and the state highway agency. Fresno, California, limited, through conventional zoning, other uses at new Interstate interchanges to preserve its agricultural character.

Although in specific situations it is easy to analyze the components to ascertain which techniques might be effective, it is difficult to describe the procedure effectively through generalization. This is why we used the case study.

The kind of analysis necessary in each specific case is as follows for case 1:

1. The benefits received by private landowners in the form of greatly increased land value could have been used for general revenue purposes through public acquisition of the farm and resale to the incoming commercial uses. This would have to be consistent with a development plan prepared by local officials.
2. The interchange could be protected from haphazard overdevelopment through vigorous enforcement of existing or modified zoning (special districts) or performance zoning to avoid traffic density and environmental impacts.
3. The Balek Road residents could have been protected from impacts on the street by a holding zone. They could be further protected from potentially adverse impacts by bonuses to tract F and G in return for buffers such as landscaping along the property lines.
4. A park-and-ride facility at tract C could have been built under presently existing highway programs, and the highway agency could have acquired the land for it along with the right-of-way acquisition.

In case 2, development along Deane Road may be encouraged by zoning, which allows high density and planned unit developments. Development may be discouraged by exactions used to protect environmentally sensitive areas. Theoretically, a transferable development rights scheme might be worked from the environmentally sensitive area to the Deane Road sites. Development along Deane Road could be allowed in the provision by dedication of easements to unserviceable areas.

The environmentally sensitive areas can be protected through density controls, exactions for water and sewer treatment, and, perhaps, through environmentally based special permit systems.

Case 3 suggests a plan is necessary to accommodate the adjustment in equities and access created by improvements to Baker Boulevard. The plan will not be implemented without special encouragement from the municipality because zoning cannot abolish pre-existing uses without condemnation resulting. A special district or a development authority might be appropriate here; the readjustments, which are very complex, might be worked out with little public acquisition and substantial private cooperation. Financial implications of the improvement might be adjusted equitably without compromising the traffic purposes.

In all cases, financial and practical problems of the impacted private owner must be considered. If all the ramifications of benefit enhancement are not adequately understood and taken into account, the leverage on which it is based may disappear.

CONCLUSIONS AND RECOMMENDATIONS

There are no set methods that can be applied automatically in all situations to realize benefits created by a transportation improvement. Indeed, the situations around which benefits can occur are so varied, not only in their physical but also in their political dimensions, that they defy a universal prescription. Thus, what we present are some of the basic principles of benefit enhancement and some general guidelines that will be applicable.

Identification of Critical Variables

Any scheme to realize nonuser benefits must identify the factors and variables in the situation that will both create the benefits and determine the most appropriate means for realization.

Ways To Manage Change

There are two vital factors in any benefit realization situation: (a) presence of a strong concept of what is the particular public benefit to be realized, and (b) presence of someone to take the leadership in devising or arranging the scheme for enhancement.

What benefit enhancement essentially involves is management of change in the public interest in the areas affected by a transportation facility improvement. Such management involves a commitment from some concerned group to implement the plan, policy, and program in a specific geographical area.

Role of Transportation Agencies

In our discussion of benefit enhancement, we carefully refrained from suggesting that transportation agencies assume the essential leadership role. Theoretically, it may be most appropriate in many such situations for the transportation agency planning and constructing the transportation improvement to take the additional responsibility for planning and implementing the scheme for realizing land-related benefits.

Such a format would run into legal and political difficulty in most parts of the country. Legislative and constitutional restraints on land acquisition powers of the transportation agencies exist in most states; therefore, a substantial amount of new legislation, perhaps, constitutional change, and a major restructuring of the functions and activities of the transportation agencies would be required. We foresee that in the immediate future, benefit schemes will have to be realized through the powers and leadership of the local government authorities. This is not to say that the transportation agencies will not play a role in benefit enhancement. They must because they control critical variables of benefit creation such as the transportation facility, its location and design, and the timetable of its construction. If the transportation agency does not play a major role in the planning and execution of benefit enhancement schemes, they will not work.

How then can the transportation agencies contribute? FHWA might undertake methods to ensure that the metropolitan agencies have the mandate and resources to examine issues of benefit enhancement both at the systems planning level and at the corridor and project planning levels. Benefit enhancement schemes should flow out of the basic processes of planning transportation facilities and systems. The methodology of transportation planning could well use techniques to factor in the potential for benefits in initial transportation plans. FHWA might consider the formulation of regulations and procedural manuals that could enable the technicians working on environmental impact statements to examine the opportunities for benefit enhancement. Possibly some supplementary grants to transportation agencies could be made available for such analysis.

In many cases, benefits created by a transportation facility will not be realized for public use because the local authorities affected lack the resources to conceive or implement an enhancement scheme. In such situations, the transportation agency might appropriately provide services to the local community to help define potential benefits and to design appropriate schemes for their realization. FHWA might take the lead in promoting such technical assistance efforts by issuing guidelines and developing financial programs to assist such efforts.

Benefit Enhancement Process

We have a strong bias toward some kind of identifiable coordinator or manager who would implement a scheme for realizing nonuser benefits. Assuming there is such a person or group, activities that would have to be undertaken to carry out a successful program are (a) analyzing the situation; (b) identifying the benefits; (c) consulting the interested parties; (d) selecting methods; (e) securing decisions, permissions, and approvals; and (f) organizing the mechanisms.

Characteristics of Methods and Techniques To Be Used

The methods and techniques discussed cover a wide range of activities: some that require little or no effort to change existing procedures and others that require dramatic changes.

In selecting the methods and techniques to be used in any benefit enhancement scheme, there are important factors to consider:

1. If a relatively simple and politically acceptable technique is adequate (i.e., a permit system to ensure coordinated high-quality private development in the vicinity of a transportation improvement), then it is advisable to stick to it rather than to try more difficult techniques.
2. A series of techniques could be applied over time.
3. Zoning and related police power controls could be used as the mainstay of most benefit enhancement schemes. We feel that zoning techniques have advanced sufficiently to handle most enhancement situations. Special zoning districts, bonus zoning, and holding zones offer promise in most schemes.
4. Schemes involving public acquisition of land may be more acceptable than schemes involving extraordinary taxes to recoup land value increases. Although Vermont used special capital gains taxes, they were imposed to curb high land speculation and not necessarily to increase the public's share of the increase in land values.
5. Joint development and benefit enhancement are closely related. Those working on joint development projects in transportation planning should concentrate as much energy on developing methods and techniques for implementation as on design possibilities. FHWA, UMTA, and HUD might well reexamine their current efforts to encourage joint development and explore ways to add analysis of implementation methods and techniques to the studies now under way.

Final Observations

Benefit enhancement of nonuser benefits of transportation facilities is just beginning to emerge as an important public policy issue. Because of this, we should expect that, for quite some time, there will be varying views about the desirability of applicability of such schemes. The attitudes and values of various people toward private property will be a key to how, when, where, and under what conditions benefit enhancement schemes will be able to be carried out. Fortunately, there is a growing change in attitude toward the nation's land resources, which, under the pressure of urbanization and development, have become a more precious and valuable commodity. As such values change, programs for benefit enhancement in transportation should become more numerous.

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