

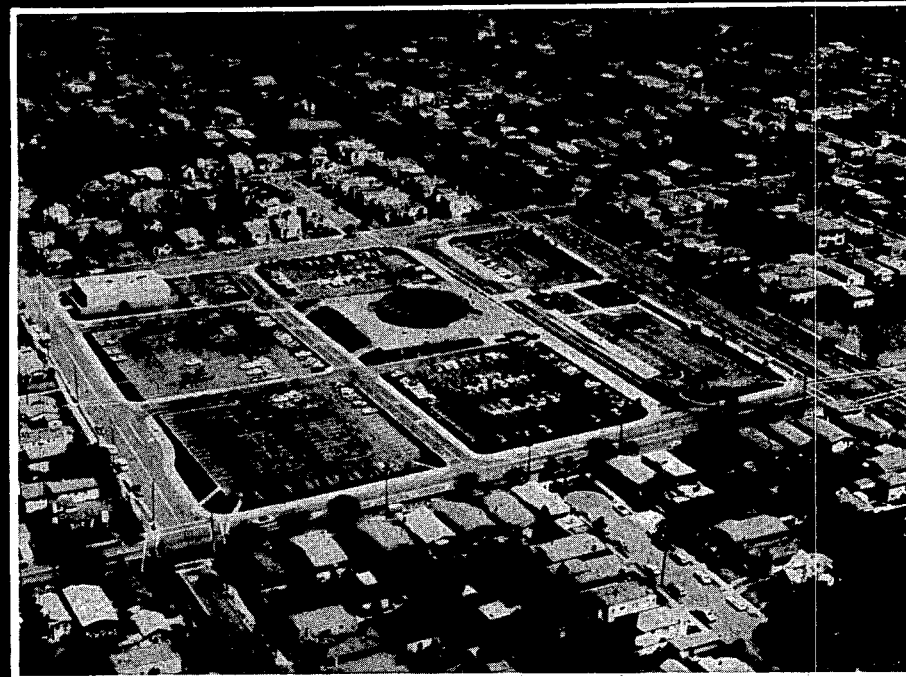
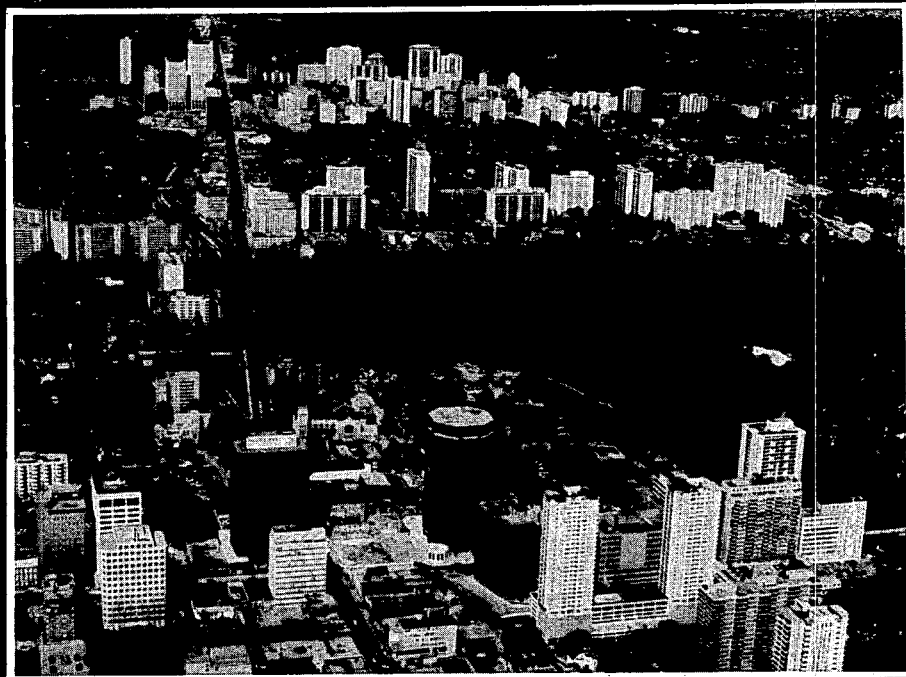
MASTER

# Land Use Impacts of Rapid Transit

## Implications of Recent Experience

### EXECUTIVE SUMMARY December 1977

Prepared for  
Office of the Assistant  
Secretary for Policy,  
Plans, and International  
Affairs  
U.S. DEPARTMENT OF  
TRANSPORTATION



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16. Abstract  This report reviews evidence of land use impacts of recent major rapid transit improvements and draws conclusions concerning the extent and nature of such impacts and the conditions under which they have occurred. Transit improvements studied are primarily post-World War II in origin. American and Canadian examples are stressed, although European experience is treated briefly. Virtually all major modern American and Canadian rapid transit improvements are included, covering conventional rapid rail, commuter rail, light rail and bus/busway. In addition to conclusions on general patterns of land use impact causes, research recommendations and Federal policy implications are drawn.					
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ASSISTANT SECRETARY

OFFICE OF THE SECRETARY OF TRANSPORTATION

WASHINGTON, D.C. 20590

14 DEC 1977

In recent years many conflicting claims and hopes have been heard concerning the ability of major new rapid transit improvements to generate or encourage desirable changes in urban land development. To aid in judging these different views, this office recently commissioned De Leuw, Cather & Company to conduct a detailed study of the ways which modern rapid transit improvements have actually been found to affect land use.

The study involved a review of most of the major rapid transit projects completed in the past 30 years in the United States and Canada. It analyzed the impact of transit improvements on (1) the overall growth of a metropolitan area relative to competing areas; (2) land use patterns; and (3) the strength of central business districts. Its conclusions emphasized the importance of the relationship of transit improvements to local land use policies and other factors, such as land availability and developability.

The study's full final report is available from our office. However, because of the important urban transportation policy implications of its findings, we have asked the consultants to prepare this brief Executive Summary for wider distribution to policy makers and the public. It emphasizes major findings and key policy implications for future public investments in the different transit modes.

We believe that interested citizens and public officials at all levels will find this to be a very valuable and informative document.

A handwritten signature in black ink, appearing to read "Chester Davenport", with a stylized flourish at the end.

Chester Davenport  
Assistant Secretary for Policy Plans  
and International Affairs

## Summary of Key Policy Implications

- Rail rapid transit improvements can influence land use significantly when supported by other essential factors including land use controls, availability of land, attractiveness of surroundings, and regional demand.
- Local land use and other related policies should be identified more precisely, and transit-related land use impact objectives should support these explicitly.
- The many factors which influence land use change should be acknowledged in policy and their coordination encouraged in general urban development as well as in transit planning.
- Land use impact-potential assessments for proposed transit improvements should include site-specific evaluations of the effects of these factors.
- Such evaluations should include knowledgeable real estate development perspectives in addition to planners' skills.
- Commitment to local land use policies supporting desired land use impacts should be demonstrated before the transit improvement is begun.
- Because land use impacts of conventional rapid rail transit were found to depend so heavily on other factors, Federal policy should consider the possibility that other fixed transit modes might also have such effects.
- Because of the likely slow pace of land use impacts, major early public revenues "captured" from such impacts should not be counted on to finance subsequent phases of transit expansion.
- Rapid transit improvements might be used as one element of a coordinated package of efforts to revitalize a declining metropolitan area, but should not be relied on solely or even primarily for such purposes.

# About the Study

This study was undertaken for the Office of the Secretary, U.S. Department of Transportation, and was completed in mid-1977. Its purpose was to help improve policies and planning methods for urban transit by identifying the extent and kinds of land use changes which have actually occurred due to major rapid transit improvements. "Rapid transit" as used here refers not only to conventional rapid rail transit (CRT) but also to light rail, commuter rail, and busways. Both United States and Canadian experiences were included in the study, covering wholly new rapid transit systems and other major improvements built during the past 25 years. Some European experiences were also described.

The need for such a study was great. In recent years new or expanded rapid transit systems have been considered in an increasing number of metropolitan areas. Very high costs are involved in such decisions, so those responsible must have the greatest possible assurance that the investment's benefits are accurately predicted. The promotion of new or intensified land development has often been suggested as an important benefit of rapid transit, but evidence to support or refute this has been fragmentary and inconclusive. Land use impact forecasting methods have been correspondingly weak.

With this lack of information and planning tools, local planners and decision-makers face severe problems in trying to select an optimal transit alternative. Similarly, Federal authorities charged with responsibility for apportioning the limited funds for such transit improvements among cities find it almost impossible to evaluate and compare different projects. Debate over land use impact continues, with extreme positions often taken. According to some, a new rapid transit system will almost automatically lead to a major restructuring of the city, while others contend that transit's effect on auto-dominated travel patterns is too small to have any significant land use consequences.

The truth is almost certainly somewhere in the middle, with impact depending on a number of factors in addition to the transit improvement. Some are no doubt unique to individual situations; others may be more widely applicable. However, to date such common factors have not been identified or specified in detail either in theory or in applied

models of land use change. This study has sought to discover which factors are consistently important, how they interact, and how powerful transit improvements are in comparison to other factors.

## Methods

The study made use of a wide variety of evidence. A major effort was devoted to the assembly of available literature on the impacts of actual rail transit systems, including historical, descriptive, analytical and policy sources. (The resulting extensive bibliography is available both in the Final Report and also as a separate document; see inside back cover.) Further information was sought through site visits, interviews with local officials and land developers, and descriptive statistical data.

Most of the study's attention was directed to conventional rapid rail transit improvements, since most new rapid transit investments have been of this type. Study of commuter rail, light rail and busway improvements was necessarily limited due to the few examples available. The available light rail improvements were particularly limited and also not representative of those now being planned or built in several cities.

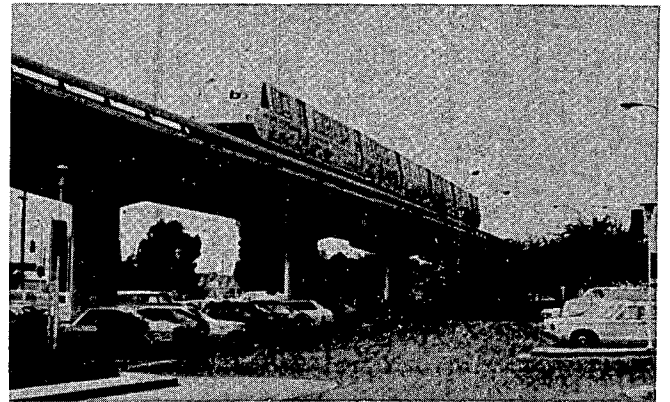
All information was combined into a series of city-by-city evaluations, and submitted to all the persons interviewed in each city for their review. The final report, which combined these city-specific studies with an analysis of their similarities and a derivation of policy implications, was reviewed by an independent panel of leading transportation researchers. These included David Boyce (University of Illinois), William Garrison (University of California), and Vukan Vuchic (University of Pennsylvania).



# Systems Studied

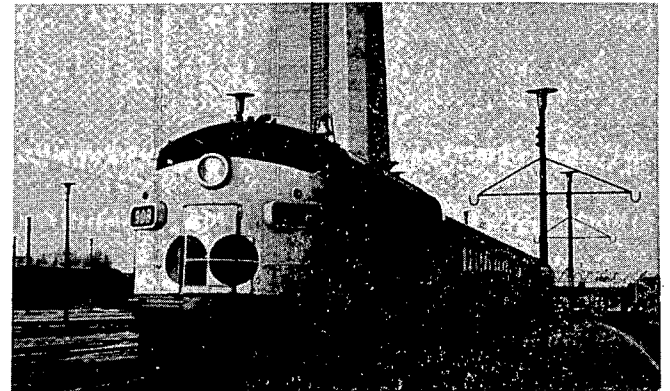
## Rapid Rail: Major New Systems

Toronto	TTC
Montreal	Metro
San Francisco	BART



## Rapid Rail: Smaller Systems and Improvements

Philadelphia	Lindenwold
Boston	Red, Orange, and Blue Line Extensions
Chicago	Congress, Dan Ryan, Milwaukee (Kennedy) Lines
Cleveland	RTS
New York	PATH, Crosstown Subway
Washington	METRO (incomplete)



## Commuter Rail

Toronto	GO
Philadelphia	Center City Commuter Connection
Chicago	General service improvements

## Light Rail

Boston	Green Line
Chicago	Skokie Swift



## Busway

Los Angeles	El Monte Busway
Seattle	Blue Streak Bus
Washington	Shirley Highway Express
Miami	Blue Dash

# Issues

The study sought to illuminate several key issues often posed by decision-makers. Although a study of past experience can only suggest implications rather than definitive answers, the findings should help to strengthen the basis on which transit decisions are made.

The remainder of this summary report presents the major findings and implications, organized according to each of the following issues in turn:

## **Downtown Development:**

*Can a major transit improvement strengthen the Central Business District and subsidiary business districts around transit stations?*

## **Growth Focusing:**

*Can a major transit improvement lead to an increased concentration of residences and activity, particularly in such a way as to create land use patterns more favorable to transit?*

## **Regional Growth:**

*Can a major transit improvement increase the overall economic or population growth of a metropolitan area relative to competing ones?*

## **Impacts of Different Types of Transit:**

*Are land use impacts limited to conventional rapid transit, or are other modes such as light rail, commuter rail and bus/busway capable of such effects?*

## **Role of Land Use Policy:**

*What role do public land use policies, such as zoning or tax incentives, play in this process either as a cause or as a result?*

## **Other Factors Influencing Land Use Impacts:**

*Summing up, how do major rapid transit improvements seem to interact with other factors to cause land use changes?*

# Downtown Development

**Recent major rapid transit improvements have been important inducements to downtown development near stations, but only when supported by other powerful factors.**

The studies of the transit systems in Toronto, Montreal, and San Francisco concluded that the transit improvements there were significant forces in the extent and nature of the intensive high-rise commercial office development in the CBD. In Toronto and Montreal, in particular, the new subways provided a much-needed **increase in access** to the downtown area and thus assisted its growth.

In such cases, where inadequate prior access was actually a recognized constraint on downtown growth, the evidence indicates that transit has been a virtual necessity for intensification of development to occur. At the same time, it is clearly not sufficient; if the New York subway had been built in Kansas; a city like New York would not have resulted. In San Francisco, the BART subway and the associated beautification of Market Street were partly responsible for the expansion of the financial district southward across Market, revitalizing that declining area. As in Toronto and Montreal, BART also enhanced the CBD's accessibility by providing additional commuter capacity in some major congested radial corridors. However, in all three cases, other factors were also essential in this downtown development.

In subsidiary centers outside the CBD, recent transit improvements have so far had relatively mixed effects. Largely transit-induced commercial development has occurred in several such centers, notably in Oakland and Berkeley along the BART system, Haddonfield on Philadelphia's Lindenwood Line, and at several stations on the Toronto system. At the same time, much of this development has been less than had been hoped. Moreover, no significant commercial development attributable to transit improvements has occurred at other subcenters such as Boston's Quincy Center and Malden, San Francisco's Mission Street, and other BART-served subcenters such as downtown Hayward.

The primary factor behind such impacts has been the existence of a strong and effective **demand for new office and retail space**. This appears to have been determined by social and economic forces of regional and national scale. A related factor present in all instances was an already healthy and active commercial area, which encouraged both consumers and developers of land.

**Timing** of such new development appears to have been determined largely by these same economic forces, such that new development (downtown and elsewhere) cannot be predicted to occur within a short time after the transit system is announced or built. In Toronto, Montreal and San Francisco the downtown subways were opened in 1954, 1966 and 1973 respectively, but intensive downtown development began at about the same time (1958-1960) in all three.

**The availability of land** for development has also been a major factor. This refers not only to nearby open or underutilized parcels but also to the feasibility of their assembly into a site large enough for economically viable development. In many instances in this study it was observed that fragmented or clouded ownership of otherwise highly attractive sites absolutely prevented development that otherwise would have occurred. The most striking example is at the intersection of Toronto's two subway lines north of the CBD, where interspersed with new development are block-long areas right at the station in which complexities of ownership are likely to prevent development indefinitely.

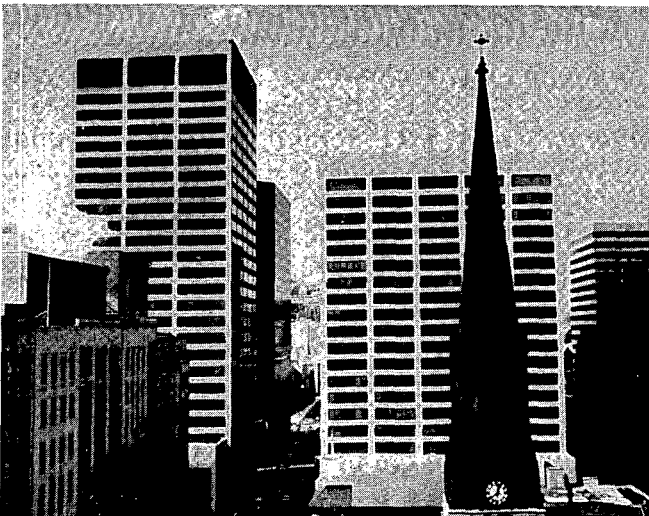
Another similar factor was the **placement of the station** with respect to the business district. At Boston's Quincy Center station, the commercial district is actually several blocks away. This is also the case in Hayward on BART. In contrast, BART stations are located in the center of the Berkeley and Oakland shopping and office areas, where related development has occurred.

**Other public investments** coordinated with the transit improvement also appear to have been influential in encouraging transit-oriented development, although in many instances their effect has been overshadowed to date by opposing forces

such as the lack of consumer demand. Typical of such investments are the Malden Government Center in that Boston suburb, the Federal government's Social Security complex near BART's Richmond station, the Oakland Museum and Laney College at the same system's Lake Merritt station, the Canadian government's large office complex now being completed at Toronto's York Mills station, and the convention center planned near Metro Center in old downtown Washington, D.C.

**Formal urban renewal** activities coordinated with transit development have been an important aspect of this public investment in several cases. Even without the construction of public facilities the simplification of land assembly for private developers has in some instances led to redevelopment, as in downtown Oakland. In others, such as Oakland's Lake Merritt and downtown areas, the combination of publicly-assembled land and the presence of new public buildings has proven attractive to private developers. This is especially significant since the areas involved were otherwise deteriorated and without significant development for many years.

Similar efforts at public-private renewal activity around transit stations have been attempted elsewhere, notably Washington. Although development appears inevitable, a variety of forces including lack of economic demand and the general unattractiveness of the specific areas involved have restrained action by developers.



## Implications

It is clear that rapid transit improvements can help to induce increased downtown development. However, the presence of other supportive factors is essential. Perhaps most important is the presence of effective demand; if business centers throughout a metropolitan area are stagnating, there is little reason to expect that transit service to one of them will generate development. In a period of slow or no economic growth, little impact can be expected under the best of circumstances.

The availability of land feasible for development is an important factor which may easily be overlooked. In particular, assembly of a viable site from the available parcels is crucial. Complexities of ownership of surrounding land should be considered a serious detriment. This should be a consideration in the early stages of transit planning, particularly in the location of stations.

The location of other **public facility investments should be coordinated with transit improvements** in order to encourage concentrated development. The public sector's own need for offices and other high-density facilities is a form of leverage which could be used more in leasing as well as construction. The location of publicly-funded urban renewal projects is another. Development resulting from such coordination within the public sector should help to generate the confidence needed among private developers to follow suit, particularly in marginal locations.

The length of time from commitment, construction, or initial operation of a major transit improvement to the generation of significant related land use change is completely unpredictable. In most cases a period of five years or more is involved, and in some others it may be much longer - if ever. As noted earlier, not only must conditions at the site be opportune; the general area's levels of demand for development and capital to meet it must also be healthy. This indicates that **Federal policy toward rapid transit financing should not, in general, be based on a presumption of public revenues from early land use impacts being available to finance subsequent system expansion.**

# Growth Focusing

**Recent major rail transit improvements have played a key role in intensification of land use in station areas outside the CBD, but only when joined with other favorable forces.**

Examples include the high-rise apartment developments at several suburban Toronto subway stations, the location of large office complexes at Boston's suburban North Quincy station, and the intensification of use at small existing subcenters. This latter is best illustrated by the Yorkdale station on Toronto's not yet completed Spadina line, where the owner of a suburban shopping center whose parking lot adjoins the station is planning to build a series of connected office buildings to join the station and the main shopping mall.

Such development has of course not always occurred. Little has happened at most suburban BART stations as well as most of those in Montreal, Boston, Chicago, Cleveland, and some in Toronto. Philadelphia's Lindenwold Line presents an in-between case; extensive low-density residential development partly attributable to the transit line has occurred in the corridor, with thousands of commuters driving to the transit stations. However, even many of the apartment developments nearby are not within walking distance, and there is no high-density development of the type most complementary to rapid transit.

As with downtown development, a number of forces have been influential in complementing or counteracting the development potential provided by transit improvements. These include several already discussed as well as others. Among them are neighborhood opposition, social and physical characteristics of the area, ease of access to the station site, availability of developable land, and public policies toward development.

In existing low-density residential areas, the placement of a transit station has often generated strong **opposition among residents**. This has sometimes led to the official imposition of tight controls on development in the area. As a result, irrespective of other factors favoring more intensive development, little if any changes in land use have occurred.

This factor has been powerful at several BART stations (e.g. Rockridge, El Cerrito Plaza) as well as the areas surrounding some Lindenwold stations and others in suburban Washington - almost everywhere stations have been or are to be sited in such areas. Even in Toronto, where transit-related development has been most intense, such areas are typically protected by zoning.

The station area's **social and physical characteristics** were found to be important factors. Transit's effect on land use appears to have been minimal when development of a scale and type necessary to be economically viable was not complementary to the surrounding land uses. For example, the stations of Montreal's north-south subway line are situated largely in working-class neighborhoods of three- and four-story apartment blocks. Air rights on the cleared areas above the stations are available and more intensive uses are permitted, yet almost no development has occurred. According to some local officials and observers, the primary reason is that construction costs allow only luxury high-rise apartments, and prospective tenants would prefer to live in other parts of the city.

Physical characteristics, particularly blight, have sometimes been added to social problems to render areas even less likely to be developed into uses complementary to the transit station. Malden Center in Boston is the scene of intensive and imaginative public efforts at renewal near the new transit station, but its generally aging and unattractive character has so far limited success. The BART stations in older, disadvantaged neighborhoods in Oakland are unlikely to attract private investment despite their high-accessibility locations. Areas around Lindenwold Line stations in Camden, a declining older subcenter, have similar problems.

**Ease of access to the station site** is a key factor. Where new transit stations are isolated from surrounding activity or available land, little development has occurred. This factor's effects are seen most clearly in Chicago and Cleveland. In Chicago, the location of the three newest rapid transit extensions in freeway medians has resulted in a separation of the station from any land which might be used for complementary development.

In Cleveland, much of the rapid transit line parallels a wide railroad switching area, substantial earth embankments and a heavy industrial corridor. Development in these station areas is as yet nil, with the main potential for activity resting in the station's parking lot air rights.

**Availability of developable land** has already been discussed in some detail. There are many additional examples of lack of development attributable in part to the difficulty of land assembly or the high cost of its conversion. However, it is more useful to complement the earlier discussion with some examples of how this factor has been used to advantage.

In Toronto, several station sites adjoined obsolete and underused wood and coal yards. These large tracts were in single ownership and were quickly developed into high-rise apartment and office structures compatible with their direct access to the subway. In Chicago, the Burlington Northern Railroad is planning a high-rise development at one of their suburban commuter stations on their own underutilized land. In Montreal, the Longueuil station is on a large tract which was originally a military post. After the subway opened, this tract was used first as a parking lot for Expo '67 (which was one subway stop away, on an island) and afterwards was developed into high-rise apartments as well as office and hotel space.

Similar examples occur elsewhere. The point, however, is clear; where large-scale land assembly was facilitated the potential for transit-oriented development was much enhanced.

Whether influenced most by neighborhood preferences, infrastructure capacity, or other forces, the local government's public land use policies concerning the preferred or permissible forms of station-area development has in some cases been a particularly powerful determinant of what land use impacts actually occur. In Toronto, allowance of very high densities of development (up to 12:1 in floor area ratio) in many areas around transit stations provided a strong incentive to intensive development. The fact that relatively small and well-defined areas were so designated, in contrast to the low densities allowed throughout most of the rest of the Metropolitan area, further enhanced the power

of this incentive. Since the region's demand for such development was strong, much of it then had to occur around the station - where transit access provided an important added inducement. Thus transit and land use policy were fully complementary.

## Implications

Transit improvements can help in intensification of land uses around outlying stations. As with impacts in downtown areas, however, many other factors are required in addition to transit. For example, location in low-density residential surroundings may completely block land use impacts. If intensification of land use is desired as a complement to rapid transit service, established low-density residential neighborhoods are poor choices. This does not mean that stations should be far from patrons' homes, but only that nearby small commercial centers or undeveloped areas are better for encouragement of land use impact. This often requires moving the proposed station location only a few blocks.

Criteria for corridor and station site selection should be expanded to include the full range of land use impact factors identified in this study. The land use impact potential of a rapid transit station could often be improved dramatically merely by moving it a few hundred feet to a new location where other factors are more favorable. **Federal policy should encourage the use of such site-specific assessments as an important element in the demonstration of likely land use benefits.**

The views and knowledge of the land development industry should also be incorporated into comprehensive urban planning as well as into transit planning. Early involvement of the development perspective in the transit system location process would ensure proper consideration of a number of key factors in land use impact which are not now commonly included. Some of these, as noted earlier, include the ease of land assembly for redevelopment, access to the site, cost of site preparation, and development potential of the immediate surroundings. **Federal policy should strongly encourage this use of knowledgeable land development expertise wherever land use impacts are sought.**

# Regional Growth

**Although evidence is limited, recent experience provides no indication that any rapid transit improvements have led to net new urban economic or population growth.**

Because of the many ways in which cities differ, it would be difficult to isolate and identify with any confidence the effect of a specific transit improvement on a metropolitan area's population and economic vitality. Any comparisons would be seriously confounded by the effects of factors not related to transit. The one case found in which this was attempted was in the BART Impact Program, where despite the use of a variety of approaches no difference in regional growth attributable to the transit system could be found.

Some earlier writers cited Toronto's growth during the first decade after the initial subway opening as an example of a major increase in regional property value largely due to transit. However, although Toronto grew rapidly during the 1960s, several other Canadian cities without transit exceeded its rate. This study concluded that Toronto's growth was mainly due to other factors. Some of these included the city's heavy European immigration, its strategic location, and continuous economic and social stability. In addition, the portion which might be attributable to the subway was most likely to have been a shift from other parts of Metro Toronto into the areas along the subway.

Other evidence includes the changes in population growth rates among cities in recent years. U.S. Census figures indicate, both in 1970 and 1975, a shift away from the country's major cities (particularly those of the industrial Northeast) to smaller cities, none of which have rapid transit systems. Population is also continuing to shift from central cities to their suburbs, but these are not interregional movements.

Historical data suggest that early major transit improvements such as the New York City subway were essential for the continued expansion of the city's population and economy. If these major improvements had not been provided in one of these major East Coast cities, it is possible that much of its subsequent economic growth might have instead occurred in another city not so constrained.

In general, the migration of population from one region to another is more likely to be motivated by considerations more immediate than transit, such as the possibility of better employment or a safer and more attractive place to live. It is therefore probable that transit's interregional effects depend on its ability to influence the rate of job-creating investment in its metropolitan area. However, relatively little of the country's basic employment is free to migrate, being fixed by prior plant investment, materials supply, and regional markets. Of the employers who can choose to establish facilities in one city rather than another, it is hard to imagine that one city's rapid transit facilities could be a decisive and consistent element in their choices.

## Implications

The lack of evidence of net regional growth in population, jobs or wealth due to recent transit improvements seems to imply that such effects should not be expected. However, such an implication is not wholly justified. Reliable data and methods for a reasonable test of this effect are lacking, and in addition future approaches to achieving such effects may be different and more effective than those which were available for study here. Moreover, future energy shortages may result in an increased dependence on rapid transit, and its correspondingly greater influence on interregional locational choices for business and individuals.

Despite these limitations, this study's findings do imply that net regional growth impacts directly attributable to new transit improvements are probably not going to be large in comparison with the transit investment. Evidence for this is found both in the BART Impact Program's study and in the present study's general finding that many positive factors, fortuitous as well as planned, are required in addition to a transit improvement even for any major land use restructuring to result. It seems that so many other forces are involved that any net gain in regional wealth or economic vitality is likely to be hard to identify and cannot fairly be attributed to the transit improvement alone. **Thus Federal policy might reasonably support the use of major transit improvements as one element of a coordinated package of efforts to revitalize a declining urban economy and social order, but should not rely upon transit investment as the sole or primary tool for such purposes.**



# Impacts of Different Types of Transit

In addition to impacts of conventional rail rapid transit, some recent major commuter rail improvements were found to have contributed to land use intensification. Evidence on light rail and busways was sparse and inconclusive.

The bulk of the evidence on commuter rail impacts is derived from Toronto's "GO" system, an all-new service begun in 1968. High-rise apartment buildings are beginning to appear at a number of suburban stations. This contrasts with the typically low density development in the rest of Toronto's suburban fringe, and occurs despite generally low levels of use (fewer than 1,000 trips per day) at most stations. Reasons for this new development seem to include the low cost and ease of assembly of land, encouragement through zoning, and high cost of housing elsewhere in addition to the ease of access to the CBD by both "GO" and nearby highways.

Little can be concluded from recent North American experience concerning light rail and bus/busway's potential for land use impact. No land use impacts attributable to recent improvements have been made on this continent in recent years, and even those available for study tend to be unrepresentative of future systems.



## Implications

Despite this lack of direct evidence, the study's other findings on impacts of rapid rail improvements permit some conjecture on this subject. Most important is the finding that even with conventional rapid rail systems, land use impacts depend largely on the coordinated action of many other factors in addition to the transit improvement. This implies that **other rapid transit modes might also lead to significant land use impacts if the same other factors could be brought to bear.** For example, both the promise and the actuality of a major rapid rail transit improvement were seen to have acted often as catalysts to the development process, providing the needed support for efforts at local zoning and land use policy changes needed to encourage land development. The new accessibility provided by the transit improvement was important, but significant land use impacts were seen to occur sometimes even where only small increases in transit accessibility occurred.

Hence it is possible that other transit modes providing less rapid or high-capacity service - such as light rail and busways - might in some cases be able to serve as effective catalysts for desired land use changes. The same is true of commuter rail improvements. Until more actual experience with land use impacts of such modes is available, then, Federal policy should not deny the possibility that fixed transit modes other than conventional rail might contribute significantly to urban growth-focusing.



# Role of Land Use Policy

**Local land use policies have often been instrumental in facilitating transit's land use impacts. At the same time, the transit improvement itself has sometimes provided the rationale needed for acceptance of such policy changes.**

Land use policies have often been instrumental in determining whether and to what degree complementary development would occur around transit stations. This is especially so in Toronto. The same is true, though to a lesser extent, with downtown development in San Francisco. A reverse situation is found in Washington, D.C. where height limits have restricted the degree of density incentive which can be offered to developers.

An important aspect of these situations and some others in which zoning and related incentives have been successful is that their power has depended on the **degree of advantage** they provided for the station site versus others elsewhere in the city. If a city were already overzoned (or if variances were easily obtained) to allow intensification of existing development at many competing locations, the inducement to develop at the transit station was correspondingly less. Both in Toronto and San Francisco, the transit station-area zoning incentives were part of a city-wide rezoning.

Land use policies have also effectively **prevented** development at transit stations by restricting land uses to such low densities that no allowable new development was economically viable. The Rockridge BART station area is an example of this. Other public policies have also restrained development; New York's 1908 attempt to tax away speculative profits on land along subway routes, resulting in a stagnation of development, is a dramatic example of such a policy.

## **Land Use Policies of the Transit Authority**

Actions of the transit authority itself with respect to the sale or use of excess land and air rights are another important form of land use policy. These may have important effects on the degree to which such land is redeveloped to complement the transit system, for example by offering long term leases in

lieu of sales to reduce developers' initial capital requirements (Toronto). Toronto also encouraged intensive land development near some central stations by designing the subway structure to include provisions for support of very heavy buildings. This amounted to a "land use policy" encouraging developers to build such buildings, since no unusual foundation costs were then required during their construction.

Conditions of air rights and excess land sale or lease have also acted as implicit land use policies. Toronto's approach has been to get the land back into use as quickly as possible, and so has encouraged development in many ways (although revenues from land leases have still been very significant). Other rapid transit systems such as BART have had similar although less aggressive policies. One contrasting example is Washington, D.C., where WMATA has negotiated one air rights lease with provisions for profit-sharing with the developer. This approach may restrain development if not sensitively applied, but the Washington case deserves careful attention as a possible model.

## **Feedback: Effects of Transit on Land Use Policy**

Evidence shows that transit has often influenced land use policies. In many cases the inauguration of a major new transit improvement has provided the rationale for changes in land use policy to complement the transit service. In fact, this may represent **one of the most important ways in which a transit improvement may influence land use.**

Land use policies generated largely by the advent of a new transit improvement include examples in Toronto, San Francisco, Philadelphia, Boston and Washington. In Toronto, as already noted, the rezoning for intensification of development at transit stations arose several years after the first subway segment's completion and was directly attributable to it. In San Francisco, the 1966 rezoning in the CBD was heavily influenced by BART, as were similar station-area rezoning efforts in several suburbs along the BART lines.

Also on BART (in downtown Oakland) as well as with the Center City Commuter Connection in Philadelphia, support for plans for high-rise redevelopment was largely dependent on the transit

improvements. In the Boston suburb of Quincy, zoning was changed specifically to complement the transit system's potential to induce more intensive development. In Washington, many of the communities to be served have conducted studies of METRO's land use impact potential and altered their zoning in response.

Not all of these transit-induced land use policy changes have been complementary to transit. Downzoning has been mentioned for BART's Rockridge station, and has occurred elsewhere as well. In fact, the power of zoning is most significant when it is used in this manner, since its effect is absolute: development is forbidden, no matter how it may be encouraged by other forces including transit. This is a substantial loss in potential regional development impact, and suggests that locations likely to have such constraints should be avoided as transit station sites wherever possible if major new station-area development is a central objective.

### Implications

The coordination of transit and land use should not be restricted to a one-time rapid transit development planning effort. If rapid transit is to be an effective policy instrument for shaping the city, its application should be based on urban development objectives which are themselves accepted policy and which are compatible with rapid transit. Such objectives tend to involve a focusing of development and intensification of density near transit stations or in corridors served by transit rather than a more spreadout, lower density pattern.

It is conceivable that rapid transit planning might be done specifically to prevent rather than encourage a focusing of development. This could be done fairly easily by locating the system to avoid complementary factors and by blocking such effects via land use policy, infrastructure limitations, and other constraints. In a few specific station areas this might be reasonable. In general, however, it seems unrealistic to seek the benefits of rapid transit service for an area without also encouraging the intensive nearby development which complements the transit capacity with large numbers of potential patrons.

This suggests that **Federal policy should encourage a more precise definition of local land use policy**

### **objectives prior to consideration of rapid transit.**

This is typically done now in a general way through adoption of comprehensive land use plans at the regional level. However, greater specificity is required. In too many of the cases reviewed, a rapid transit system was built with its stations in neighborhoods which were actually unwilling to allow complementary intensification of development. The typical result is either underutilization of the station, serious station access problems, or both. To avoid such misuse of the costly transit resource, planning - both as a continuing comprehensive process and in the specific studies in preparation for a major transit improvement - should include assessments of the feasibility of land use intensification in the small, specific areas to be proposed for transit access.

Land use policies have often been instrumental in the generation or prevention of land use change around transit stations. Policies regarding provision of infrastructure (such as streets, sewerage and water), property taxation, and plan approval procedures have had similar effects. These specific policies should support overall urban development objectives; if for example a stated objective of focusing future development into subcenters is contradicted by zoning regulations which allow equally intensive development in many locations outside the subcenters, the objective is not likely to be met successfully.

In most cases reviewed, the presence of a transit station was not enough to attract a major share of new development when in competition with an excess of other similarly zoned locations. **Federal policy should urge the rationalization of land use and other local policies with transit-related land use impact objectives** as much as possible within legal constraints. At the very least, zoning and infrastructure provision in most transit station areas should allow intensive development, and efforts to further liberalize zoning in other areas counter to growth-focusing objectives should be denied as a matter of consistent local policy.

# Factors Influencing Land Use Impact

**A consistent set of factors is involved in the generation of transit's land use impacts. These form an empirical model on which predictions of impact may be based.**

Formal and informal theories abound regarding the relationship of land use and transportation. None is of adequate scope, precision, and empirical relevance for practical use in the study of transit's land use impact. From among these, this study has adopted the hypothesis that such impacts are dependent on many non-transportation factors in addition to the access, travel time and cost benefits of the transit improvement. Moreover, the study has focused on the decision-making process of the land developer rather than the ultimate consumer. Thus the study has sought to identify the factors of significance to the developer and the combinations of factors under which development is likely to occur or not occur.

As described earlier, recent experience with transit's apparent land use impact was found to exhibit some common properties from city to city and case to case. Many of the same causal factors were found again and again despite many differences in specific conditions from one example to another. These recurring factors may be combined to suggest a general model of the land use impact process.

A diagrammatic view of such a model is shown on the following page. Each major factor which was found in this study to encourage land use change following a transit improvement is shown with its various components. The model illustrates clearly the scope of such factors in addition to the transit improvement itself.

All these factors act to influence the developer of land, whose decisions are the immediate "causes" of land use impacts. As the model indicates, the developer is free to choose whether or not to invest in a particular location. If these factors are not favorable in comparison with other choices, the investment will be made somewhere else.

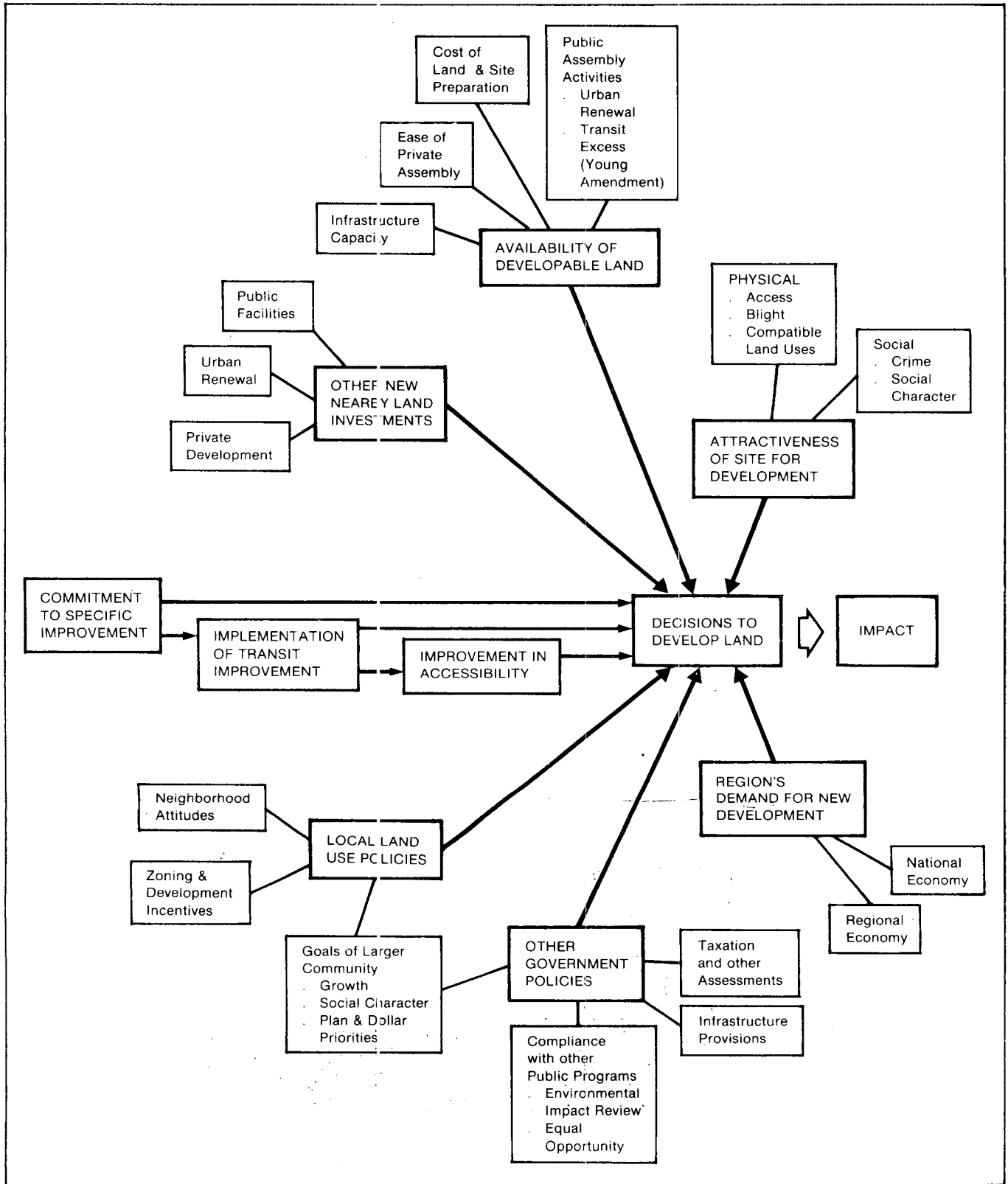
## Implications

Once local urban development objectives are defined, supporting policies and programs - including rapid transit - can be developed. These should be focused on influencing the land developers' investment decisions. This study's results indicate that **rapid transit can be used as one factor to help shape land use patterns.** This appears to be largely a process of influencing the location and nature of development in a metropolitan area rather than its net amount. However, transit cannot create desired land use patterns by itself if other powerful factors oppose it.

Land use objectives are difficult to meet largely because of all the diverse forces which influence development. **Federal policy must acknowledge these many forces and the need for their coordination.** This is not an abstract goal; if land use, energy, and environmental objectives are to be met, it is a practical necessity. Without coordination, urban development will continue to be essentially unplanned and the land use impacts sought from transit improvements will seldom be realized.

Clearly the relative importance of each factor varies from one case to another. In general, however, the study's findings indicate that none can be ignored, for a serious deficiency in any one appears to be capable of limiting or even preventing land use impacts. Thus, all the factors should be made as favorable as possible. In some cases this may involve moving a proposed transit station to a more advantageous location; in others there may be a need to coordinate policies in land use, taxation, urban renewal, and infrastructure with the transit investment.

With such an approach, various transit alternatives can be evaluated on the basis of their ability to take advantage of each of these factors and their consequent relative likelihood of land use impact. Even more important, an understanding of the workings of these factors permits the use of rapid transit as an effective component in the continuing, integrated process of planning and guiding the development of urban areas.



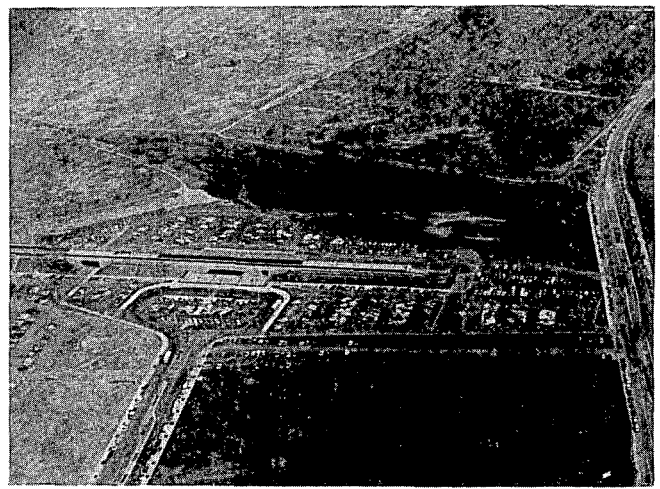
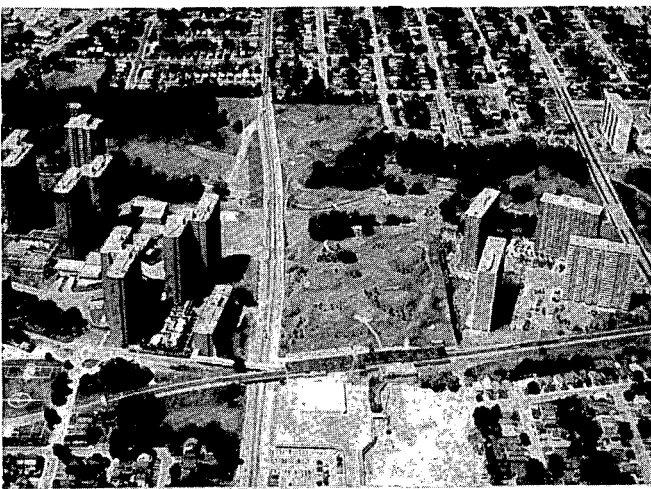
# Conclusions

Clearly Federal policies such as those derived and presented here must not be so unrealistic at the local level as to be impossible to implement. There are real limitations to the immediate success of even these modest proposals. The fragmentation of local authority in most cities, the ever-present conflicts among jurisdictions and the differences in the priorities of their constituencies, natural though they are, loom large as frustrations in the achievement of meaningful regional objectives and enforceable, consistent policies. In the face of these realities, the Federal government's policies must be realistic.

The thrust of the policy implications which have been presented here is straightforward: The Federal government should use its influence to encourage every possible means of local coordination of the factors which this study has found necessary to achieve desired land use impacts from major transit improvements. Complete control over these factors is not a possibility nor is it ever likely to be in this society - nor should it. But much can be done now to improve the chances of achieving desired land use impacts - where they are desired - simply by stressing the early identification of situations in which the needed factors are favorable or not. Beyond this, local policies in fields such as land use and infrastructure can be better coordinated with transit planning, at least by realizing and avoiding further inconsistencies as policies evolve and are

implemented from day to day. Finally, there is no reason that the private land development perspective could not now be incorporated into public land use and transportation planning.

These implications must be used with great care in the making of Federal policy toward support of local initiatives in urban development and transit improvement. The Federal government already places many requirements on local authorities seeking financial aid for such initiatives; this study's results should not be interpreted simply as a call for more difficult, slow and costly analyses prior to a Federal commitment. There are other ways to encourage the needed attention to land use impact. For example, the recommended transit station site analyses can be done in stages as projects are planned and implemented, beginning with a screening of general locations and a review of other factors such as local policy during initial alternatives analyses. More precise site selection studies and initial local policy coordination could be made during preliminary engineering, after an initial Federal commitment. Demonstration of previously-promised progress in local land use-transit policy coordination could be made a condition of initial and continued construction funding, based on periodic review. In this way the implications of this study could be implemented without delaying implementation of the transit system.



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### FOR FURTHER INFORMATION

Knight, R. L. and L. L. Trygg. Land Use Impacts of Rapid Transit: Implications of Recent Experience. Final Report, DOT-OS-60181. Washington, D.C.: U.S. Government Printing Office, 1977.

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