TRANSPORTATION AND LAND USE PLANNING ABROAD

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Contents

Introduction

Floyd I. Thiel, Federal Highway Administration, U.S. Department of Transportation

The papers in this Special Report discuss some of the ways that transportation and land use planning abroad is providing experience that can be helpful in the United States. The papers result from a Conference on Socioeconomic Experience Abroad held at Cornell University, July 22-23, 1975.

Geographic areas from which experience is drawn include Japan, Canada, Europe, and the Middle East. Topics include noise and other transportation impacts, land use techniques to deal with these impacts, transit financing, public participation, "pedestrianization" in various countries, pricing to restrain parking, truck regulation, highway needs in Canada, and transportation sensitivity considerations in developing countries. Observations by the authors and commenters include the following.

1. Japanese experience suggests that highway measures alone to control noise may be 2 to 5 times as costly as highway plus roadside measures (Kitamura and Torii).
2. French techniques to prevent land speculation and to finance transit through employer taxes deserve attention (Sloan, L'Huillier, and Holmes).
3. England, France, and Japan appear to be dealing with transportation impacts faster than Canada and the United States, perhaps because these 3 governments are more centralized and can impose land use solutions (Blackburn).
4. The public should be involved only when there is something substantive to discuss. According to Soberman, "When people have nothing to discuss, they usually start throwing things."
5. A key to success in involving people (more than 10,000 at meetings in the Metropolitan Toronto Transportation Review Plan) may have been to have no fixed plan but several principles such as avoid overcommitment, work within the traditional decision-making process, and meet people on their own terms (Steinkrauss).
6. Public participation may involve only the public reacting to proposals defined by professionals who have their own ideas of what transportation is possible (Frisken).
7. Traffic control abroad is producing such results as high (80 percent) acceptance by residents of one-way traffic in alleys in Bolton, Endland, and significant reduction (40 percent) in fatalities in Nagoya, Japan (Appleyard).
8. To encourage car pooling, it may be more effective to tax private parking space reserved for employees (33 percent in Toronto and 55 percent in Ottawa) than to adjust commercial or municipal parking (Frayne).
9. Comparison of Canadian provinces with and without intraprovincial intercity trucking regulation indicates that annual costs may be about $15 million in regulating provinces (Sloss).
10. The Canadian Highway Systems Study to help guide federal policy indicates

provincial user taxes exceed highway expenditures (Zelman and Dutz).

11. In developing countries, fatalities (typically of the educated minority) are 10 times rates in the United States, citizen participation is an untried novelty, and user analysis is inapplicable because travel time is unvalued (Sargon).

Japanese Experience With Highway Noise and Noise Abatement Measures

Teruki Kitamura and Yasumasa Torii, Japan Highway Public Corporation

Japan's economic growth since the 1950s has increased transportation demand, and a nationwide highway system is now being constructed. One of the main issues regarding highway improvement is to harmonize highway construction with its surrounding environment. This report describes the Japanese experience with noise abatement measures, including the use of absorptive and reflective barriers, shelters, plantings, and buffer zones. Because of the high population density and much mountainous country, use of alternative routes has proved extremely difficult. Cost comparison studies indicate that both on-highway (barriers) and off-highway (building insulation) noise abatement measures should be used for effectiveness and economy.

Rapid development of the Japanese economy since the latter half of the 1950s has dramatically increased automobile traffic. In 1973, approximately 70 percent of all freight and 52 percent of all passengers were carried by motor vehicles. Registered vehicles increased from 3.4 million in 1960 to 24.6 million in 1974. However, length of paved highway per vehicle has not kept pace with this growth. At the end of 1974, Japan had 12.4 m of highway per vehicle; the United States had 24.0 m/vehicle, nearly twice as many.

To deal with this increased demand, we have devoted our efforts to developing a nationwide highway network by implementing several 5-year road improvement programs, which include improvements to national highways, prefectural and municipal roads, and expressways. This rapid growth of motor vehicle traffic has also enlarged market areas, increased mobility, raised the standard of living, and had other impacts on society and the urban environment.

In the course of this economic development, population and socioeconomic activities have concentrated in the urban areas, precipitating increased congestion and traffic accidents. This, in turn, has brought about a deterioration in the urban environment. In the rural areas, highway construction has often led to the destruction of the natural environment. The adverse effects of the automobile (exhaust fumes, noise, vibration) and the highways (separation of local areas and communities, sunshine obstruction, environmental damage) have been observed and have turned many against the automobile and highway construction.

Thus, the most serious problem facing Japan now and in the future is combining economic growth and environmental harmony while developing an affluent society and a congenial environment. In this report, we present some examples of highway impact in Japan, emphasizing noise and noise abatement measures.

BACKGROUND OF ENVIRONMENTAL PROBLEMS IN JAPAN

The government has attempted to harmonize highway construction with the environment

by formulating laws and regulations setting environmental quality standards regarding noise and air pollution. Table 1 gives the noise level standards.

When construction of a new highway is begun, future noise levels are estimated by highway authorities such as the Japan Highway Public Corporation based on the projected traffic volume generated by the new highway. Residents involved are shown countermeasures that will be used if necessary to achieve the environmental quality standard for areas facing highways (Table 1). However, they insist that the highway authority either meet the environmental quality set for residential areas (area A in Table 1) or preserve the present state of the environment. Thus, in many places throughout Japan, highway construction is deadlocked and not expected to advance.

A common saying in Japan is, "Agree in principle but question particular points." Applied to highway construction, highway construction is approved in general but disapproved in or around a particular community. The government realizes the necessity of highway construction and is prepared to provide buffer zones, noise barriers with absorptive structures, and shelters to abate noise. To cope with exhaust emissions, traffic control and regulation of overloaded vehicles are enforced, though effective measures have not yet been worked out. Compensation for radio-TV wave disruption and sunshine obstruction has been established, and provision of insulation measures, such as the improvement of window structures, has been adopted.

HIGHWAY AUTHORITY RESPONSE

Measurement and Estimation of Noise

As previously stated, the basic goal of the highway authority regarding noise pollution is to achieve the environmental quality standards for areas facing highways (Table 1). Route location and structure design of a proposed highway are determined based on that standard. The noise level of existing highways is measured by a standardized method (Z8731 of the Japanese Industrial Standards).

To forecast future noise levels of a proposed highway, empirically derived models, analytical models, and simulation models have been developed. Most commonly used is an analytical model for which the Japan Highway Public Corporation employs a modified version of an equation developed by the Japan Acoustics Academy.

$$L_{50} = L_w - 8 - 20 \log 1 + 10 \log \pi \frac{1}{d} \tanh\left(2\pi \frac{1}{d}\right) + d2 + i$$

where

L_{50} = medium noise level, dBA;
L_w = power noise level of 1 vehicle, dBA;
1 = distance between the center of traffic lanes and sound receiving point, m;
d = headway, m;
d2 = correction factor for diffraction of line source; and
i = correction factor to adjust the difference between calculated and measured noise levels, mainly the difference due to the effect of surface characteristics.

A noise model experiment is conducted to estimate noise levels under a complicated highway structure, along the roadside or at a particular location. A nonecho room at the Japan Highway Public Corporation makes it possible to estimate the noise levels of an expressway under various conditions by using a typical cross section. At the same time, the scale model is used to evaluate the effectiveness of various noise abatement measures.

Noise Abatement Measures

The Environmental Quality Standard Related to Noise states that comprehensive measures to reduce noise and achieve the standard are necessary. Measures to be employed are not restricted to the highway itself but include improvement of automobiles, promotion of urban redevelopment, traffic control and regulation, and intensifying traffic enforcement. To date, these measures have not been fully implemented, resulting in some residential complaints.

Although the countermeasures discussed below have been provided by the highway authorities, they are, of themselves, insufficient to deal with the problem. Three highway corporations have recently requested 7 transportation-related industries, such as automobile manufacturers, tire manufacturers, trucking and bus service industries, to develop their own noise abatement measures.

Proposed Highways

Highway authorities pay careful attention to ensure that proposed highways are coordinated with land use plans and other public works programs. However, solutions through route alternatives are difficult in Japan because the density of residential districts, which are widely distributed in the inhabitable areas, is high. Schools, hospitals, and other facilities that require quiet are regarded as important control points, and efforts are made to keep the route as distant from them as possible.

If the highway must pass through a residential area, noise abatement levees, barriers, plantings, or shelters are used to supplement highway alignment and structure in order to conform to land use patterns and the need for quiet. Noise abatement measures of facilities are designed to accommodate 10-year traffic volume projections. If estimation is difficult, design or construction or both are done to facilitate any future remedial work that may be necessary.

In September 1974, the Standard Related to the Acquisition and Operation of Right-of-Way to Preserve Highway Environment was established. Applicable where a trunk road with 4 or more lanes is newly built or improved, the standard recognizes the necessity to preserve the natural environment adjacent to the road. The width specified for the area to be taken as part of the right-of-way is 10 m from the edge of the roadway along both sides. If heavy night traffic is anticipated, the width is expanded to 20 m. The area thus obtained is to be used and properly maintained as a space for plantings and noise barriers and can be used when necessary for sidewalks, bikeways, or roads excluding through traffic.

Highways in Operation

For highways in operation, noise barriers are the most commonly used remedial measures. A few sections exist, however, where a shelter is planned or considered in response to complaints from residents adjacent to the highway. Although research on barriers as a means of noise abatement has just begun in Japan and no design criterion has yet been established, the Japan Highway Public Corporation has developed a tentative standard in which design load, positioning of barriers, height, lengths, and property of materials used are specified.

Two types of noise barriers are employed: reflective and absorptive. Both are expected to have an attenuation effect because of the diffraction of sound. The question of which is to be used is dependent on other external factors.

A reflective panel is used where the reflective effect of the barrier is deemed negligible, i.e., where only one side of the highway needs to be protected and no houses are located on the other. Otherwise, absorptive barriers are used. A typical cross section of each of the noise barriers is shown in Figure 1; attenuation effects are shown in Figure 2.

Where noise barriers are used in a continuous line, importance is attached to using

plantings and barrier design both to preserve the aesthetics of the surrounding environment outside the highway and to diminish any feeling of being closed in within the highway. Figure 3 shows such a barrier design.

Traffic Control and Regulations

If the noise abatement measures for existing highways are insufficient to control noise, traffic control, based on consultation with the Public Safety Commission and the police, may be used. Among the measures to be taken are restriction of traffic volume and speed, lane designations, and the regulation of overloaded heavy vehicles.

Although restriction of overall traffic for noise control is difficult, regulations specifying type of vehicle and the time of day for their use are in effect in some urban areas. On multilane roads and streets in urban areas, experimental traffic regulations require large vehicles, considered to be the noisiest, to drive on the innermost lane, increasing their distance from adjacent buildings. Regulation of overloaded large vehicles is facilitated since all expressways in Japan are toll roads. Loadometers are placed at most of the toll barriers, and weigh meters are stationed at strategic locations to aid in enforcement of load regulations.

Speed control has also been used in an attempt to control noise emissions. On a toll road operated by the Japan Highway Public Corporation in suburban Tokyo, the speed limit of 80 km/h was reduced to 60 km/h. On a section of the Metropolitan Expressway in Tokyo, the speed limit was reduced from 60 km/h to 50 km/h, and a movement is under way to have the reduced speed limit applied to the complete expressway. On the intercity expressways, we have been asked by the police to lower the current speed limit on one section in response to residential complaints regarding highway noise.

Examples of Noise Abatement Measures

Highways in Operation

As of June 1975, the Japan Highway Public Corporation operated approximately 1600 km of expressway, of which 79 km (as of March 1975) have noise barriers in place. In fiscal year 1975, an additional 40 km will be protected with noise abatement barriers. However, there exists approximately an additional 150 km where neighboring residents are complaining about highway noise. Plans are to provide additional noise abatement measures, mainly barriers, according to a 3-part priority system based on roadside conditions. Of the noise barriers installed in fiscal 1973, 43 percent were absorptive and 57 percent were reflective; 38 percent were on bridges and viaducts, 58 percent were on embankments, and 4 percent were on cuts; and 90 percent of the absorptive barriers were on bridges and viaducts and 92 percent of the reflective barriers were on earthwork sections.

Highways Under Construction and Planning

Recognizing the necessity and importance of coordinating highway construction at the planning stage with neighboring housing developments, we have worked out a method to deal with noise pollution. In the event a housing development is planned adjacent to a proposed highway, every effort is made to coordinate and adjust plans to reduce noise levels. Among measures considered are to provide an adequately wide green belt or buffer zone and to install noise abatement measures, if necessary. Possibilities also include rearrangement or improved structural design of housing. Noise abatement procedures for proposed highways are illustrated by 2 highway construction projects.

The first project is a section of an expressway in suburban Tokyo, where the process of deciding on highway structure and noise abatement measures took approximately 3½ years. Both the expressway and a city street bisected a residential district. Al-

Table 1. Environmental quality standard related to noise.

Item	Noise Level (dBa) Daytime	Morning and Evening	Nighttime
Area			
AA-hospitals and similar facilities	≤45	≤40	≤35
A-residential	≤50	≤45	≤40
B-mostly residential, some commercial and industrial	≤60	≤55	≤50
Areas facing highways			
≤2 lanes in area A	≤55	≤50	≤45
>2 lanes in area A	≤60	≤55	≤50
≤2 lanes in area B	≤65	≤60	≤55
>2 lanes in area B	≤65	≤65	≤60

Figure 1. Cross section of noise barriers.

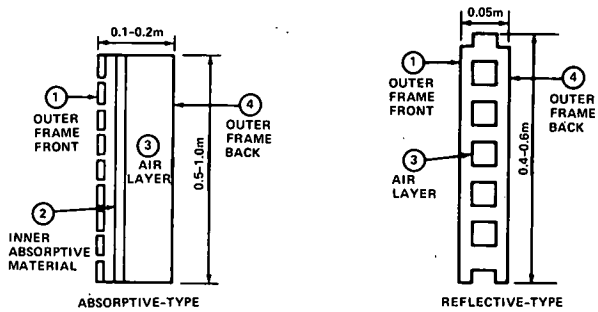


Figure 2. Effect of noise barriers on both sides of 6-lane highway.

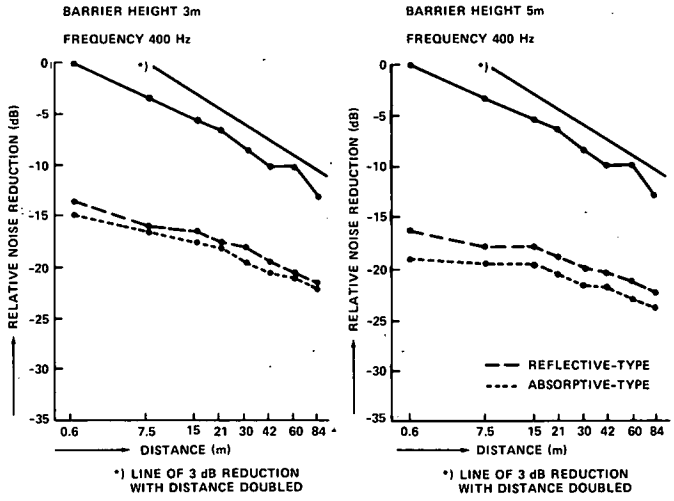
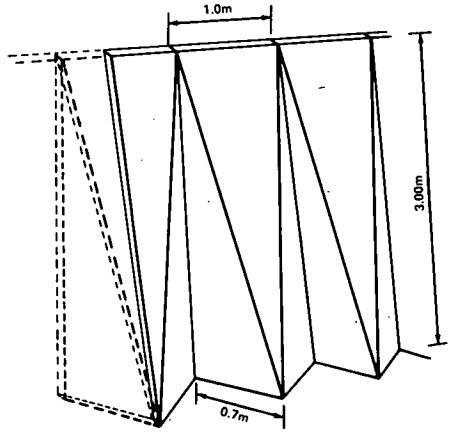


Figure 3. Example of aesthetically well-designed noise barrier.



though the highway programs had been established when the housing development plan was under consideration, insufficient information was given tenants regarding the proposed highway. Later, when we explained the expressway construction project to the residents, a considerable amount of hostility was aroused. Four different measures to preserve the environment around the housing complex were proposed and closely examined: noise barriers, a highly elevated viaduct, a tunnel, and a highway with a shelter.

The shelter plan, with a length of 245 m, was finally adopted on the condition that it would not adversely affect adjacent areas (Figure 4). A steel structure with double walls, the shelter is lined with absorptive panels to increase the noise attenuation effect. Compliance with the environmental quality standards was demonstrated by a scale model of the shelter equipped with noise barriers at the approach sections. From a highway structural-design aspect, however, the section is undesirable, for it aggravates the highway environment within, poses potential hazards in the event of accidents and fire, and causes pollution problems at and around the mouth.

The length of the second project, mostly a cut section, is approximately 1000 m and provides an example of well-coordinated planning of highways and housing developments. In the area where residential houses were planned, the Japan Highway Public Corporation purchased 20 m of additional right-of-way, measured from the shoulder, to be used for noise barriers and also to be planted with trees. A service road and low-rise houses are planned by the housing corporation in areas adjacent to the planted zone. Medium-height buildings, which rise above the noise barriers, are to be located as far from the highway as possible (Figures 5 and 6).

Cost Estimate of Noise Abatement Measures

Comparisons were made on the basis of effectiveness, total cost, and allocation of costs between the provision of facilities separately and in combination. The underlying premise of the study was that noise reduction down to 60 dBA could be attained by measures taken on the highway, and further reduction to 50 dBA should be attained by insulating the houses.

The cost of noise abatement measures on the Tomei (Tokyo-Nagoya) and the Meishim (Nahoya-Kobe) expressways, 540 km in length and now open to traffic, was estimated by drawing noise contours on aerial photos. A comparison of the estimated costs gave the following results:

1. To achieve exterior noise levels of 50 dBA at night by using highway measures only would cost $1830 million;
2. To achieve exterior noise levels of 60 dBA at night by using highway measures only would cost $197 million;
3. To achieve exterior noise levels of 50 dBA or interior noise levels of 40 dBA at night by using highway and roadside measures would cost $362 million; and
4. To achieve exterior noise levels of 60 dBA or interior noise levels of 50 dBA at night by using highway and roadside measures would cost $97 million.

In this cost estimate, measures taken on the highway for reducing noise included providing barriers of 3 and 5 m in height and a shelter. Measures taken off the highway to further reduce noise included insulating houses (along part of the roadway, some houses were replaced). Calculations of cost were based on a classification of roadside developments into ordinary residential housing, medium height and higher buildings, hospitals and schools, and factories and warehouses.

The estimate assumes that the cost of insulating the houses will be borne by the highway authority. To date, however, agreement has not been reached as to whether the exact form of payment will be compensation of loss, damage reparation, or a subsidy. Not in effect yet, the final decision will lead to a revision of related laws.

From this, it can be seen that noise reduction brought about by focusing solely on the highway is considerably more expensive than measures that combine both the highway and housing.

Figure 4. Plan of the Karasuyama-Kita housing complex along the Chuo Expressway.

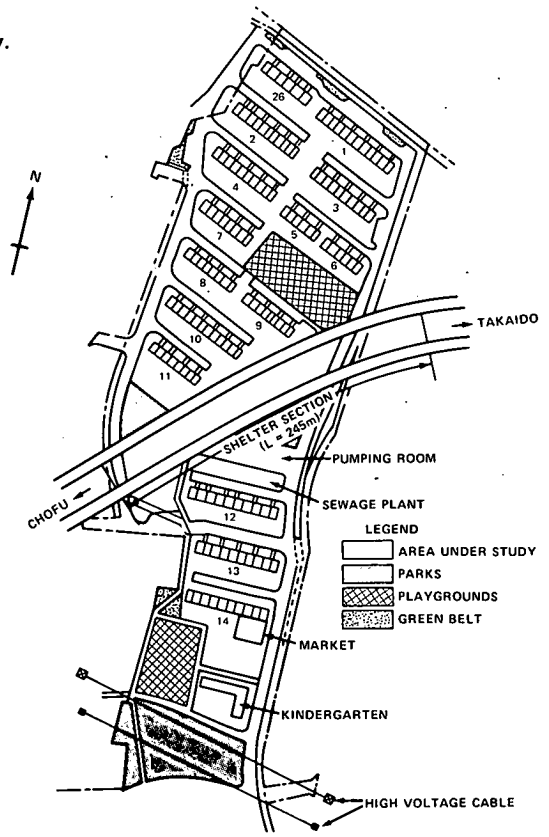


Figure 5. Plan of the Kawatsuru housing complex along the Kan-etsu Expressway.

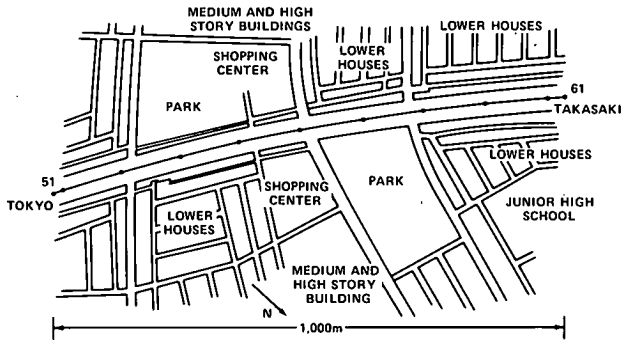
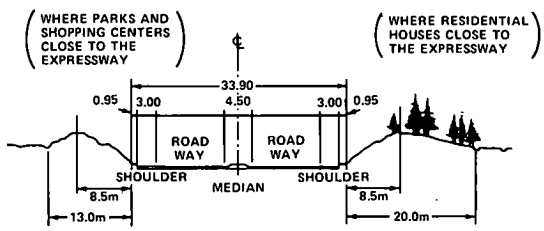


Figure 6. Typical cross section of the Kan-etsu Expressway near the Kawatsuru.



CONCLUSION

Land for transportation use in Japan is quite restricted since the total amount of land available is limited, a portion of it is mountainous, and land requirements for socio-economic activities are increasing. At the same time, however, improvement of the functionally systematized highway networks is essential to ensure the continuance of these activities. The main issue regarding highway improvement then becomes one of harmonizing highway construction with its surrounding environment, both urban and natural.

This description of noise abatement measures in Japan emphasized the experience of the expressways. Noise abatement measures are extremely expensive if they focus solely on the highways. Measures must include not only improvement of the highway structure itself but also coordination with neighboring land use plans, insulation of residential houses, traffic control and regulation, and improvement of automobiles. Efforts should also be made to use the buffer zone, legally established to be taken as part of the right-of-way, to preserve the environment and aesthetics.

Enhancing the Public Share of Highway Benefits: The French Experience

Allan K. Sloan, Arthur D. Little, Inc.

Because of a high premium placed on management and control of land resources in the national interest, the French have developed some of the most effective tools for land use control in the western world. Among these are a sophisticated set of performance-based zoning designations combined with coordinated land use and transportation planning. This paper describes the functions and purposes of 3 of these designations: (a) Priority zones for urban development are designed to control land development by concentrating urbanization in designated areas outside but adjacent to built-up urban areas; (b) zones for cooperative or planned urban development provide a flexible formula for joint public-private development to permit large-scale, well-designed developments in and around major urban centers; and (c) differed development zones provide a mechanism to prevent large-scale speculation in land and to protect areas of environmental interest and areas in which some major public improvement is foreseen in the long-term future. The paper concludes by illustrating the operation of this system, which began with the development of a regional development plan calling for a new Paris-Rouen-Normandy expressway and is resulting in the creation of a new town, Le Vaudreuil.

This paper discusses French experience with using the increased accessibility and potential for change brought about by highway building to achieve related land use development or other benefit in the public interest. In France, the implications of the highway building program—mainly the autoroutes or intercity expressways—are just beginning to be fully realized. Although there may not be a specific category of activity in connection with highway construction that involves systematically examining the potential public benefits of each facility and developing an appropriate response, there are some interesting potentialities for this to happen in France because of the sophisticated system of land use planning, control, and management.

Because French culture and public policy put such a high premium on management and control of land resources in the national interest, the French have developed, in a system of private land ownership, some of the most effective tools for land use control in the western world. Public officials responsible for both highway planning and land use regulations are in the same government ministry; planning at the local or regional level for both land use and transportation is done by people in the same agency. These circumstances give the French a real potential for maximizing the land development benefits of highway investments, if they so desire. French planners cannot only plan joint transportation-land use development schemes that coordinate the transportation investments with the land use developments but also implement them as well.

PERFORMANCE-BASED ZONING DESIGNATIONS

To this end, the French have also developed a sophisticated set of performance-based zoning designations, 3 of which are of particular interest.

Priority Zones for Urban Development

Designed to control land development by concentrating urbanization in designated areas outside but adjacent to built-up areas, priority zones for urban development (zones a urbaniser par priorite or ZUP) have often been designated in areas adjacent to circumferential or ring roads, which are popular features of French town plans since World War II and which have obviously helped stimulate pressure for development in adjacent undeveloped land. In effect, the ZUP is an antisprawl device. The creation of the ZUP allows public authorities to

1. Develop a comprehensive land use-circulation plan for the entire zone, which may range from small tracts of 100 ha to large tracts of 40,000 ha or more;
2. Acquire land under the laws of preemption—at values fixed by a special legal formula—and control the land values within the zone;
3. Specify the types and locations of all developments within the zones, including highways and other transportation facilities; and
4. Refuse to grant building permits outside of the zone.

Although similar in concept to urban renewal areas in the United States, the ZUP can also be used in predominantly vacant or underdeveloped suburban zones to control development.

Zones for Cooperative or Planned Urban Development

Zones for cooperative or planned urban development (zones d'amenagement concerte or ZAC) are land use zones designed to provide a flexible formula for joint public-private development. Different from the ZUP, which is built around public authority initiative, the ZAC allows for concerted or cooperative public-private planning and building in a particular zone. When a ZAC is created, the provisions of the local zoning laws can be superseded. Land can be acquired by public authorities under the laws of preemption (eminent domain), and land transactions and trading within the zone can take place between public and private interests, in accordance with a jointly developed land use plan. Local building permit requirements can be altered and local taxes adjusted to provide a more equitable tax burden among the property owners.

Used basically to permit large-scale, well-designed developments in and around major urban centers, ZACs often have been designated at the intersections or urban expressway systems where integrated shopping centers, high rise apartments, office complexes, and sometimes whole new towns are being built.

Differed Development Zones

The third type of zone is the differed development zone (zones d'amenagement differe or ZAD), which provides a mechanism to prevent large-scale speculation in land in areas that will be developed at some future time but for the present should be kept off the private land market in the public interest. This mechanism has been used both to protect areas of natural beauty or environmental interest when their accessibility has been improved by the opening up of a new highway and areas in which some major public improvement is foreseen in the long-term future.

Application of ZAD consists of 2 phases. The first is the preoperational phase during which the land values in an area are frozen for a specified period of time. Speculation in real estate is discouraged by the inability of owners to sell their land at anything but the price of land fixed at the time of designation. The second phase begins when the operations, foreseen when the zone was originally established, begin. In this operational phase, the ZAD has many of the characteristics of the other development zones, including the operation of preemption (eminent domain) powers by public authorities, creation of comprehensive areawide plans, joint public-private development, and the like.

CASE STUDY: THE NEW TOWN OF LE VAUDREUIL

This battery of zoning mechanisms provides the French with a set of flexible controls that can be used to ensure that public benefits are realized when development opportunities arise, including, of course, those created by new highways. The operation of these mechanisms is best illustrated by the process that is resulting in the creation of one of the French new towns—Le Vaudreuil—near Rouen.

Planning Stage

The process started some years ago when the development plan for the region, which called for a new expressway to connect Paris with Rouen and Normandy to the northwest, was being prepared. The line of the expressway was to pass close to a flat plain sandwiched between the River Seine and some low hills—a site considered by the planners to be ideal for the creation of a new town needed to accommodate some of the populations of both Paris and Rouen. The expressway location and its interchanges were then planned to give maximum possible accessibility to this site.

Implementing the Plan and Controlling the Land

Once the regional plan was approved, the planners were able to have all of the new town site designated as part of a ZAD to prevent private real estate speculation from driving up land costs and thus rendering new town development financially infeasible. At the same time, a new town development corporation—a joint instrumentality of the national government, local governments, and some private banking interests—was established and empowered to purchase land in the ZAD as needed and to plan the new town.

Helping the Existing Villages

One of the first tasks of the new town corporation was to plan an internal highway system for the area. Sites to permit the expansion of 2 little villages that had existed in the area for hundreds of years were then designated. Each of the villages created a ZAC that, with the aid of private developers and the new town corporation, was turned into new housing, an industrial park, and schools to handle both the needs of the villagers and the influx of people who will be building the new town.

Building the New Town

The new town corporation is in the process of preparing sites for sale or transfer to private developers or local government agencies for construction of various elements of the new town, using the particular zoning designations, as appropriate, to ensure proper development. The new town corporation is working with the national and local agencies to build the roads and all the other community facilities and with private developers and housing authorities to build the housing.

Two critical factors have made possible the development of Vaudreuil: (a) the ability of initial planners to plan the new Paris-Rouen highway and designate the new town coincidentally and in concert and (b) the ability of the planners to subsequently control and manage the land in question so that the "public" was able to take full advantage of the new accessibility of the site for development in the public interest.

CLOSING REMARKS

I am not an advocate of applying the French system as is to our problems in the United

States. Our governmental systems, philosophies, and attitudes toward land and development may be too different to allow that. However, there are, in my opinion, some interesting lessons that we can learn from the French, particularly in the application of land management techniques, and that we might adapt to our system. I think that some of these may be well worth exploring by federal, state, and local government officials responsible for both highway and land development.

Transportation Effects in France

Daniel L'Huillier, School of Economics, University of Aix-Marseille, and Director, Research Center for Transportation Economics, Paris

This paper concentrates on 3 aspects of the relation between transportation and its environment in France: (a) means used to apportion the external losses and benefits of a transportation investment among the parties involved; (b) measures used to improve public transportation operations in major cities (an employer tax that rests on the premise that employers benefit from the existence of public transportation and should pay for it); and (c) the fact that transportation is a servant of other human activities. A strategic scheme is presented for relating regional planning to transportation.

The title of this paper is so broad that I must concentrate on a limited number of items. I will deal briefly with 3 aspects of the relation between transportation and its environment:

1. The way in which the external benefits and losses of a transportation investment are shared by the various parties involved;
2. A new system of funding urban public transport systems by taxing employers, thus making them share the responsibility of public investments and making them more conscious of the link between transportation and the location of their activities; and
3. A strategic scheme for relating regional planning to the planning of transportation systems through the concept of "moving needs."

SHARING OF TRANSPORT INVESTMENTS

If I were to limit any paper to answering the question, "What is being done in France to share the public benefit of transport investments?" it would be a short one. The answer is nothing—or almost nothing. In France no taxation is based on the value of capital, or on capital gains. Taxes are levied only on income or sales. So, the public benefit or loss of a transportation project results only in an increase or decrease of the land and building value, which is extremely difficult to measure.

There are some exceptions to the principle of "no tax on capital gains." Since 15 years ago, there has been a law taxing the gains on land and building values. The value increase may have occurred for various reasons and is computed by using a complicated system that takes into account factors such as the rate of inflation and property usage. In fact, this law has been rather inefficient and ineffective, resulting in frequent court action. Since judges are reluctant to fix the amount of this tax, almost everyone finds a way of avoiding it. Of course, it is applicable only in cases of sale, donation, or succession.

A new law for extending and improving taxation of capital gains is currently being

prepared. This would eventually lead the way to a general taxation on capital; however, the project has met with a lot of opposition, and its discussion has already been delayed in Parliament.

Another law in preparation that is meeting the same strong opposition is a land use law. It is the liberal answer to the socialist proposal for a municipalization of the cities' land. This project gives the municipalities a better control over the building rights, allowing them to transfer development rights to enforce their zoning projects. Its purpose is to eventually level off the price of land in urban areas, thus preventing speculation.

All French cities, large or small, must complete by January 1, 1977, a comprehensive scheme that includes a land use plan and a transportation scheme for the coming 10 to 20 years. These schemes have to be approved by the administration and are now becoming an important political issue. Large segments of the population are becoming aware of the importance of land use planning and of the transportation problems related to it.

For a number of years, the Administration policy has been to ask developers or building promoters to participate in the funding of the public facilities (roads, schools, community halls) needed by their projects (or to build the facilities themselves). It is usually part of the bargain with the municipality that grants the development rights. However, a number of promoters claim that this is an unfair practice.

A good example of the ambiguity of shared costs is the case of the suburban shopping centers that tend to locate along the superhighways. All they pay is the cost of the land and the building of special exits and access roads if needed. If built on an ordinary road, they may be asked to pay for the traffic lights at the crossing of their parking entrance. However, they can never be made to pay for the cost of the traffic jams generated by the in-and-out flows and for the other disamenities involved.

On the negative side, there are few instances of compensation for public "losses" generated by transportation investments. The only one I know of is a nuisance tax levied by airport authorities on airlines and allocated to people located in the noise zone of the airport. Some of this money is given to the public housing agencies having projects in these areas in order to soundproof their buildings. The highway department is testing antinoise screens in suburban residential areas; the results of the experience are still inconclusive.

There are no legal means of compensation for other disamenities suffered by the public, except, under the common law, for an actual and proven damage for which a suit can be filed against the administration. And still in this case, the "public utility" concept would be used by the administration to defend its actions.

Even among the different government agencies, the compensation concept for benefits and losses cannot be easily worked out because of the strict boundaries that separate their budgets. Take for instance a new highway built in front of a public hospital. Nothing can make the highway fund finance the soundproofing of the hospital, which is funded by the health department. But the real solution might be to have comprehensive interdepartmental planning, making sure that a superhighway is not constructed in front of a public hospital.

It proves once more the interrelation of transportation with every other activity concerned with the organization of space.

FUNDING URBAN TRANSPORT

Several measures were introduced by law in 1973 and 1974 to help improve the public transport operations in major cities.

In urban areas with a population of more than 100,000 a tax may be imposed by a decree of the city council on all employers, public or private, of more than 9 employees. This tax is based on the total amount of salaries paid during the same year; its rate may vary from 0.45 to 1.5 percent according to the decision of the city council. The basic idea under this new law is that employers benefit from the existence of a public transport system that moves one of their most valuable resources—people. They, therefore,

should have to pay for it. There are some distinct features in this new system:

1. Different neighboring cities may conglomerate in order to reach a population of 100,000 and may create an authority of any kind (or use an existing one) to manage the funds collected. This is a step toward comprehensive transportation authorities in metropolitan areas.
2. Some tax exemptions are possible for employers who provide their employees with either free collective transportation or housing in the immediate vicinity.
3. The spending of this tax fund is controlled and must be used in the following ways: compensation of income losses by the public transport authorities due to government-imposed reduced rates for workers, financing capital investments within the public transport system, and funding of improvements, revamping, or extension of public transport services.

This is supposed to allow for an ambitious public transport policy, which is one of the national priorities selected for the next Five-Year Plan. At an average rate of 1.0 percent, the tax would yield about $12.50 per inhabitant in 1975. This should be sufficient to allow the municipalities to prepare multiannual plans and to set up an efficient coordination between the different modes of transportation serving the city.

This scheme is quite new and it is still difficult to evaluate its success. Nevertheless, it has some limitations.

1. It is concerned primarily with commuter movement of the work force closely connected with the "production" requirements. What about the other intracity moving needs?
2. With strong opposition from the local businessmen, the city councils have been reluctant to fix high rates. The majority has stayed with the minimum figure; only Marseilles has voted for the maximum.
3. The financial needs of the public transport authorities are so great that the revenue of this tax does not appear to be able to solve all their problems. And as it cannot be used for reducing the operating deficit showed by almost every public transport system, it is usually looked on as a mere crutch and also as a real source of political conflict.

However, this system seems to open the way toward a better recognition of the fact that public transport is an external benefit to the activities served by it, and that in this respect it has to be supported in a collective way.

RELATING REGIONAL PLANNING TO TRANSPORTATION

My third point emphasizes the fact that transport is a servant of the other human activities, whether economic or noneconomic—an intelligent and a dynamic servant (and costly too!), but a servant.

Much has already been written on the "structuring" effects of transportation, and this is a productive line of research. But it should not be overlooked that moving needs are generated by facts and acts outside the transportation field. So alongside the research on the structuring effects, we have to develop another line concerned with the "structured" effects of transportation, that is, the way in which it is determined by the upstream activities. Of course, this is an interactive process, and the moving needs have to be accommodated by the possibilities of the transportation tools, existent or potential. If these tools, because of their technical and economic characteristics, cannot properly fill the needs, then the needs themselves have to be reconsidered and modified.

The moving needs are primarily shaped by the actual land use patterns, whether preplanned or anarchic. Thus, if we adopt a strategic approach, we may say that transportation is a maneuver that has to be designed to serve the socioeconomic objectives included in an accepted spatial organization. Those objectives themselves are dependent

on the chosen socioeconomic values of a society. Once the objectives are set up, we may well speak of a transportation strategy, consistent with them. This includes specific transportation objectives and transportation maneuvers: general design of the transportation system, investment, regulation of flows, training, and information of users and operators. In fact, these maneuvers are complementary and partially interchangeable.

Every move in the field of transportation—building new roads, pricing, setting up speed limits, choice of rolling stock, radio traffic information—has a definite meaning with respect to organization of space and perhaps other strategies as well, such as public finance and employment. That is the reason why it is so difficult to design a transportation strategy—at a national, regional, or local level—if the commanding issues have not been clarified.

Reynoird and I (1) outlined a scheme to clarify this strategic approach for decision-making at the regional level (Figure 1). It is intended to be a mere methodological tool and is still too simple to reflect the complexity of the real problem. (The problem is even more complex when transportation facilities already exist, shaping the actual economic, human, and physical landscape.) The following are some of its features.

1. Transportation planning is voluntarily placed at a subordinated level, not to downgrade it, but to show that many analyses and decisions must be made before the design of a transportation system is considered. Moreover, any wrong move in the transportation field would jeopardize the success of higher ranking strategies.
2. Transportation planning and policy are the most important tools of regional planning; a space is not really shaped before adequate transportation is provided.
3. Transportation, however, is not the only maneuver to implement regional planning; horizontal links exist with tax policy, industrial policy, and other policies.
4. We must insist on the strategic indicator concept that has to be used at every stage of the process in order (a) to make the strategic objectives clear and measurable and (b) to permit control and evaluation both prior to the implementation of the maneuver (by some kind of simulation) and after the system has been put into operation.
5. We may show on this scheme the iterative process through which transportation models space by its specific action; this loop may be used in a simulation aimed at testing the consistency between regional planning objectives and transportation maneuvers.

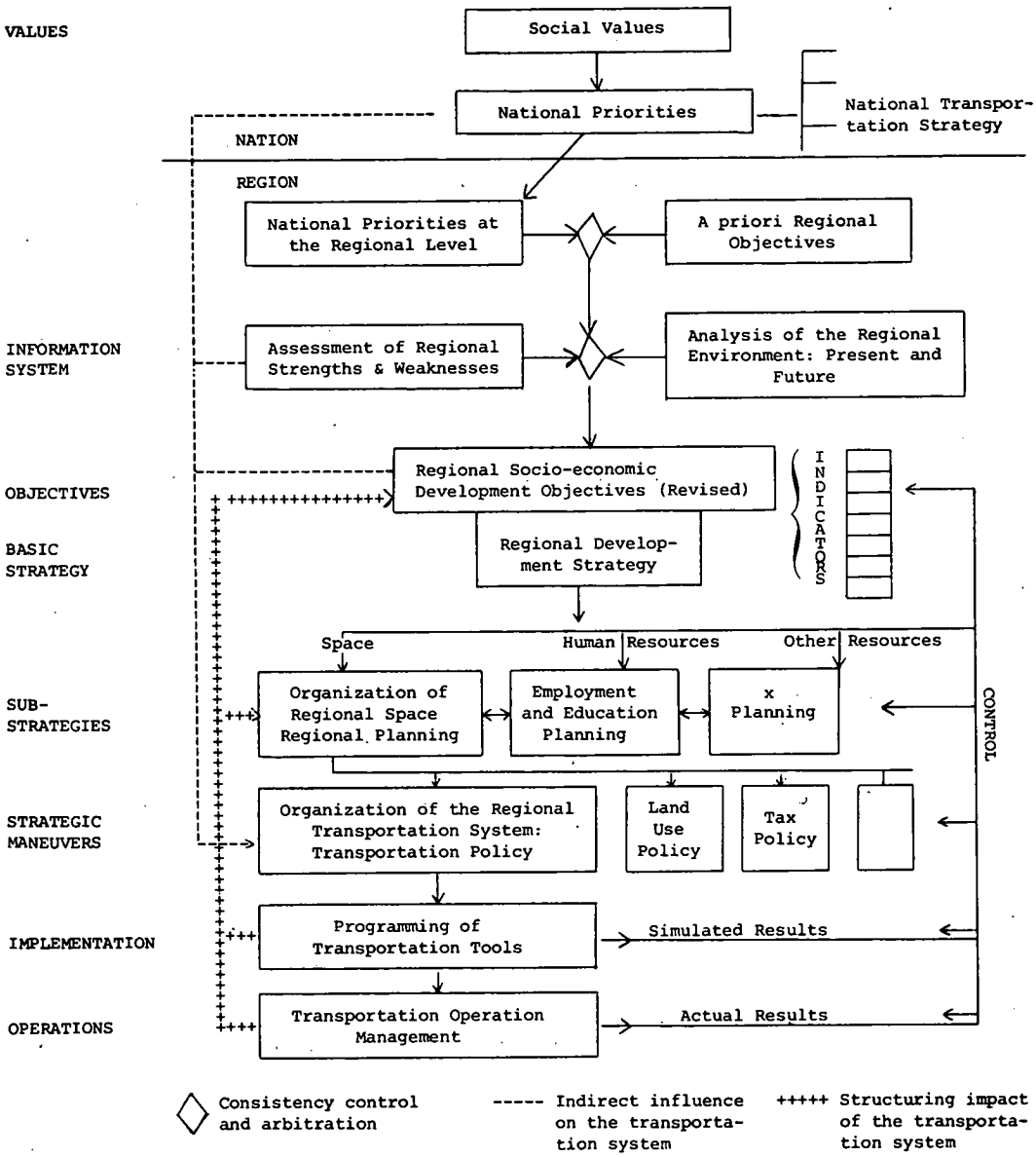
Using this scheme as a guideline, our group has conducted a methodological research focusing on the development of conceptual and operational tools for (a) identifying the transportation needs generated by each function of space, (b) matching them with the technical and economic characteristics of the different transportation modes, taking into account the various decision makers, and (c) evaluating the consistency of transportation projects with the regional planning objectives. A first quick test of these tools has been made in the metropolitan area of Montbeliard-Belfort in the east of France.

This line of research is now being developed in various directions: socioeconomic functions of regional airlines and airports, multimodal demand for freight and passenger transport in the Rhone Valley for 1990, and socioeconomic aspects of the development of the passenger transportation system in the fast-growing metropolitan area of Marseilles.

CONCLUSION

One conclusion we cannot escape about the external effects of transportation projects and actions in France or elsewhere is that they are political issues, and this is what they should be in the noblest sense of the word. Their strategic impact is so far reaching that the most important goal of our research may well be to train technicians and decision makers to measure the exact significance of their actions and to enable them to say in an informed and responsible way: "That is exactly what we want."

Figure 1. Strategic scheme for transportation and regional planning.



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Transportation Impact Solutions

comments on the preceding 3 papers

Edward Holmes, Consultant to International Road Federation

I never quite know how to comment on other people's papers. I can only say that the 3 preceding papers provided a substantial contribution to showing what can be done to bring transportation and other forms of development into harmony.

The paper by Kitamura and Torii is a particularly valuable paper for those concerned with noise because they were able not only to make highway facilities acceptable to the public but also to bring actual value into the cost. They were unsure about the cost being borne entirely by the highway and the highway industry. There is no reason to load onto the public the cost of overcoming noise resulting from private operations such as vehicle and tire noise. The point they clearly make, however, is that, relative to the total cost of the facilities, the costs involved in restricting or reducing the noise level to an acceptable figure would not be regarded as a great addition. If the amount of money required is small, why do we not go ahead and do it? The question is, Who will pay for it? Neither the highway people nor the abutting land owners want to do so.

A second point the authors make relates to the subjectivity of noise and what noise seems to bother people. I recall an investigative reporter with the Boston Globe who measured noise levels in Boston on the heaviest traveled streets and then in the Park Street subway. He found that the noise level in the subway was far greater than that on any street. He also found that in Durgin Park's Restaurant the noise level was the highest of anywhere he had measured, and still people lined up to get in. A great deal of subjectivity surrounds the question of noise, and we need some way of relating actual physical measurements and their meaning to people.

Financing transportation systems by taxes on the employers, as L'Huillier reports French cities may now do, is quite different from what we try to do in the United States. We seem to want to have everyone pay except the employers. Yet, they are the ones who profit by it the most. I doubt that either BART or Washington Metro would have been approved if the cost had to be borne by area employers. It is an interesting approach that should be followed with great interest.

There is one thread through all these papers: Transportation cannot be looked at in isolation, but must be looked at in terms of total development with transportation as one factor. L'Huillier said transportation is subordinated to general development. Of course it must be subordinated, since it is only one factor in development; it is a land use. It not only directs land use but is itself a land use and must be subordinated to the general land use plan.

Sloan covers development possibilities under French law. The bureaucratic system in France is a marvelous thing to behold. It does not seem to matter who is elected; the bureaucracy operates as it has for almost a century, and it operates well. For

example, it is doing a fine job in some of the new towns, which illustrate total development. We do not do that in this country. We plan transportation separately. Not only that, we plan the different modes separately. We are not one generation, but two, behind where we ought to be. I do not know why, but possibly it is because we are politically immature compared to others.

We have no way of measuring the quality of transportation as one factor in urban development. We can measure the quality of education: We know we need so many pupils per teacher, for example. We know we need so many square feet per capita for housing. But do we have any means for measuring the quality of transportation? What is good transportation? Good rapid transit or good highway transportation or good air transportation or good total transportation?

An important point emerged from studies in Toronto. When transportation was reasonably free and a choice of mode existed, about 30 percent of the trips in downtown areas during peak hours were in private vehicles. When the planning was done for Ottawa, development was to be limited in the downtown area to a level at which 30 percent of the total demand for transportation could be accommodated on the intended physical highway structure and parking facilities. The figure of 30 percent is low today, but it is interesting that, if there is a good choice of transportation, the figures seem to be lower.

Therefore we cannot look at a single mode. We must look at transportation in total and find some way to measure its quality. Then when we start trading off transportation against other values, we have some means of saying, "If you want to do this, you are hurting transportation by this amount" or "If you want to provide this quality of transportation, then you are hurting some other urban value by that amount."

Anthony J. Blackburn, Urban Systems, Cambridge, Massachusetts

If I were asked what existed 10 years ago in the area of research and programs dealing with the impact of transportation facilities on the environment, I would have to say nothing or very little. There was some academic work in this area, but almost no programs to deal with the environmental impact of transportation facilities.

I am amazed that 10 years later we have governments throughout the developed free world, as evidenced by these papers, with programs in force dealing with these problems in sensible and innovative ways. We have come to a time when even the language of noise measurement is international. This language did not exist 10 years ago. People talk knowledgeably about absorptive and reflective barriers. Ten years ago this group would probably not have been aware of what such things were. These papers taken together are evidence of remarkable development in this area.

I am somewhat familiar with the experience of the United Kingdom, where in 1973, a broad and comprehensive piece of legislation was passed called the Land Compensation Act. This act, dealing not only with transportation facilities but with all public projects, essentially revised major parts of the land code in the United Kingdom, provided the means for excess acquisition of land, defined transportation impacts, and made provisions for compensations to individuals for home losses that went beyond the ordinary relocation assistance and property value losses that could be attributed to the operation of transportation facilities.

There are some differences among countries with regard to the remarkable developments that I have alluded to. These developments, although not coordinated efforts, were in response to essentially similar problems: (a) a widespread perception in the 1960s on the part of the community that transportation facilities were inimical to many things related to the quality of life and (b) the appearance of community opposition to highway and other transportation facilities. So, whereas the source of these programs is largely similar in the sense of transportation planners responding to community opposition, some of the speed and, in some cases, the approach taken have been different.

I shall make some conjectural generalizations explaining these differences. It appears clear, for example, from the paper by Kitamura and Torii, the discussion by Sloan and L'Huillier, and my own knowledge of what has happened in the United Kingdom, that these countries have acted faster than the United States and, I believe, Canada. I think this deserves some explanation. Furthermore, it appears that the approach taken in these countries is fundamentally different from what I believe will be the outcome in the United States.

Probably one significant explanatory variable related to these differences is the strength of government to impose land use solutions for the problem of transportation. In the United Kingdom, France, and possibly Japan, the government has much more power to impose land use solutions for transportation problems. The ability to do that rather than to acquire land and carry out extensive alternative solutions makes the problem cheaper to deal with and more feasible from an administrative point of view.

Another explanatory variable may be the decentralization of governmental power. I would say that the speed with which government is developing these programs is, to a large degree, a reflection of the centralization of governmental authority in countries such as the United Kingdom.

In the United States, I do not believe that land use planning and land use solutions are going to play as significant a role as they have in the United Kingdom and elsewhere. When I ask myself what the direction will be in the United States, I find some significant straws in the wind pointing in a different direction. The Interior Committee of the House voted down a piece of land use legislation so watered down as to be almost invisible. This, I think, reflects the real strength of the interests opposed to deeding to the government major ability to control land use. I believe these influences will persist.

I find another straw in the wind in the Federal Register of July 9, 1975, in which the Federal Aviation Administration requests public comment on its Airport Noise Policy. This policy presents 4 alternatives, 3 of which are minor variations on the federal government doing nothing. The other, which I think is a straw man, makes the federal government a total dictator. I have little doubt about how the comments will come in. On the other hand, I think there are grounds for encouragement. Both the airport and highway legislation submitted by this administration contain provisions for highway and airport sponsors to carry out additional activities outside the right-of-way that are designed to deal with environmental and social impacts. I find this encouraging. I would not like to conjecture about what we will find in 5 or 10 years. I have some concern that the effect of inflation and energy may moderate efforts in this direction, and I believe that would be a mistake.

Developing Transportation and Land Use Alternatives in Toronto

Richard M. Soberman, Ontario Transportation Development Corporation

The Metropolitan Toronto Transportation Plan Review involved an evaluation of a total transportation system and extensive public participation. It produced not a single transportation plan but a number of alternative plans and indicated how each would contribute to differing development objectives.

One of the difficulties in presenting a case study is that, unless the audience is familiar with the locale under study, interest in the material tends to diminish exponentially with increases in the number of strange street names, expressways, and rapid transit routes. In the presentation of this material on the Metropolitan Toronto Transportation Plan Review (MTTPR), therefore, one challenge is to avoid as far as possible mentioning even a single street name.

At the outset, it might be worthwhile to ask what is different about the Metropolitan Toronto Transportation Plan Review that justifies presenting it to a large group of non-Torontonians? Basically, 4 things:

1. The MTTPR was a comprehensive evaluation of a total transportation system in which an attempt was made to involve the public as extensively as possible in an open planning process. To a degree, that process was successful: A large number of private citizens were involved in the review and in some cases they had considerable influence on the nature of the studies carried out.
2. Every effort was made to relate transportation issues to land use issues in a manner that could be readily understood by elected officials, the community, and the media. We were probably successful in forcing elected officials to realize that major transportation decisions should not be taken in isolation of their consequences for land use development. In this regard, the numerous publications stress the presentation of information in a manner that is relevant to the decision-making process and to the decision maker's perspective of the issues at hand.
3. Wherever possible, efforts were made to avoid aligning the professional staff with particular solutions and recommendations about which they might subsequently become defensive. Wherever possible, the conclusions tried to show how different transportation decisions could be grouped in a manner that was consistent with certain sets of objectives for overall urban structure. We then tried to indicate how certain transportation decisions were common to a wide variety of urban development objectives and could therefore be taken safely. By contrast, other transportation decisions might preclude certain development options and should therefore not be taken without first settling on those objectives.
4. Considerable emphasis was placed on the problems associated with implementation. In particular, the phasing of transportation improvements, the use of short-term

improvements as part of long-term solutions, and the long-range financial implications of transportation solutions were given considerable stress.

PUBLIC PARTICIPATION

Public participation is probably one of the most used and abused terms in the planning profession today. Almost every planning agency today claims to be committed to full public participation in its planning decisions. Planning studies are now hardly ever prepared without some reference to a significant public participation component.

Public participation, or "open planning" as it is sometimes called, is of course not without its skeptics and critics. These include planning officials who are inured to change and regard participation as merely another fad that will eventually disappear, politicians who already regard themselves as "the people's choice" and who regard professionals who attempt to deal directly with the public as being interlopers on their turf, individual citizens who regard participation programs as sinister attempts to co-opt the opposition, and some "people power" addicts who theoretically approve of the concept but who really thrive on dissension and prefer it to the boredom of cooperation.

Even among the advocates of public participation there are extremes in views. Some planners are philosophically committed to the concept of citizen involvement in planning decisions, so much so that they are often among the most naive when it comes to evaluating the real effectiveness of such programs. Others are involved in participatory processes because they now consider public participation to be a necessary evil.

These different viewpoints can all be justified, of course, depending on how public participation is defined and the perspective adopted. There are public participation programs that are complete shams that were never intended to be more than that. There are examples of participatory planning that has been successful in that both planners and the public have benefited from mutual interaction. There are also many examples of missed opportunities for effective public participation in the planning process.

One interpretation of public participation is quite simple: Public participation involves nothing more than producing information and making it available on a widespread basis. That information must be relevant; it must be presented in a way that is readily understood by both politicians and the public; and it must be more factual and objective than information produced by the press, which often dramatizes contentious points taken entirely out of context.

The argument for adopting such a simplistic definition of participation is that opportunities already exist for public involvement in the planning process. Planners are not charged with the responsibility for changing the nature of that process. They are charged with improving the process by broadening the base of public participation and treating it as an opportunity to improve the quality of planning.

This point can be illustrated by looking at a now shopworn concept of how decisions are actually taken in the transportation planning field (Figure 1). The process usually begins with a number of technical studies, although, admittedly, the nature of these technical studies is already based on some preconceived notion as to what kinds of improvements are desired. A politician, for example, may be aware of an abandoned or lightly used railway facility and suggest that it be put to more intensive use by the provision of new public transit services. This "conclusion" may instigate a technical feasibility study that deals with items such as costs, revenues, and possible operating strategies. In most cases, the technical studies produce recommendations that are then passed on to the decision makers, usually a group of elected officials. There, the recommendations may be debated, modified, distorted, sent back for further work, or ignored. Ultimately, a policy decision is taken.

These policy decisions are then subject to some further review by a more senior level of government that exercises a degree of financial control. The review process usually results in a decision to either proceed with the implementation of the improvement or to prevent the project from being carried forward.

Throughout this process, various elements of the community at large also become involved in the decision making. There are some examples of community or citizen

involvement during the technical studies or at the time when preliminary policy decisions are being debated by elected officials. By and large, however, the bulk of the citizen involvement occurs at the review stage, and it is largely characterized by confrontation and, in some cases, highly organized protest movements. How the nature of these community inputs can be improved is not dealt with here, but it should be pointed out that there are ways of improving the quality of community input, using that input more productively, and, in particular, using it to help identify what are the most relevant issues and consequences to be considered by elected officials when they make their decisions (1, 2, 3).

The most important feature of this simplistic approach to decision making is that the technical studies constitute a starting point. They produce information and recommendations that ultimately become the basis of decisions. To the extent that the quality of the information produced is improved, one must assume that the quality of the decisions taken will also improve.

One of the most important ways of improving the quality of information is to ensure that the kinds of information presented to the decision makers describe the factors and consequences that they and the community consider important in making their decisions. That can only be accomplished by ensuring a broader range of input early in the process and by more open discussion of the issues and potential solutions by all concerned before a significant degree of planning is undertaken. Involving the public early in the process will help ensure that the right issues and problems are identified. It will also ensure that the right studies are undertaken in the first place.

Involving the public more fully in the planning process is, of course, not a substitute for the normal decision-making procedures of government. All that is being said is that improved communication with the public early in the planning process may give professionals a better assessment of the true needs and desires of the community. In that regard, public participation is an important means of educating the planners. As a result, better solutions might be recommended.

In some cases, the interactions between professionals and the community may not be particularly productive, but keeping the community informed, if nothing else, helps the individual citizen to argue his or her particular point of view more effectively. And, in a free democratic society, that happens to be one of his or her basic rights. It may also help to quickly deflate extraneous arguments, thereby saving both time and money in the implementation of policies and projects that governments eventually decide to pursue.

There are perhaps a few lessons that can be learned from the successes and failures of trying to involve the public more fully in the way that is being suggested here.

1. The true test of how effective public participation has been only comes at the end of the process. If the process has been successful, then no credible group should be able to suggest a reasonable alternative that did not emerge before the final recommendations were made. That means not that their alternative must be accepted, only that it has received fair consideration in relation to other alternatives that were analyzed.
2. If the public is to participate in influencing planning recommendations, politicians must be prepared to recognize their participation and to take part in the proceedings themselves. An essential ingredient of good public meetings is to have local elected officials present to respond to questions and to obtain a measure of the community's sentiment.
3. Some thought should be given to using the press effectively in a participation program. Ultimately, the media will reach a much wider audience than any highly organized public participation program. The media, therefore, should be looked at as yet another opportunity for improving the quality of information that is eventually presented to the public. That means holding meetings, as opposed to press conferences, with representatives of the media to provide them with a better opportunity to review any material produced. Often such meetings will be much more useful if the media are given an opportunity to read reports and documents beforehand.
4. Professionals involved in a participatory planning process must really understand how decisions are taken in the political arena. That is the only way of ensuring

that the information and recommendations that they ultimately produce at least take into account the decision maker's perspective of the problem.

5. A cardinal rule is to involve the public only when there is something substantive to discuss, even if it is nothing more than a definition of the problem as the planners see it. The worst thing to do is to have a meeting when there is nothing to say. It is when people have nothing to talk about that they usually start throwing things.

DEVELOPING TRANSPORTATION AND LAND USE ALTERNATIVES

Perhaps one of the most distinguishing features of the MTTPR is that more effort was devoted to the formulation of alternatives than to their testing and evaluation. Engineers and planners have developed some fairly good techniques for the analysis and evaluation of alternative transportation systems. By contrast, the process by which these alternatives are formulated is not so rigorous. The generation stage is, of course, the most critical because good choices or decisions cannot be made if the best solutions are not included in the population of alternatives from which the evaluation is made. For this reason, most of the discussion on this case study concerns the process for generating or formulating alternative transportation solutions.

Developing long-range transportation plans is not an easy task for 2 reasons. First, long-range planning is talked about a great deal, but there is little evidence of long-range planning in transportation decisions that are actually taken. Almost all major transportation decisions appear to be based on short-term considerations. Yet decisions taken today will obviously have a significant effect on the future growth of any metropolitan area. As a result, one of the approaches used to develop the long-range alternatives involved a consideration of how they could be staged to deal with shorter term needs.

Second, transportation issues cannot be considered separately from land use issues. One basic difference in our approach, therefore, was that the transportation alternatives were related to alternative land use development. In most transportation studies, future land use is normally taken as given, and the transportation alternatives are then designed to service the needs implied by a particular land use pattern. In the Toronto study, we attempted to recognize the interaction between land use and transportation and tried to emphasize that it does not make a great deal of sense to consider one without the other.

The process for developing alternatives is shown in Figure 2. It begins with certain assumptions about one land use pattern for the year 2000 based on the principles of the Toronto centered region (TCR) concept. (The TCR concept is a set of policy guidelines established by the provincial government for the growth of the metropolitan Toronto region. It designates particular areas for new development, sets population and employment targets for those areas, and identifies controls to encourage development or discourage it where none is desired.) This land use forecast was used as the basis for preliminary traffic predictions. Since the demand for transportation depends on the kinds of facilities and services available, certain preliminary assumptions also had to be made about the extent of the transportation system that would exist in 2000.

For this particular transportation and land use configuration, it is possible to make a prediction of future travel demand for various trip purposes and for different modes of transportation. That can be accomplished by using some of the traditional models for trip generation, trip distribution, and traffic assignment. In this case, the traffic assignment routines were applied to a simplified spider network.

For the particular distribution of population and employment implied by the assumed land use pattern, traffic assignment to the spider network provides some indication of where the major travel demands are likely to exist. Comparison of a number of different spider network assignments suggested the existence of 8 major travel corridors, 6 of which are oriented to the existing central area and 2 of which appear to accommodate cross-town travel, as shown in Figure 3. [The actual techniques are described in detail in Report 62 (4).] For these corridors, the traffic assignment provided estimates re-

Figure 1. Decision process for transportation planning.

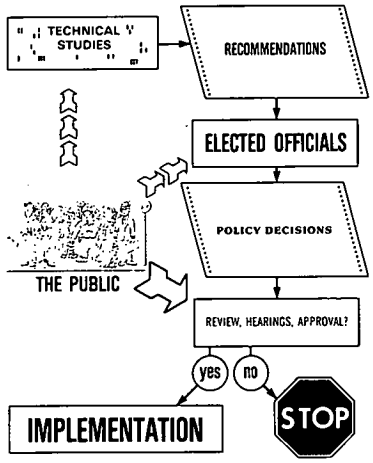


Figure 2. Work flow for developing transportation and land use alternatives.

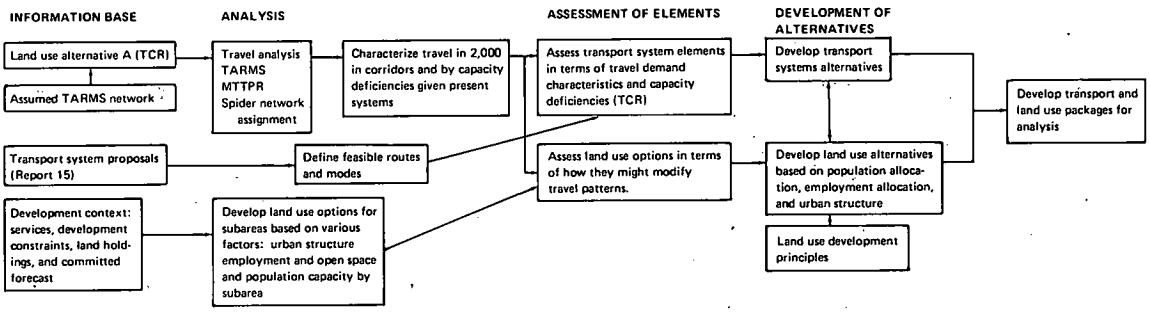
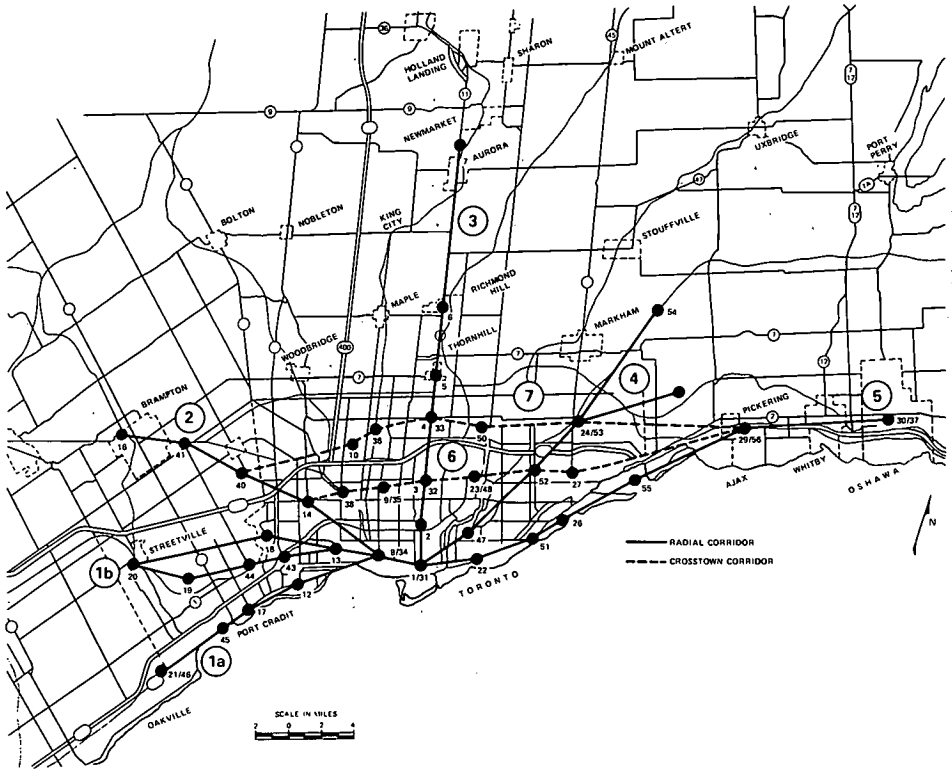


Figure 3. Travel demand corridors in 2000.



lated to both volumes and the character of travel (which is important because of its influence on the choice of appropriate transportation technologies). As a result of the travel prediction procedure, therefore, we have some indication of where the major corridors of travel are likely to be and an estimate of the character and magnitude of travel demand within those corridors.

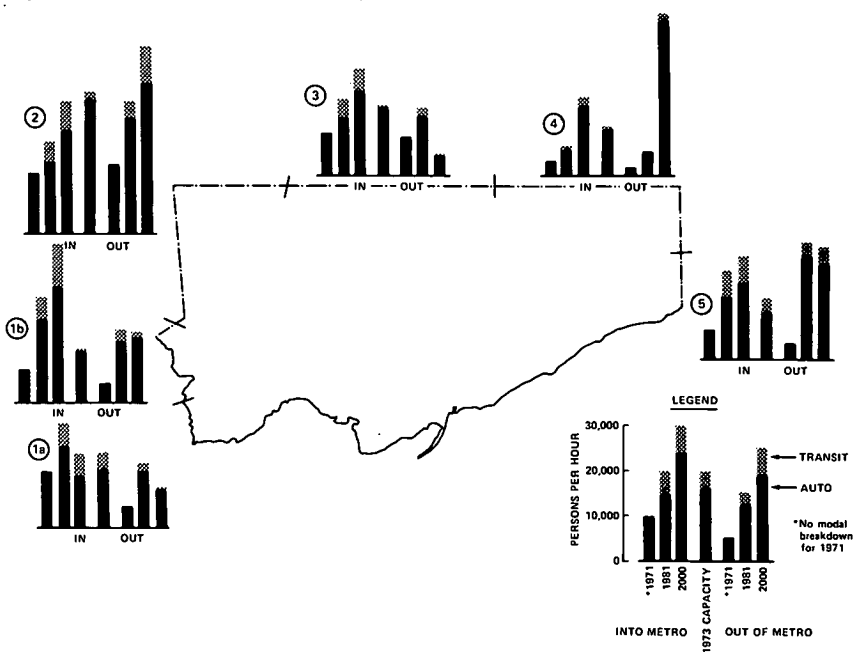
The next step is to look at the capability of the transportation system to accommodate these projected demands, remembering that they are based on certain preliminary assumptions about land use and the extent of transportation facilities. Obviously, the ability to accommodate projected demand will vary at different locations within a particular corridor, so key locations must also be defined for comparing the relation between projected demand and the ability of the road and transit system to handle that demand. This involves establishing a series of cordons and identifying the road and public transit facilities now crossing the cordons in each corridor. The capacity of these facilities within each corridor at each cordon can also be calculated and compared to the demand estimates for travel in the corridor. Figure 4 shows an example of the analysis carried out at one particular cordon, the metropolitan boundary. In each bar diagram, the central bar represents existing capacity that can be compared to inbound and outbound volume estimates for the years indicated. Similar analyses were carried out for other cordons and a variety of other key locations.

Through this process, a composite picture can be assembled of where the deficiencies are in the existing system of transportation with respect to the future travel demand implied by the preliminary land use assumption. This description of the deficiencies forms the basis for formulating future transportation improvements.

There are, of course, a number of ways in which attempts can be made to accommodate these deficiencies. One is to modify land use, or, in other words, to alter the relation between places of residence and places of employment so as to reduce travel demand. Another is to modify travel behavior, for example, by greater incentives for transit use and greater restrictions on automobile travel. A third is to increase the capacity of the transportation system.

We have thus characterized travel in 2000 for various major corridors and have

Figure 4. Demand-capacity analysis by travel demand corridor.



some idea as to where the major deficiencies of the present system lie. We also have a number of different transportation system proposals that have been suggested at one time or another by the various agencies that are concerned with transportation planning and operations within metropolitan Toronto. In addition, there are a number of opportunities within each corridor for improving transportation.

Taking the capacity deficiencies by corridor, considering some of the existing transportation proposals, and recognizing the limited opportunities that exist in each corridor, we then developed a number of transportation system alternatives. In the formulation of these alternatives, the underlying design philosophy was to satisfy the transportation requirements within each corridor and to provide facilities that would be compatible with the characteristics of the travel demands in each corridor.

In all, 4 alternative transportation systems were developed during the first round of analysis. Subsequently, the number of alternative transportation systems was increased to 7 as a result of public discussion and consultation with a number of local and regional planning agencies. All systems recognize that it will be increasingly more difficult to accommodate travel demands of the metropolitan area by road improvements. Therefore, all alternatives assume a higher degree of public transit use in 2000 than is now the case.

The transportation system alternatives were developed on the basis of potential travel demand and the deficiencies within the existing system of transportation. The estimated travel demand, however, is based on certain preliminary assumptions about future land use and transportation. The next stage, therefore, was to review those original assumptions about land use in the light of the transport system alternatives subsequently developed. A variety of other factors that might affect future land use development were also considered, including

1. Proposed or committed municipal services,
2. Large-scale assembly of land,
3. Variations that are possible concerning the distribution of new employment in the study area [During the short term, for example, significant variation in population and employment distribution is not likely because of the lead time involved for new urban projects. Thus, the land use pattern during the time period for already committed projects (say, to 1981) was assumed not to be subject to much variation. Major variations in land use were assumed to be possible during the time period 1981-2000.], and
4. Opportunities for redevelopment.

These factors were used to develop a number of land use alternatives. The basic land use implied by the Toronto centered region concept was the starting point. It assumes a central area employment of about 400,000 jobs out of a total regional employment of about 2.2 million jobs. The remaining land use alternatives were developed as land use responses to transportation issues. They involve

1. Reducing travel in a corridor to eliminate capacity deficiencies,
2. Restructuring travel in a corridor to make better use of facilities, and
3. Encouraging greater transit use.

Basically, differences among the land use alternatives can be characterized by additions and subtractions to population or employment or both in different areas so as to achieve these objectives. For example, one land use responds to a problem of excess outbound demand across an eastern boundary by reducing employment to the east and increasing employment to the west of this boundary. This results in the area in question becoming more self-sufficient with respect to residence-employment compatibility. Other land use alternatives were developed to support the efficient use of public transit, for example, by concentrating new employment at the extremities of rapid transit facilities to encourage better balance in directional flows.

The various land use and transportation alternatives were generated in this manner based on some fairly crude initial assumptions about future land use and transportation. If we were to change the basic transportation network for the initial demand simulation

used to establish the major corridors of travel, perhaps other corridors would have become more important. But, here, there are basically 2 approaches that can be followed: Either we can attempt to establish the future land use and transportation network from "first principles," or we can make some initial assumptions as a starting point and come back later to check the validity of those assumptions. In the MTTPR we chose the latter course of action, largely because considerable development and a large transportation network already exist. The alternatives thus generated constituted what we considered to be the reasonable range of transportation and land use alternatives for the future growth of metropolitan Toronto. In total, 14 land use alternatives and 7 transportation alternatives were developed for subsequent testing and evaluation. To this point, no attempt was made to evaluate either the relative desirability or the feasibility of these alternatives. An attempt was made to ensure that the list covered the range of reasonable alternatives as viewed from a number of different perspectives.

TESTING AND EVALUATION

The 7 transportation systems and 14 land use alternatives potentially allow for 98 combinations of land use and transportation. Obviously, to test all of these would not be practical, and in many cases certain combinations would be inconsistent with one another. Ultimately 23 combinations were selected for testing as shown in Figure 5. All of the transportation systems were tested with land use B, which is a modified land use alternative based on the TRC concept (i.e., a policy alternative). Land use M, characterized by high central area growth, was tested with 4 transportation systems because high central area growth is a major planning issue in Toronto. The performance of several transportation systems should therefore be evaluated under these conditions. In all other cases, only the most apparently compatible transportation system was tested with each land use. The testing procedure essentially involved 4 steps.

1. A number of criteria were selected to characterize the performance of each combination of land use and transportation. These criteria included travel demand, costs, socioeconomic effects, environmental impact, development effects, and phasing. A description of these criteria is too detailed for inclusion in this paper, but can be found in the final report (5).

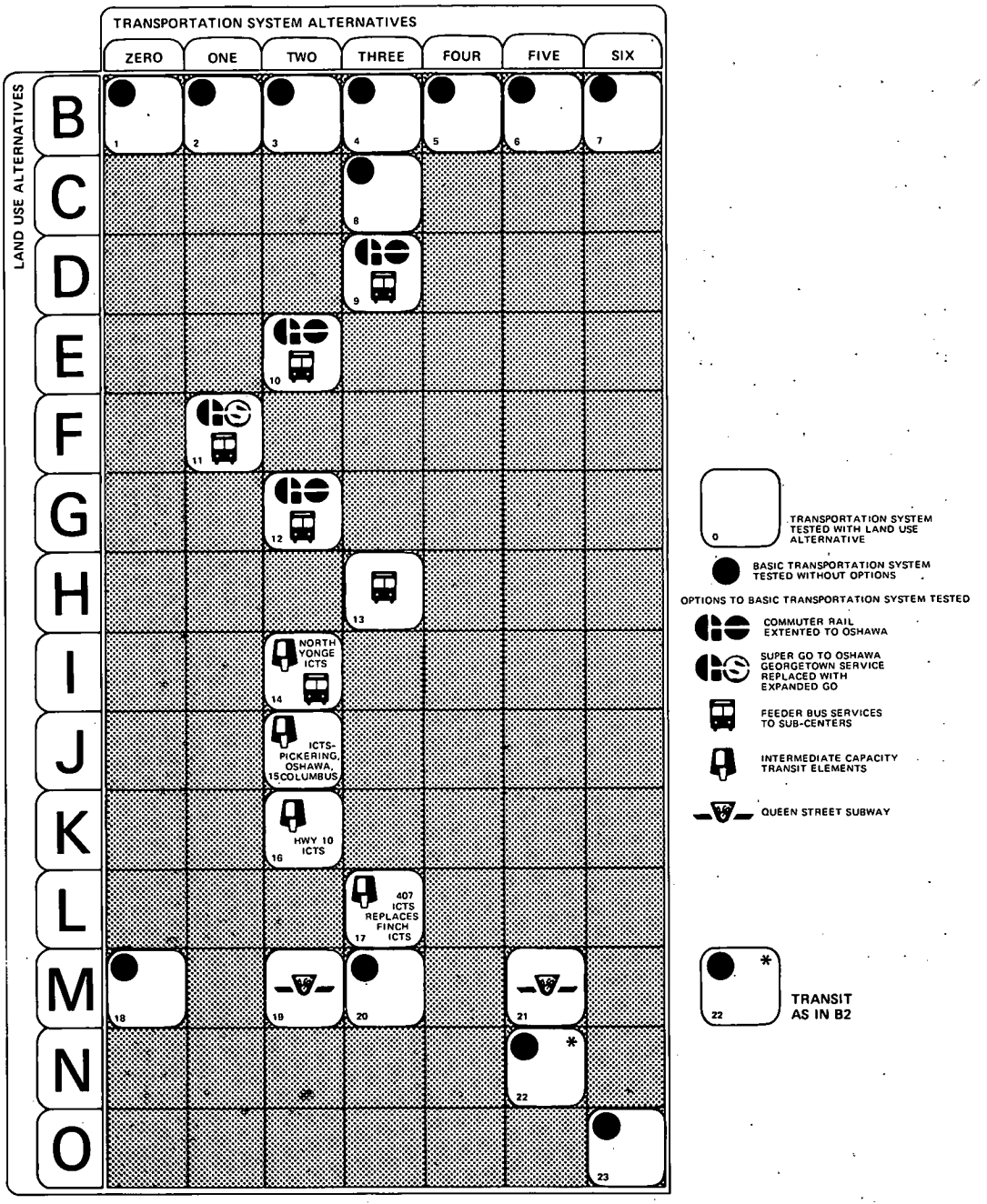
Briefly, however, it might be worth commenting on the less traditional testing criteria. The analysis of social effects gave some indication of the differences among alternatives with respect to life-styles, the extent to which the systems differ with respect to the accessibility provided to employment and recreational activities for different segments of the population, and the incidence of benefits in terms of how various segments of the population are served. Developmental criteria refer to the feasibility of land use concepts when they are considered from a local perspective and take account of local estimates of population and employment, official plan objectives, development concepts under consideration by local municipalities, and opportunities perceived through visual observation and judgment. Phasing criteria concern the extent to which a long-range alternative through its staging process also deals with short-term deficiencies, because it is the short-term demand and capacity relation that has the greatest influence on decision making.

2. The land use and transportation combinations were classified in terms of long-range development objectives. Basically, there were 2 categories of land use patterns: centralized and decentralized. The second category includes a number of subcategories for achieving decentralization.

3. The results of applying the test criteria were summarized for each combination of land use and transportation.

4. From this summary, the preferred combination of transportation and land use could be selected for each category of development objective as given in Table 1. The term "preferred" simply indicates which combination ranks highest within that category and is not meant to imply that the combination ranks highest overall.

Figure 5. Land use and transportation combinations selected for testing.



CONCLUSIONS

At the outset, I suggested that some relation might exist between the value of case study material and the extent to which site specific examples are included. Thus, although the Transportation Plan Review produced a large number of conclusions that relate to specific transportation corridors and land use issues in metropolitan Toronto, some conclusive material may have general relevance to transportation planning in any urban area.

First, it is noteworthy that the MTTPR did not recommend a single transportation plan. A number of alternative plans were described, and in each case an indication was given as to how each plan would contribute to different development objectives. In other words, the nature of the conclusions was somewhat of the "if-then" variety. If, for example, a highly centralized land use concept is desired, then the conclusions indicated what transportation decisions would be most appropriate for achieving that land use objective (basically, transportation facilities that serve the central area). Table 1 gives the various land use decisions and transportation decisions that are consistent with a variety of development objectives.

Second, an attempt was made to point out the degree of commonalty associated with specific transportation decisions. Decisions at the political level are rarely taken about entire systems; they are taken incrementally about individual projects. Each system, however, comprises a number of individual elements. The summary given in Table 2 indicates the extent to which a particular facility is common to a number of different transportation system alternatives. Sufficient information was also provided for each of the individual transportation components to evaluate their effectiveness and desirability in terms of many of the usual measures related to demand satisfaction, economics, and various other criteria listed in the previous section.

Third, based on the commonalty aspects of specific transportation projects and the way in which they contribute as part of an overall system to long-range development objectives, individual transportation decisions were categorized into those that were neutral and those that had a high degree of impact on development. Neutral transportation facilities may well have a high impact on land use, but they are generally defined to be facilities that do not limit the choice of alternative development options in the future. Taking decisions with respect to these types of transportation facilities does not preclude changing direction with respect to land use development should growth objectives change in the future (or even if they are not well defined now, which is usually the case).

By contrast, high impact decisions not only affect land use seriously but also do so in ways that eliminate certain opportunities to change direction in the future. For example, a decision to electrify a low-volume commuter rail facility and thereby increase its capacity significantly may result in substantial growth and development in a particular corridor. Such development might preclude concentration of activity at other locations or in other corridors that may be consistent with a different set of development objectives.

In other words, the analysis suggested that there is one set of transportation facilities about which decisions may now be safely taken. Some of them may be costly and have a high degree of impact on the community, but essentially they do not close off any significant options for the overall growth of the metropolitan area. There is another set of transportation projects that may be appealing in the short term because they deal with existing problems (which is the reason why there is pressure to consider them in the first place), but no decisions should be taken about these projects until it has been established that the development pattern that they will encourage is the one that is desired.

Finally, we attempted to indicate how certain short-term improvements could be made to the existing transportation system in ways that would ensure that subsequent investment in major projects would produce the highest payoff possible in terms of effectiveness. For example, many of the major transportation facilities involve construction of new rapid transit services. To ensure that these services are well used as they become available may require the use now of short-term improvements as a means of shaping and building the market during the time required for implementation. Thus,

Table 1. Preferred land use and transportation combinations and related decisions.

Development Objective	Preferred Combination	Description	Land Use Strategies	Supporting Transportation Elements
Centralization	M3	Highest level of central area growth	Oppose development controls in central area Support full-scale development of metro center Centralize government functions	Modest expansion of GO Transit to Streetsville and Richmond Hill; increased capacity of Lakeshore GO Eglinton Transit Allendale and Don Mills high-capacity transit Scarborough town center and Malvern ICTS Road improvements in northwest Major metropolitan center transportation terminal Don Valley Parkway extension
Binodal	06	Downsview Airport major center	Support development controls in central area Prepare proposals for development of Downsview Airport site Locate Metro offices in Downsview	Modest expansion of GO Transit to Streetsville and Richmond Hill; modest increase in capacity of Lakeshore GO Sheppard and Wilson transit Scarborough town center and Malvern ICTS Road improvements in northwest Highway 407 Spadina Expressway extension to Highway 407
Subcenter	D3	Subregional centers at North York, Mississauga, and Oshawa Several local centers	Support development controls in central area Support high-density development at sites with good transit access Decentralized government functions	Modest expansion of GO Transit to Streetsville and Richmond Hill; modest increase in capacity of Lakeshore GO Eglinton Transit Scarborough town center and Malvern ICTS Road improvements in northwest Highway 403
Corridor development	G2	Eglinton development corridor	Support development controls in central area	Same as D3 except for Highway 403
	F1	Lakeshore development corridor	Support development controls in central area	Same as D3 plus Major capacity increase of Lakeshore GO (possible electrification) Major metropolitan center transportation terminal
Metro dispersion	C3	Toronto centered region concept with minor adjustments	Support development controls in central area Support intensive use of commercial and industrial areas of Scarborough Oppose high-density redevelopment	Same as D3 plus Support more regional freeways
Regional dispersion	L3	Decentralization with development in Highway 407 corridor	Support development controls in central area Discourage extensive residential redevelopment in Metro	Same as D3 plus Support early construction of Highway 407 Don Valley Parkway extension Spadina Expressway extension to Highway 407

Table 2. Alternative transportation systems.

	Transportation System						
Major Facilities	0	1	2	3	4	5	6
Freeways							
Highway 427 extension		X	X	X	X	X	X
Highway 404	X	X	X	X	X	X	X
East Metro Freeway		X	X	X	X	X	X
Highway 401 widening	X	X	X	X	X	X	X
Highway 407		X	X	X	X	X	X
Highways 403 and 410	X	X	X	X	X	X	X
Richview Expressway					X	X	
Highway 400 extension					X	X	
Spadina Expressway						X	
Crosstown Expressway						X	
Scarborough Expressway						X	
ICTS							
Eglinton ICTS to Mississauga center		X	X	X	X	X	
Eglinton ICTS Malton Branch		X	X				
Malvern ICTS to North Pickering		X		X	X	X	X
Malvern ICTS to Malvern only	X		X				
ICTS from Mississauga center to Bloor subway terminal				X			
Eglinton ICTS branch extended to Brampton				X			
Finch ICTS from Highway 427 to Malvern				X			
Inner ICTS loop—Don Valley, Eglinton, and Allendale				X			
ICTS from Pickering GO station to airport				X			
Sheppard ICTS—Mississauga to Scarborough town center							X
Commuter rail							
Lakeshore maximum super GO		X					
Brampton minimum super GO		X					
Richmond Hill standard GO	X	X	X	X	X	X	X
Lakeshore expanded GO	X		X	X	X	X	X
Streetsville to Pickering expanded GO			X				
Streetsville-Union GO							X
Georgetown standard GO				X			
Georgetown expanded GO	X		X		X	X	X
Special services							
Express bus from Bloor subway terminal to Mississauga center		X			X		
Pickering-Oshawa express bus	X	X	X	X	X	X	X
Pickering-North Pickering express bus		X	X	X	X	X	X
Richmond Hill express bus		X	X	X	X	X	X

although some of the short-term improvements, such as the use of express buses, may not appear to be particularly cost effective in terms of revenues generated, they act almost as "loss leaders" in developing the market for future services that would be more cost effective.

In closing, I should note that this process of defining alternatives and their implications without necessarily making specific recommendations resulted in some quick action on the part of elected officials (too quick in the minds of some). The final report of the Metropolitan Toronto Transportation Plan Review was presented on January 24, 1975. By July, decisions had been taken to proceed with implementation of 4 major transportation projects (Scarborough LRT, Streetsville commuter rail line, metro center transportation terminal, and road improvements in the northwest) and 2 short-term improvements (transit for the physically handicapped and express bus services).

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Public Participation in the Metropolitan Toronto Transportation Plan Review

Whipple Steinkrauss, Metropolitan Toronto Transportation Plan Review

A public participation program cannot be reduced to a flow chart, nor will a program that has been effective in one area necessarily be effective in another area. Principles that guided the Metropolitan Toronto Transportation Plan Review included the following: develop planning alternatives that incorporate a number of different viewpoints and that offer something to everybody; do not agree to a level of participation that cannot be adequately serviced; follow a policy of open information; work within the traditional decision-making process; maintain day-to-day contacts with media; meet people on their own terms; broaden the base of involvement; rely on the use of community resources; and hire participation staff with strong community skills and limited knowledge of planning.

There is no common understanding of what the term public participation means. Therefore, those who initiate or carry out any kind of participation program should define the term for their own purposes and make that definition publicly known: what level of participation is being sought, how can the public participate, what is the program intended to achieve, and what is it not intended to achieve. Second, consideration should be given to the size and nature of the group to be involved and the context within which the work is to be done. For example, as the coordinator of public liaison for a royal commission, my role is clearly one of liaison in setting up formal hearings. On the other hand, at the neighborhood level, I might play the role of an advocate planner.

I make these points at the outset because I do not want to convey that what worked best in Toronto will necessarily work at all in some other city of comparable size and in all probability will not work without major modifications for programs on a different scale or programs designed to achieve different ends.

Metropolitan Toronto has a population of slightly more than 2 million people within an area of 240 miles^2 (624 km^2). We have a 2-tiered federated system of local government that incorporates 6 area municipalities: an inner ring of 3, which is considered the central city, and an outer ring of 3, which is considered the suburbs. Since 1951, the population of the outer ring has grown from 200,000 to more than 1.1 million. The impact of this rate of growth has been enormous. Many citizens, particularly in the central city, fear that we are losing our livability and that we should stop and reassess our priorities. As a result, the addition of any new centrally oriented transportation facilities is not generally favored. Opponents of the automobile-oriented city are numerous and are not prepared to accept any further urban expressway proposals. Toronto has approximately 800 citizen and community groups, a significant percentage of whom are fairly well informed and moderately active. Most are concerned with the preservation of residential neighborhoods. Few are militant, perhaps because there has been little evidence of corruption in local government, which is relatively open. In addition, area municipalities have developed a number of programs to involve residents in neighborhood issues.

Toronto is a wealthy city. It is the commercial center of Canada and one of its

leading cultural centers. As a result, its population is more politically sophisticated than that of some cities. It is perhaps important too that housing is scarce and housing costs have risen to the highest on the continent, thereby limiting the mobility of residents.

The major task of the Metropolitan Toronto Transportation Planning Review (MTTPR) was to develop some long-range transportation and land use alternatives for metropolitan Toronto. Therefore, public participation in the review meant involvement in the development of choices and not in the making of final decisions.

For the purposes of the MTTPR, public participation was defined as a process of mutual education among the public, planners, and elected representatives. Those who got involved in the program were urged to maintain close liaison with their local elected representatives not only while the review was in progress but also subsequent to it when some of the final choices would be made. There was no formal transfer of power from elected representatives to nonelected citizen bodies, citizen groups were not funded to hire their own staff, and there was no moratorium on transportation decisions while the review was in progress. The program supplemented rather than competed with the traditional decision-making process.

The review was not established to deal with specific issues. However, after the release of a preliminary report stating that the need for a proposed expressway facility had never been documented, we were directed to review the proposal and make a specific recommendation to Metro Council as to whether the expressway should be built. Since there was some indication by the council that the recommendation would carry considerable weight, a much more intensive public participation program was carried out on this issue.

In my view one of the most common fallacies with regard to public participation is the assumption that one can develop a flow chart of a participation program before that program is initiated. Even worse is the assumption that participation blueprints can be developed for use in a variety of locations and for a variety of purposes. Naturally one must work within an overall time frame and an overall budget, but the first rule in public participation is to have sufficient changes within the course of a program should the need arise. We can never program people nor can we plan for unforeseen crises.

The goal of the participation program of the MTTPR was to involve as many people as possible in long-range transportation planning. The program was never planned ahead for more than about 3 months, and major changes were made along the way. Although there was no fixed plan for the program, it was guided by a number of principles.

1. Develop planning alternatives that incorporate a number of different viewpoints and that offer something to everybody. It was hoped that, by the development of such alternatives, some of the trade-offs would be made at the planning stages and negative confrontation would be less likely at the time of decision making.
2. Do not agree to a level of participation that cannot be adequately serviced.
3. Follow a policy of open information. Review reports and research were available for public scrutiny at all stages of preparation (except for the final one that was prepared under considerable pressures of time). Rough drafts were not distributed. (People did come in to see them, and in the 2½ years, only one such report was handed to the press.) As soon as a report was completed, 1,000 copies were printed, about 700 of which immediately went into the community; every public library in metropolitan Toronto received a copy. Although the participation program was originally viewed with considerable distrust, we developed through our information dissemination a great deal of credibility in the community. An aggressive information policy also reduces the ability of individuals to manipulate people at the neighborhood level. Neighborhood issues do emerge, but local government is better able to negotiate reasonable compromises among groups with opposing views.
4. Work within the traditional decision-making process.
5. Maintain day-to-day contacts with the media. Before materials were released, the media were given copies so that they could review the materials and ask questions before preparing their reports. For the most part, the coverage received was better than average in terms of both accuracy and fairness. We did little advertising, largely

because of the cost, and in my opinion, we lost nothing by not doing so.

6. Meet people on their own terms. Staff went out to area neighborhoods and worked with people on local as well as metropolitan concerns. In this connection, we encouraged and supported the establishment of local or neighborhood participation programs in the belief that such programs provide people with a base of knowledge and experience invaluable to understanding and appreciating broader concerns.

7. Broaden the base of involvement. The MTTPR attempted to offer opportunities for participation on a variety of levels. Some groups were just kept informed, others prepared briefs that we printed and distributed, and others worked on a day-to-day basis with members of the staff.

8. Rely heavily on the use of community resources. Neighborhood facilities, such as public libraries, schools, and plazas, were used for public meetings. Community groups helped to organize and advertise these meetings. The staff of community agencies, schools, and other government departments assisted the MTTPR in identifying issues to be dealt with at the neighborhood level. Such a policy keeps costs down, avoids the compartmentalization of different planning initiatives, minimizes the chance of failing to take neighborhood concerns into account, and ensures a certain degree of acceptance of one's activities.

9. Hire participation staff with strong community skills and a limited knowledge of planning. The role of the participation staff is to bring all of the actors together, to provide the support services for this to happen on an ongoing basis, and to carry out a substantial information program. For large-scale programs, highly skilled community workers are needed. However, the program they develop makes heavy demands on senior planning staff. The senior planner many times worked 4 evenings a week. Junior planners were not sent out to deal with the public. By the end of the 2-year period, participation staff were quite comfortable in most planning discussions. They had a wealth of information about the structure of local government, the kinds of planning issues that were of greatest concern, and the kinds of solutions that were being proposed. They brought to the work team a social and human element that is badly needed in urban planning.

The public participation program of the MTTPR centered around public meetings. Meetings were held in neighborhoods all across the metropolitan area at which we discussed the role of the review, outlined the major existing transportation and land use proposals directly affecting the area in question, asked area residents to identify their transportation concerns and to suggest solutions, and invited them to get involved in transportation planning. Presentations at the meetings were brief since information booklets on each area were prepared in advance and contained many of the details. These booklets listed the people to contact for everything from getting a bus stop changed to getting detailed information on a regional transportation proposal.

In addition, numerous meetings were held to discuss specific issues or to hear the views of a special interest group. These meetings were advertised in neighborhood newspapers, and colorful flyers noting some of the issues to be discussed were distributed to community groups, area residents on the mailing list, libraries, and community agencies. In addition, flyers were often distributed to school children to take home to their parents. There were also many public service announcements in the media. With the exception of the meetings on the proposed Scarborough Expressway, advertising costs seldom exceeded a few hundred dollars.

In addition to having a senior planner at these meetings, we invited resource people from other transportation agencies and area elected representatives to participate. All of those who attended a meeting received a transcript of it. Therefore, any commitment made by a planner or elected representative was documented in writing. This practice, although cumbersome, helps to allay any fears that the meetings are being used as a public relations gimmick.

During the course of the review, more than 10,000 people attended these meetings. They were successful, I believe, because

1. They were held in people's neighborhoods,

2. Local residents were involved in organizing and advertising them,
3. They dealt with local as well as metropolitan concerns but avoided stepping on toes by involving local officials directly, and
4. The MTTPR was the first transportation body in the metropolitan area to go to the people despite the virtual stalemate that had developed in transportation planning particularly with respect to roads.

The second major activity of the program was the production of simply written tabloids, which were distributed widely in the community. Some were progress reports, some outlined alternatives and invited public comment, and some provided a detailed description of particular aspects of transportation.

Many programs find tabloids to be of limited use, perhaps because they are often written by technically trained people and are difficult for the average person to read and understand. We found them immensely popular. They were used in classrooms and as discussion papers by community groups. They are also inexpensive. In 1972, we produced 20,000 copies of tabloids in black and white for approximately $500 and staff time. Our most expensive tabloid at about $2200 was 20 pages in length and had printing in several colors. Maps of plans or alternatives can be pulled out of a tabloid and hung on the wall for purposes of comparison. Tabloids can be mailed for a few pennies each.

The MTTPR had many other means of reaching people. Both participation and planning staff addressed and worked with numerous community groups, staffed and unstaffed displays were set up throughout the area, courses in urban transportation were offered by 2 community colleges and were taught by teachers provided by the review, TV programs were produced by review staff, and staff took part in many community affairs programs. MTTPR produced a host of information booklets on local government structure.

Although the participation program was largely an education program, it was successful in influencing a number of transportation decisions. An additional station was added to a proposed commuter rail line, a proposed expressway was canceled and a transit scheme will be implemented in its stead, an arterial road is to be built along part of the right-of-way of the previously canceled Spadina Expressway but will not continue into the city core, and additional capacity is being planned for the commuter rail lines. Perhaps the most important achievement of the review, however, is that it produced a final report in which land use and transportation planning are tied together and a report that recognizes the affect of transportation services and facilities on the day-to-day lives of people. The alternatives produced by the review will form a major part of the Official Plan Review of Metropolitan Toronto and will be reviewed by a number of study groups.

I will return now to the review of the need for the proposed Scarborough Expressway, list participation techniques used, and expand on several of them. This program was designed to solicit opinion on both a metropolitan wide and a corridor basis with the greater emphasis being given to the area that would be impacted by the proposed facility. Features of the program were

1. Community advisory committee,
2. One-hour TV program,
3. A tabloid,
4. Public meetings,
5. Formal questionnaires at public meetings,
6. Reproduction of letters and briefs submitted and distribution in the community,
7. Socioeconomic survey of those persons who would be displaced along the western portion of the expressway route (the eastern portion of the route had not been decided), and
8. A report on public input to Metro Council.

The 1-hour TV program was scripted and produced by MTTPR staff. It described the expressway proposal in detail, showed models of certain sections, and discussed

the pros and cons of building it; described some transit alternatives to the expressway and their pros and cons; and discussed the impacts on the community of building these different facilities. The majority of the commentary was given by individual citizens who stood on all sides of the issue. The total cost of producing the program was less than $7,000 and the purchase of Sunday afternoon air time was approximately $3,000. The response to the program was far beyond our expectations; it was carried by the 1 commercial station and by the 5 cable companies as part of their community programming.

For reaching 2.5 million people in a community, television has enormous possibilities and need not be expensive. Our program was far from technically perfect. In fact, its imperfections won it praise for it was not viewed as a slick, expensive piece of public relations.

Members of the community advisory committee primarily advised on the public participation aspects of the expressway review, although they did make a limited number of more technical suggestions. To get meaningful technical advice from the public would require full-time planners working on a day-to-day basis with citizens prepared to give up many hours of their spare time. From my experience, voluntary technical committees can sometimes be effective on short-term projects; however, the net effectiveness on long-term projects is limited.

The questionnaires handed out at the public meetings were an attempt to get at people's values and to determine whether they thought this expressway should be built. The review did not want to solicit uninformed opinion. For this reason, we did not mail out the questionnaire to a random sample in the community. The responses we received were from people who had seen the TV program, read the tabloid, or attended public meetings on the issue.

The survey of those who would be displaced, should the expressway be built, was rather intensive and was done by an outside firm. The MTTPR wanted to know as much as possible about this group so that it could determine the real costs of relocating them. The area was a low-income area, but most homes were owner occupied. (Many of the people were elderly.) Virtually no low-priced housing is left in Toronto, and a more than adequate price for a home in that area would not have allowed the owner to purchase a comparable home elsewhere. The area in question was and is extremely well served by transit and is close to most other services. The MTTPR suggested that, should relocation become necessary, a body be established to plan and implement the relocation and that this body have sufficient resources to cover all of the costs to those displaced. Since the review recommended that the expressway not be built, no action was taken on this recommendation.

The real questions were whether adequate compensation would have included the costs of better accommodation if similar accommodation could not be found, whether such a body would compensate those who would require new mortages at much higher interest rates, and whether it would lend money at low-interest rates to middle-aged or elderly low-income home owners who would in all probability not be able to borrow in the private market. There is also the larger question of what happens to a city when those with lower incomes are pushed into smaller and smaller spaces. I suspect that few would argue that policies that create this kind of situation may prove to be costly. Too often the construction of transportation facilities has been used as a kind of urban renewal. We need low-cost housing.

In conclusion, I have a few thoughts and suggestions that might be helpful to those planning or involved in a public participation program.

1. If you are trying to reach a large population, try to get a level of participation that is not prohibitively expensive and one that can be adequately serviced.
2. If the work group is working on a regional scale and reporting to an intergovernmental committee, do not set up a community steering committee with supervisory powers. On the other hand, such bodies can be extremely valuable at a neighborhood level or in dealing with a specific issue.
3. Remember that open information must precede any meaningful participation.
4. Keep the program flexible enough to accommodate changes along the way. You

may find yourself providing needed public services that are somewhat beyond your terms of reference because no one else is providing them. This particularly applies to the production of information.

5. Try to meet people on their own terms and allow for as many different kinds of participation as possible.

6. Involve the community in the design of your program and use existing community resources wherever possible. Be particularly careful to recognize those who are perceived to be or who are in fact community leaders.

7. Tell the public what you are prepared to do and also tell them what you are not prepared to do.

8. Ensure that the public understand the decision-making process and the role of your agency in it.

9. Unless you are prepared to take on the whole system of government, involve all relevant elected representatives from the outset. Although they may derive some political gain from the program, you can be reasonably assured of their support, particularly if activities involving them are visible and become part of the public record.

10. Remember that the person who holds the purse strings exercises a good deal of control. If the federal government will pay for a large portion of the facilities or services you propose, then members of Congress and their staffs should be kept informed and involved. Given the U.S. system of government, this is probably even more important than it is in Canada since the United States tends to have a stronger central government.

11. Expect at least a 50 percent increase in planning time, and ensure that senior planners are prepared for periods of unreasonably heavy work loads. Most staff will, therefore, need a good deal of freedom with regard to hours, and some attention should be paid to their morale.

12. Once you have set your short-term schedule and made it public, stick to it. Otherwise, you will be asked for postponement; delaying is a common opposition tactic. Meet your own deadlines and insist that the public do the same.

13. Beware of those who have found the perfect program. Public participation is a consultant's paradise. This is one area where a knowledge of the community is better than many kinds of training or expertise. The latter can be bought when required. Consultants can be useful in pointing out pitfalls to avoid and techniques used elsewhere, but try to find local people to design and manage your program.

International Efforts and Neighborhood Traffic Management

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Most residential traffic restraint schemes abroad are planned as part of urban rehabilitation in which landscaping is integrated with traffic management, but a number are limited to traffic controls. The schemes presented in this paper depict the size and nature of the areas planned and a variety of means used to control traffic. In Nagoya, Japan, which has one of the most inventive and comprehensive policies, a net reduction of 43 percent in fatalities and a 39.4 percent decrease in severe injury accidents were experienced within the cell area. At the same time, an average decline in noise levels of 3 dBA was recorded in some of the cells. Of the problems that have arisen from these schemes, one of the most common is residential and spillover parking. Another, noted in Uppsala, Sweden, was a map change that required some period of adjustment for motorists.

In 1975 the Organisation for Economic Co-operation and Development sponsored the conference on Better Towns with Less Traffic at which numerous examples of "pedestrianization" in countries outside the United States were given. Some of these are discussed below. OECD surveyed 300 cities, of which 59 percent had installed pedestrian schemes of one kind or another (1). Most were located in commercial centers, the most visible and dramatic use that affects more people and receives the most attention. In some of the central-area schemes residents benefit; in others, they do not because traffic is diverted into ring roads through residential areas.

DELFT, HOLLAND

The city of Delft has one of the most original programs: Residential streets are converted into pedestrian-dominated "residential yards." These yards have been created in 2 small residential areas of 550 and 1,100 dwellings respectively and a number of scattered streets with traffic levels of fewer than 100 vehicles per hour. Emphasizing pedestrian priorities, the program has stayed with integrated solutions in which vehicles and pedestrians are mixed. Sidewalk curbs are eliminated, and the whole street is paved for pedestrians. Streets are broken up with planters, walls, benches, barriers, and mounds and are designed so that the drivers must attend "incessantly to the fact that the car is only one of the users and a guest to other functions having priority" (2). The profile where a car can drive is no more than 3 m for 2-way traffic and a widening for passing every 50 or 60 m. Route changes are overaccentuated.

One-way streets are not advocated because drivers are tempted to drive at high speeds on them. At crosswalks where children play, additional narrowings, bumps, and thresholds are used. Parking spaces are designed and limited for the use of vehicles measuring up to 7 by 2 m. Right-angle parking spaces are preferred since they demand more attention from the driver and can be used better by children when they are empty. Traffic control devices are multifunctional in nature, telling drivers that con-

trol of automobiles is not their only purpose: "A tree is an obstacle but it is also part of the greenery; a small hill can force cars to the side, but it is also an object for children's play" (2). Planting in the yards is scattered, and illumination is geared to the residential character of the street. No tall electric standards are allowed (Figure 1).

Some difficulties have been caused by the reduction of residential parking places by 10 to 15 percent within the residential yards. One proposed solution is to charge residents for parking near their houses and use the funds to finance municipal parking facilities farther away. Another is to reverse the present situation so that parking is permitted only in designated areas as opposed to allowing parking where it is not expressly forbidden. Legislation giving pedestrians priority over vehicles in the residential yards is also thought to be desirable.

NAGOYA, JAPAN

Nagoya, a city with a daytime population of 2.3 million, has been particularly inventive and comprehensive with its residential traffic restraint policy. Unlike other major Japanese cities, Nagoya lacks a central freeway system. After World War II, the city took the dramatic step of widening all its main streets in the central area. With streets in a grid pattern, it looks more like an American city than other Japanese cities. Because of this and poor public transport, Nagoya has many more car commuters (33.6 percent of all commuters) than Tokyo or Osaka (17.3 percent and 7.7 percent respectively).

However, outside the central area the majority of the main streets narrow to 2 or 4 lanes and street expansion has been barred by local opposition. Twenty-eight percent of the city's streets are less than 5.5 m wide and 34 percent are from 3.5 to 5.5 m wide. There are few sidewalks on these narrower streets since they were originally constructed for pedestrians. The intricate network also results in frequent intersections; mean intersection distance is only 60 m.

In 1970, the city had an accident rate double that of Tokyo, carbon monoxide density at heavily trafficked intersections often exceeded the designated maximum (average 10 ppm in 16 hours), and a traffic engineering study predicted that air quality would be exacerbated to 1.8 times the 1973 level within 10 years.

Although one transportation group is now pressing for the construction of a cross-town freeway system, the ad hoc Traffic Management Committee reporting to the Prefectural Policy Headquarters is using computer control techniques to improve efficiency on existing routes and to protect residential areas. A 4-year program has been proposed, comprising the following steps:

1. Redesign the existing loopway mainly for the use of through traffic (and long automobile trips in the city), thereby diverting the through traffic from the central area;
2. Apply the traffic cell method (called "unit cell control" in Nagoya) to target areas plagued by accidents, noise, or other traffic problems, and, at the same time, put stringent access controls on arterial networks to prevent through traffic invasion into neighboring residential areas;
3. Expand pedestrian streets and bikeways such that users are led to their destinations with minimum disadvantages;
4. Establish a computerized areawide signal control system to secure optimum traffic flow with the least undesirable impacts on urban environment;
5. Exclude roadside parking from the central district of the city to restrain the use of private automobiles and to restrict the use of streets as a garage substitute; and
6. Introduce bus lanes and bus priority signals to compensate for the parking ban and to induce more bus passengers.

The unit cell control system to keep traffic intrusion from residential areas grew from a system aimed at protecting students walking to school by speed limits and stop signs (2):

> A typical cell consists of a one-way system spanning the nucleus of pedestrian streets, aided by speed limits, parking bans, turning restrictions, commercial vehicle exclusion, etc. The one-way system in the cell is usually arranged in an L or a U shape.... The pedestrian streets also serve to exclude these vehicles having no entry permits that are issued to car owners in the related district.

Figure 2 shows smaller cells with some exclusively pedestrian streets, 1-way streets, right-turn restrictions, and limited entries. All streets under 3.5 m wide are restricted by traffic signs to pedestrian use. On wider streets the exclusion of traffic is limited to certain hours. An effort is also being made to develop bikeways leading to railway stations and bus terminals.

As of September 1974, 92 cells had been introduced at an average implementation cost per unit cell (1.1 km^2 average) of $30,000 including signs, road markings, signals, curb improvements, and publicity expenses.

A net reduction of 43 percent in fatalities and 39.4 percent in severe injury accidents was experienced; outside the cells fatalities decreased by 16.8 percent. Accidents on the major streets were counted as in-cell accidents, so we do not know whether there were increases in accident rates on those streets. An average decline in noise of 3 dBA from the previous 59 dBA was recorded in 12 spots of 6 cells.

Apparently problems still exist with traffic during hours of limited law enforcement, and there is a movement to "convert the cells into fully repaved, decorated streets, in some cases with the installment of physical barriers such as concrete blocks and small trees. It is expected that the unit cell control will pave the way for a complete redesigning of the community living environment" (3).

To reduce automobile congestion on major routes, a computer control system to redistribute traffic has been installed. This operates through traffic signals, radio announcements, and variable signs warning of congestion. Priority bus lanes and staggered work hours are also being proposed.

TOKYO, JAPAN

Residential areas in inner Tokyo, as in Nagoya, are characterized by high densities, high floor area ratios, and 2-story buildings. They have narrow, winding streets that were originally built for pedestrians but are now used by automobiles. The plan reserves many streets for pedestrians and develops a main pedestrian network focusing on the school. Since earthquakes and fire are major hazards (most buildings are constructed of wood), one aim of the plan is to construct fireproof buildings along the major pedestrian system as an escape route inasmuch as stalled automobiles would be a hazard blocking exit along automobile streets.

UPPSALA, SWEDEN

Uppsala, a town of 105,000 inhabitants and high automobile ownership, implemented a master plan in 1969 that proposed pedestrian and bus-only streets in the center. "An unbroken mall of about 550 meters... with some adjacent small squares... and a few short pedestrian side streets connecting with the periphery of the central zone" were created (4).

A careful evaluation of the project was made by using a variety of measures. General public satisfaction with the scheme, and an overall decline in accident rates were shown. A public opinion poll showed that 64 percent of the residents outside the central area and 56 percent within the area favored the scheme. Lower satisfaction within the central area was attributed to the concentration of traffic on the main streets resulting in greater pollution along those routes.

One consideration noted by the planning director of Uppsala was the effect on motorists. Since the plan changed the map of the city with which they were familiar, many motorists were confused and unhappy and some loss of business resulted until the adjustment was made (about 3 months).

MUNICH, GERMANY

Restriction of traffic in the central area of several German cities has been instituted. In cities such as Stuttgart or Bremen, large parts of the central areas are now free for pedestrians. Munich, which has been in the forefront of these efforts, placed a loop road around the pedestrianized central city and built a rapid transit system (5). In 1 or 2 residential areas, traffic has been restricted.

A temporary closure scheme for the core was implemented to handle traffic of the 2-week-long Oktoberfest. Difficulties arose because of the German concept of Anliegerverkehr, a right-of-way for residents or businesses. This makes it legally difficult to cut off access. Permits for these areas (more than 3,000) were given to local residents and businesses who incorrectly thought they had been provided parking space. A more permanent closure scheme has been developed whereby streets are blocked off toward the periphery of the inner city.

Four street sectors have also been turned into playground streets by reducing normal traffic through the use of 1-way systems, no parking during after-school hours, and barriers or blockings applicable to nonresidents. To warn motorists of the changed situation, conspicuous signs, flower baskets, and additional plantings have been set up.

Problems have arisen with regard to these schemes, however. By moving toward the cell concept, the city apparently has aroused opposition from residents complaining of route deviations and, together with the police, the loss of shortcuts. Because long-term parking is restricted in the core, automobiles have spilled over into the inner-city residential areas. One proposed solution for this problem is special parking permits for local residents.

These transportation policies have also generated considerable polarization among residents favoring and opposing automobile traffic restraints. Although emphasizing the political value of these discussions, the Munich planners also state, "Every change in the street and traffic system must be final: Provisional measures create negative results."

ROME, ITALY

In the central area of Rome an extensive pedestrianization scheme has evolved in an ad hoc manner although a comprehensive traffic plan had been commissioned by the city. A careful visual and land use analysis of each street was made to assess its sensitivity to vehicular and pedestrian traffic, its pedestrian potential, and its historic and architectural value. Streets were selected to form a network from one side of the Centro to the other to preserve pedestrian zones.

Although city officials never adopted the plan, the city traffic engineer's office has carried out some proposals on an ad hoc basis. Several shopping streets have been turned into crowded pedestrian thoroughfares. Other areas, such as the Piazza Navona, have also been made automobile-free zones although occasional illegal automobiles race through those areas. Other main streets such as the Carso Venezia are restricted to taxis, buses, and automobiles belonging to local residents. The impacts have not been evaluated, and the sudden changes, which were made without a clear plan, have caused some confusion for drivers and citizens. However, tourists find the effects increasingly attractive, though some merchants still complain. Buses and taxis move more rapidly, and it appears that the improvements are associated with considerable "gentrification," a common result of environmental improvement.

BOLTON, UNITED KINGDOM

British cities have experimented with approximately 150 schemes emanating from the Buchanan report relating to traffic restraint (6). In an area in Bolton, Lancashire, containing about 300 houses occupied by working and lower class residents, streets were closed off to traffic and adorned with planters and a sitting area. Alleys at the

rear of the houses were converted to 1-way travel and parking. Eighty-four percent of the residents responded positively to the project, and 60 percent considered living in the area preferable to living in a more modern dwelling or municipal corporation flat. The functioning of the area was more important than appearance to the residents. Pedestrianization was of paramount importance to those under 40, and street lighting was to those over 40.

NOTTINGHAM, UNITED KINGDOM

The city of Nottingham plans to introduce a much more comprehensive traffic restraint program on the major highway system. The focus on the plan is to limit the amount of traffic on major streets by controlling exit from the suburban areas through the use of traffic signals and exit closures. Operable during morning rush hours, the plan aims to reduce congestion on the main roads and remove long automobile queues from the main system. The zones, which have populations of 5,000 to 20,000 people, however, will have unrestricted entry. The rationale for the plan lies in the hypothesis that traffic may be less likely to transit residential areas having controlled exits (Figure 3).

Coupled with the traffic restraint program is an active program to encourage the use of public transport. Semiluxury buses (called lilac leopards!) painted in dramatic colors have been acquired by the city in an attempt to turn bus riding into a status activity. In addition, park-and-ride facilities are being provided at suburban bus terminals.

Control by the "collars" on entry to the inner-city area will clearly improve conditions for inner-city residents (7). As the system goes into operation entry controls for the major networks will be adjusted. If needed, 2 or 3 collars will be placed around the center at distances of approximately 1.5 to 4.5 km out.

The British firm of Colin Buchanan and Partners is engaged in several large traffic studies. Its Sheffield and Rotherham land use and transportation study illustrates the latest thinking (8). The study began by identifying residential localities rather than environmental areas. Not just a new name for the same thing, these localities are functional areas based on the combination of catchment areas for primary schools, a walking radius of 0.5 km from local shops, and groupings of physically homogeneous areas. Many of these areas have major roads passing through them, but have a common name or other kinds of homogeneous character. They vary in size from 170 to 24,000 people. The locales of heavy accidents were plotted including streets with shops where elderly people are often involved, streets where children are involved, and wide roads requiring more time to cross. The plan designates certain routes as major routes equipped with computerized signals, pedestrian railing to prevent crossing at grade, and grade-separated crossings. Relying heavily on a program of compensation for those living along the main roads, the plan may cost as much as $2.3 million for the whole city. At the same time, public transport with park-and-ride terminals is being actively encouraged.

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Figure 1. Residential yard in Delft.

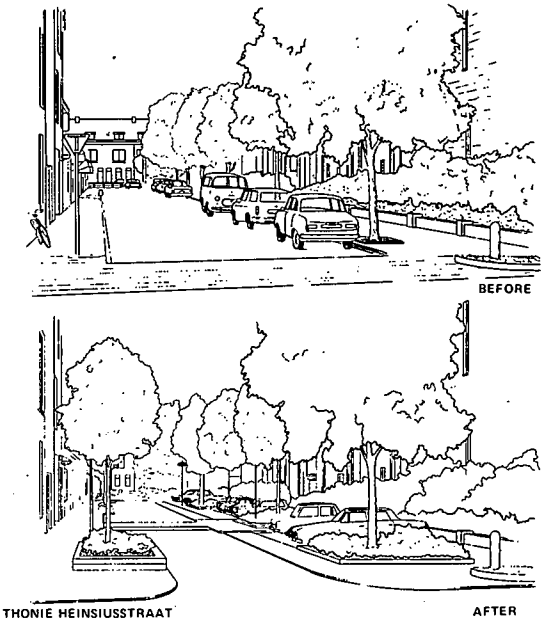


Figure 2. Unit cell in Yagoto area of Nagoya.

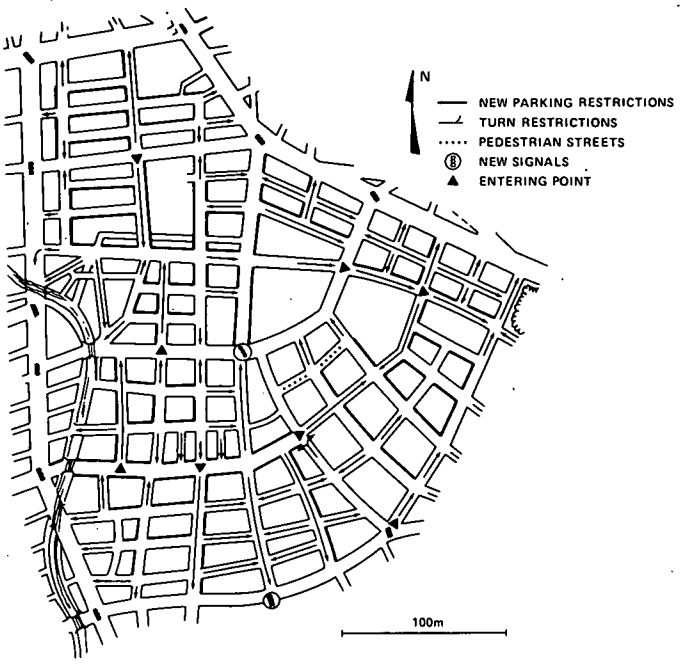
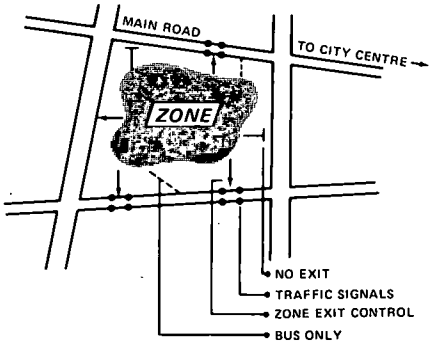


Figure 3. Zone control in Nottingham.



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Effectiveness of Pricing in Restraining City Traffic

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Parking charges are at present the only pricing measure used widely in Canadian cities to restrain city traffic. Most interest in modifying prices is focused on their use to discourage CBD-oriented trips during the peak periods. However, the majority of such trips do not use all-day parking. Evidence on whether other trips are sensitive to parking is limited, but generally supports the hypothesis that, for work trips, the demand for automobile usage as a function of parking charges is inelastic. This agrees with studies made of parking charges in U.S. cities. Gillen's analysis, which gives elasticities of about -0.3 in Toronto, explains these low estimates by the reaction of many drivers faced with a higher charge: relocating rather than switching modes. Nevertheless, different pricing policies for private parking in Ottawa and Toronto appear to have a significant effect on commuters' choice of mode, and parking rates may be a useful instrument when used with other measures.

In recent years, some interest has appeared in Canada in measures to discourage the use of automobiles, especially in urban areas. The interest has been stimulated by concerns over energy consumption, the negative impacts of the private automobile on the urban environment, and the need to improve the overall efficiency of urban transportation systems. Measures using pricing to meet these concerns have several advantages: They retain individual freedom of choice, can often be applied through existing taxing mechanisms, and generate revenues that may be used to cover the social costs of private vehicle usage.

A large number of measures might be used to restrain traffic, as has been excellently summarized by Thomson (1). The principal pricing measures he considers are parking charges, area licenses, tolls, road pricing, and gasoline taxes.

Of these measures, only parking charges have been used systematically in Canadian cities with the effect of restraining traffic, and most proposals to discourage the use of automobiles in urban areas rely heavily on this measure. The city of Toronto, in a recent unsuccessful application to the Ontario government to control all parking within the city, proposed that parking rates be set solely on an hourly basis and that the preference given to commuters through the present lower all-day maximums be removed (2). In Vancouver, proposals are being formulated to freeze the number of parking spaces available and then to let the market ration the available supply through higher rates. The federal government recently introduced charges for parking permits so that parking costs for many federal employees working in central urban areas increased considerably.

In general, these schemes discourage all-day parking to reduce the numbers commuting by automobile into the CBD. Given this objective, parking charges appear one of the most applicable forms of fiscal restraint. It is popularly argued that increases will be borne most heavily by vehicles traveling in the urban core during peak periods and that they are an effective way of diverting commuters to transit. They are attractive to municipal governments because they can be a revenue source that is easy to

implement and administer.

APPROPRIATENESS OF PARKING CHARGES AS A MEASURE OF TRAFFIC RESTRAINT

Nevertheless, there are limitations to the ability of parking charges to meet this and other objectives of traffic-restraint policies. Within downtown areas their impact is reduced by through traffic or vehicles parked illegally. Control and parking facilities in and around the urban core are limited because of the large proportion of commercial and private parking, and the resistance to greater municipal control is substantial on grounds of social inequity, impact on downtown retail trade, and alleged inadequacy of transit facilities.

EFFECTIVENESS OF PARKING CHARGES IN DISCOURAGING DOWNTOWN COMMUTING BY AUTOMOBILE

Even disregarding these problems, considerable doubt has been expressed as to whether parking charges do in fact have much effect in reducing automobile usage. More formally, it is suggested that the price elasticity of demand as a function of parking charges is rather low. This was the conclusion of Kulash in a review of the effects of parking charges in several U.S. cities (3). His general finding was that the short-run price elasticity of demand for automobile usage into urban core areas is about -0.3 and that even major increases in parking charges would only reduce automobile usage sufficiently to offset 1 or 2 years of normal growth in traffic. For instance, a doubling of parking costs would only result in a 22 percent decline in automobile trips terminating in the parking restraint area, and this effect would be diluted to under 10 percent of the volumes on major arteries by the presence of other traffic.

That parking charges should have such little effect in large cities with ample alternative transportation services may seem rather surprising. It is generally accepted that the price elasticity of demand for transit is low (estimates of approximately -0.3 are the norm), but this can be largely ascribed to the relatively small part of the transit fare in the modal-choice decision. However, in large North American cities, where parking fees are typically around $2.00 per day, one would expect parking charges to have much more impact. Although a 50 percent change in transit fares would typically modify total return trip costs by only $0.30 or thereabouts, a 50 percent rise in parking costs involves an increase of $1.00. One would expect the impact of this on modal choice to be much greater and the elasticity of demand for automobile trips to be correspondingly higher. Figure 1 shows how an estimate may be derived from a modal-split model. Assume that the transit fare is $0.30 so that a return trip costs $0.60, that the modal split is 50-50 between transit and automobile, and that a 50 percent transit-fare reduction will increase the modal share to 60 percent. The price elasticity of demand for transit is -0.27. If a model is used in which modal choice is dependent on the money-cost difference between modes, so that a 50 percent decrease in transit fare is equivalent to a $0.30 cost increase in the parking charge, then an increase in the parking price from $2.00 to $2.30 will also lead to a 40 percent modal share for the automobile. The elasticity computed from these demand and price changes is -1.59, nearly 6 times as high as the elasticity of demand for transit.

Such an approach is a logical extension of most modal-split models. It assumes, in effect, that a fixed amount of parking must be purchased for an automobile trip. This fails to recognize that the automobile user is not constrained to a single parking space, but has the option of relocating his or her parking in response to a change in price. Parking is a separate commodity and its demand, while complementary to that for automobile usage, is not completely dependent on it.

GILLEN'S APPROACH

The implications have been furthest explored by Gillen (4), who developed modal-split models of work trips into downtown Toronto. He hypothesized that the influence of parking cost on modal choice would differ from that of other automobile costs and that an increase in parking charges would be followed by (a) a reduction in demand for parking services through a relocation of drivers to less expensive, less convenient parking spaces and (b) a shift from the automobile to other modes. Because of the larger number of options available to drivers, he expected that the elasticity of demand for automobile trips as a function of parking charges would not be high.

He tested this hypothesis with data obtained in the Metropolitan Toronto and Regional Transportation Study of 1964. In alternative models he developed, the parking charge was considered as a part of total automobile costs and as a separate variable. In the second model, the coefficients of the cost variable were significantly different from each other and from the cost coefficient in the first model. Moreover the index of good fit, a surrogate correlation coefficient, was higher for the second model.

The elasticity of demand computed from the second model was -0.31, coinciding with one of Kulash's estimates for San Francisco. As might be expected, a stratification of the model by income groups showed that the elasticity was much lower for high-income than for low-income individuals.

OTTAWA EXPERIENCE

However, the data used by Gillen are more than 10 years old and, in many cases, are derivations of data collected in the original survey. Recent data are just becoming available from work under way on monitoring the effects of a sharp increase in parking charges in Ottawa.

The federal government has 35,000 employees working in the urban core of Ottawa and Hull and controls 7,000 parking spaces, i.e., 1 space per 5 employees. Until recently these spaces were provided free. Because the supply did not meet demand, demand was rationed according to criteria such as seniority and need. On April 1, 1975, charges for the spaces were introduced, ranging from $20 to $24 per month, about 70 percent of the average rates in the area.

Details of the impacts of these charges are only just becoming available. The percentage of employees applying for parking was as follows:

Year	Percentage
1974	35
1975	
Old applicants	18
New applicants	1

The modal-split percentage was as follows:

Mode	1974	1975
Automobile driver	35	27
Automobile passenger	11	11
Bus passenger	41	48
Other	13	13

Since applications in 1975 almost equaled the spaces available, there was no need to

ration demand except through the price mechanism. When charges were imposed, 17 out of 35 percent of the 1974 market for free applications withdrew. However, the effect on the modal split is not exactly equivalent, for employees always had the option of using uncontrolled commercial parking in either 1974 or 1975. In fact, the modal share of automobile fell from 46 to 38 percent between the summers of 1974 and 1975.

As usual, several notes of caution are necessary before one generalizes from these results. First, during the interval between the 2 observations, several important improvements in transit were made that have been increasing its share by 2 percent per year during the last 6 years. Second, the charges affected a particular population: federal employees with specific socioeconomic characteristics and, possibly, attitudes. The average income of permit applicants in 1974 was 20 percent above the sample mean. Third, the effect of the charge is somewhat obscured by the existence of commercial parking, which is an attractive alternative for individuals who are unable to get convenient space or who use their automobiles only 2 or 3 days a week. This commercial space has a significantly different price structure from that of the federal parking. Finally, the analysis is not complete and major causes of bias may appear at a later date.

TORONTO CROSS-SECTIONAL DATA

High parking charges are often accompanied by inconvenient parking locations and higher search times, and the combinations of these factors may lead to significant differences in automobile usage. These factors may explain some interesting findings by Berger in his work for the city of Toronto (2), which permits a cross-sectional analysis of parking behavior. Downtown and midtown Toronto are both major employment centers separated by more than a mile, and both are excellently served by transit services. However, the midtown area has much higher availability of parking space and generally lower charges partly because of preferential rates for private parking in the area.

Figure 2 (2) shows these characteristics and the much higher usage of automobiles by commuters into the midtown area. Parking rates in midtown are a little more than half those of downtown, and automobile usage is more than double. If one assumes that this higher automobile usage into midtown is solely due to the lower parking rates, the elasticity of demand can be computed as -1.1. However, such an assumption ignores the unknown impact of the greater availability of parking space in midtown, which probably results in time savings to automobile users in terms of searching for space and walking from the space to their final destinations. One would surmise that these savings substantially reinforce the effects of the price differential so that a true price elasticity of demand might be much lower.

CONCLUSIONS

Policies of increased parking charges to drivers parking all day in the CBD will not have major effects on traffic volumes. Moreover, they are unlikely to have a significant impact on energy consumption so long as they apply only to core areas with a small proportion of trips. Even around and within the urban core, their impact will be limited by the large proportion of vehicles entering it that do not park and the fact that many drivers are not sensitive to parking charges. Although the available evidence is limited and considers only short-term effects, it fairly consistently suggests that elasticity is about -0.3. Thus, in Canada, as in the United States, parking charges can only be expected to reduce street traffic volumes by amounts less than 10 percent.

Parking charges can still make a valuable contribution to reducing automobile usage and increasing transit ridership. Their impact occurs at the point in urban transportation systems often considered the most critical. In Ottawa, the number of employees driving to and from work fell by about 2,000 during a 12-month interval. Their vehicles account for about 6 percent of traffic entering the urban core each day between 7 and 10 a.m. Such trips are disproportionate in their effect on the need for road facilities.

Figure 1. Costs and model choice: a basic model.

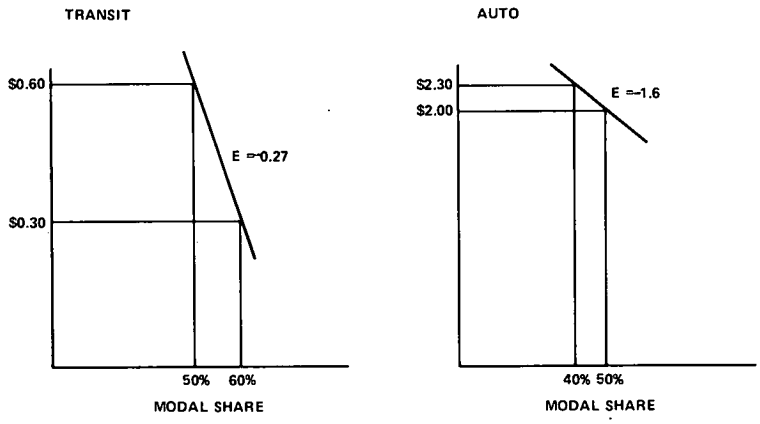
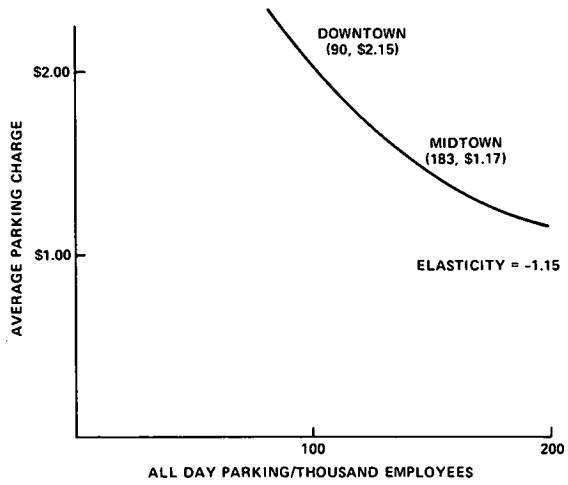


Figure 2. Parking facilities and travel behavior in Toronto.



Even a respite of 1 year's growth in traffic volume would save Canadian cities many millions of dollars, although this would be partly offset by needs for expanded transit facilities.

Parking charges also have a useful role in conjunction with other measures. The great differences between downtown and midtown Toronto suggest that the total parking situation—prices and availability—can be of major importance. Reducing the supply may be much more effective than pure pricing measures such as taxes.

The Toronto and Ottawa cases illustrate a major factor in parking in Canadian cities: the large proportion of private space reserved for employees and often provided at preferential rates. Greater leverage can probably be obtained from charges here than adjustments to commercial or municipal parking. Measures such as taxing of parking as an employee benefit or as a nondeductible expense may have greater impact.

This could be extended to cover parking facilities beyond the urban core, where large amounts of unpriced space are often provided. Parking controls could then be used as an important incentive to car pooling by employees. Only in this way could parking be used as an instrument that has a more general effect than reducing traffic entering the CBD and that makes a significant contribution to energy conservation.

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Neighborhood and Other Land Use Considerations

comments on the preceding 4 papers

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My comments on the preceding 4 papers touch on 4 general points.

The first is that traditional transportation planning has had a fairly simplistic view of the city as a work or marketplace. The ideal within the profession was to help people get around as fast as possible to fulfill those 2 basic functions. The attitude toward urban neighborhoods was that, at best, they were rather anachronistic. More usually, it was that they were a type of residential purgatory through which people had to go on their way to the paradise of the suburbs. Urban neighborhoods were not taken seriously. So it came as some surprise that many of the people living there took them seriously indeed and, even more surprising, that some of those people actually liked to live in the cities.

We are now coming to recognize that there are many people who are satisfied with living in cities and who want not only to retain those privileges but to improve them. As yet, we have a minimal understanding of what urban life really is, what satisfactions and needs are most important to people, and how, as policy makers and planners, we can satisfy them. So this is a dilemma we all face.

The second point deals with public participation. I wonder if our thinking about public participation and the methods we use to generate it are really getting at the fundamental issue: Is the public really participating in planning for the transportation it wants? I ask this because it seems that the public is usually asked to react to proposals that are defined within a professional context by professionals who have their own ideas of what transportation is and what is possible.

A second problem arises because most of our efforts in transportation are at the system level while people's concerns are at a local, simple level. This was brought home to me in connection with a project examining the transportation concerns of children and housewives. It is a revelation to actually talk to children and housewives and find (a) how important transportation is and (b) how much more important lack of transportation is. Many of them do suffer from a lack of transportation that prevents them from doing some of the simple things we take for granted. I do not think we have yet devised a public participation program that is getting at the needs and concerns of the people: what they want, how they want to move, and, more specifically, where and for what purpose.

The third point, which is closely related, concerns the degree to which we accept current travel patterns and trip habits as a basis for predicting future travel patterns. Much transportation planning, as it is defined, is in terms of what is done. The way people travel now is used as a basis for predicting the way they will probably travel in the future. Then facilities are provided and so forth. Of course, this is a self-fulfilling prophecy because people do not use facilities that are not there.

This gets back to the problem of determining where people would go if they could, how often, and for what purposes. We realize, or are coming to realize, for example, that the journey to work is not so salient an issue for most people in their choices of residential locations or perceptions of where they live in cities as transportation planners have long believed. I think as we look to the future we see that there is going to be a redistribution in the way people spend their time in cities. They are going to spend less time working and more time doing other things: going to school, amusing themselves, and so forth.

The fourth point is that transportation planning is essentially a political process. As a political scientist, I think this is what I liked best about the Metropolitan Toronto Transportation Plan Review: It recognized this and went to considerable lengths to spell out for local politicians and decision makers the implied choices in terms of land use associated with the alternative transportation plans. And, although the review staff in general were extremely articulate, they were still too sophisticated for more than 90 percent of the metropolitan politicians.

As we approach some of the questions of dealing with issues that have arisen, i.e., managing the automobile and responding to neighborhood issues and demands, we have to remember that, no matter what we do, someone will benefit and someone else will get hurt. Appleyard indicated that in London lower class residents do not benefit because improvements made their neighborhood so attractive to middle class people. The fact that the middle class is moving back into the cities is sometimes viewed as a problem. Anything we do—control of automobile use, public participation programs that tend to involve the articulate and the best informed, upgrading streets and neighborhoods—in effect shifts the benefits of transportation planning from one privileged group to another or from one segment of both privileged groups to another. This still leaves a large but not very vocal group of people who have always been deficient in transportation and amenities of all kinds. Are we going to leave them in the same or possibly worsened position? This is another serious issue that we have to address.

Regulation of Motor Freight Transportation in Canada: A Reappraisal of Policy

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This paper updates an article published 5 years ago on measuring the additional for-hire trucking charges incurred on goods transported in Canada that would be attributed to economic regulation. Although certain constraints have been imposed by the nature of available data and some departures from prior computational procedures have been effected, the investigation has been designed to facilitate comparisons with the earlier study. There was tentative affirmation of the hypothesis that regulation of motor freight services results in higher charges. Combined intraprovincial and extraprovincial data show increased trucking charges of $16 million on 2,337 million ton-miles (3.4 Pg-km) for 1958-1963 with average annual increased charges of $15.3 million on 7,023 million ton-miles (10.3 Pg-km) for 1970-1972. At the same time, the increment in the pricing structure per ton-mile for which regulation could be held responsible declined from 0.68 to 0.22 cent, indicating a trend toward greater equality of rate levels between regulating and nonregulating jurisdictions.

In an article published 5 years ago, I undertook a measurement of the additional for-hire trucking charges incurred on goods transported in Canada that would be attributed to economic regulation (1). Inasmuch as those findings could have been substantially modified by subsequent changes in provincial or federal regulation or both and in the nature of operations conducted by the Canadian commercial motor freight industry, a project has been initiated to update the earlier investigation in the light of current conditions and statistical data.

This paper represents such a task. Although certain constraints have been imposed by the nature of the available data and some departures from the prior computational procedures have been effected, the content of the descriptive material and the quantitative analyses have been designed to facilitate comparisons with the earlier study and assess the consequences of prevailing regulatory policies.

The paper reviews the existing regulatory environment applicable to the intercity movement of goods by truck in Canada and accentuates the changes legislated since publication of the previous article as well as anticipated regulatory reforms that failed to materialize, particularly nonimplementation of Part III of the National Transportation Act of 1967. Also described is the methodology established to estimate by quantitative means any increment in for-hire motor carrier charges attributable to economic regulation. Feltham describes this regulation as follows (2, p. 309): "Regulation designed to implement the national transportation policy . . . may be described for convenience of reference as 'economic regulation,' to distinguish it from other subjects of regulation." The actual estimation of these charges and their validation by means of a standard test of statistical significance are discussed in another section. The conclusion of the report, subject to some important qualifications, is that there appears to be evidence that the regulatory policies described in the previous article represent, with few exceptions, the policies prevailing in 1975.

MOTOR FREIGHT REGULATORY POLICIES REVIEWED

As in the case of the United States, authority over transportation activities in Canada is dichotomous, being shared between the federal and provincial governments. In theory, the federal responsibility extends to the movement of goods and persons across provincial or national borders; services confined wholly within the territorial limits of a single province are supposed to fall within the purview of provincial officialdom. In practice, however, interprovincial motor freight regulation was delegated to the respective provinces by the Parliament at Ottawa under the Motor Vehicle Transport Act of 1954.

It was expected that this delegation of authority would terminate when Part III of the National Transportation Act of 1967 became effective by proclamation in May 1970 and that henceforth extraprovincial motor vehicle transport would be subject to regulation by the Canadian Transport Commission. However, because of the inability of the federal and provincial governments to reach an agreement on the transfer of the delegated regulatory authority to Ottawa, the 1954 act continues to apply and no major changes in motor carrier regulation have taken place since 1967.

Notwithstanding the grant to Ottawa of constitutional power to regulate the national transportation system, including highway carriers, there has been considerable expressed reluctance on the part of the provinces to give up control of extraprovincial truck and bus service. Because these services require concurrence of at least 2 provincial boards, significant a priori differences in the regulatory effects of intraprovincial and extraprovincial for-hire trucking should be expected, and the measurement of the overall effects of regulatory policies therefore necessitates separate consideration of each of these 2 categories.

Extraprovincial Regulatory Policies

The terms of the Motor Vehicle Transport Act of 1954 empowered each province to apply to interprovincial truck traffic controls similar to those imposed on its internal services. In view of the complete absence of regulatory uniformity among the provinces, an anomalous situation has been created since an agreement must be reached between concerned provinces covering the issuance of operating authority and approval of rates on each proposed extraprovincial commercial trucking service. As a general rule, no standard procedure to facilitate timely disposition of such proposals has been developed.

The information given in Table 1 indicates the status of provincial truck regulations in 1963 and 1971 and reveals the diversity in the scope of authorized and exercised power over motor freight operations among the several provinces. Provisions applicable only to extraprovincial services have been appropriately noted in the table. The acts that govern motor carriers in provinces as given in Table 1 are as follows:

1. Motor Carrier Act,
2. Transportation Board Act,
3. Public Commission Vehicle Act,
4. Highway Traffic Act,
5. Vehicles Act, and
6. Public Service Vehicles Act.

The motor carrier regulatory authorities are

1. Public utilities commission,
2. Board of commissioner of public utilities,
3. Motor Carrier board,
4. Transportation board,
5. Highway transport board, and
6. Highway traffic board.

Intraprovincial Regulatory Policies

The 2 basic ingredients of economic regulation are control of entry and prices. In respect to entry, the most recent available information indicates that all Canadian provinces require a showing of public convenience, interest, and necessity and issue carrier operating licenses (franchises) except Alberta, where control of entry is applicable to extraprovincial operators only (3, Table 4). The status of rate control has been well stated by Feltham (2, p. 337): "The provincial laws applicable to rates for truck service vary widely from the extreme of no regulation whatsoever (for example, Ontario and Alberta) to specific approval (for example, Saskatchewan and British Columbia). Only Quebec attempts to regulate rates for extra-provincial service." In Ontario rates are not regulated but only have to be filed, and truckers can offer whatever rates they want to and shippers can solicit different truckers to get the best rate (4, pp. 18-19). However, a carrier offering a specific rate to a shipper must offer the same rate to all shippers of like commodities in the province.

On the basis of these distinctions, the provinces can be classified as either effective regulators or nonregulators of intraprovincial intercity for-hire truck service as of 1971.

Regulators	Nonregulators
Newfoundland	Nova Scotia
Prince Edward Island	New Brunswick
Quebec	Ontario
Manitoba	Alberta
Saskatchewan	
British Columbia	

The quantitative analyses developed in the following sections have been formulated in accordance with the above separation for the purpose of measuring the effects of regulation on the prevailing level of intraprovincial and extraprovincial trucking charges, subject to constraints imposed by the characteristics of the available data.

DESCRIPTION OF METHOD DESIGNED TO ESTIMATE REGULATORY EFFECTS ON MOTOR FREIGHT CHARGES

In terms of effective regulation of entry and price, 6 Canadian provinces could be adjudged as regulators and 4 as nonregulators of intraprovincial intercity motor freight in 1971. [Annual publication of The Motor Vehicle (3) was suspended by Statistics Canada after the 1971 issue.] The situation applying to extraprovincial movements has been found to be ambiguous because of the diversity of the provincial regulations governing such truck operations under the delegation of authority contained in the Motor Vehicle Transport Act of 1954. The most feasible scheme for classifying extraprovincial highway freight has been through its identification with the province of origination. Hence, a load from Montreal, Quebec, to Toronto, Ontario, would fall within the regulated category, but a load in the reverse direction would be considered nonregulated.

The limitations of this assignment process will be observed in the subsequent quantitative evaluations. At the same time, since records show extraprovincial traffic crossing as many as 3 or more provincial borders, the difficulty in devising a more accurate method of allocation becomes apparent. The seriousness of this problem is mitigated by the fact that extraprovincial truck traffic constitutes a smaller share of the total than its intraprovincial counterpart. Evidence to this effect is given in Table 2 (5 and also Statistics Canada computer printouts of 1970 data marked "preliminary—subject to revision").

In reappraising Canadian truck regulatory policies in the light of reasonably current

Table 1. Provincial regulation of trucks—1963 and 1971.

Item	Newfound-land		Prince Edward Island		Nova Scotia		New Brunswick		Quebec		Ontario		Manitoba		Saskatch-ewan		Alberta		British Columbia	
	1963[a]	1971	1963	1971	1963	1971	1963	1971	1963	1971	1963	1971[b]	1963	1971	1963	1971	1963	1971	1963	1971
Governing motor carrier act[c]		1	1	1	1	1	1	1	2	2	3	3	4	4	5	5	6	6	1	1
Motor carrier regulatory authority[c]		2	1	1	2	2	3	3	4	4	5	5	3	3	6	6	6	6	1	1
Requirement to show public convenience and necessity																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[d]	Yes	Yes
Carrier operating licenses (franchises)																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[d]	Yes	Yes
Routes																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[d]	Yes	Yes
Areas																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Time schedules																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes	Yes
Commodities																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Filed freight rates																				
Has power to regulate			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[e]	Yes[e]	Yes	No	No	No	Yes	Yes
Regulated freight rates																				
Has power to regulate			Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exercises power			Yes	Yes			Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes

[a]Motor carriers not regulated.
[b]Ontario Ministry of Transportation and Communications exercises power to register licences and supervise operations and rates.
[c]Numbers refer to listing in text.
[d]Applicable to extraprovincial operators only.
[e]Intraprovincial only.
[f]Prescribed.

Table 2. Intraprovincial and extraprovincial truck traffic—1970 and 1972.

Province	Year	Percentage of Intraprovincial Revenue	Percentage of Intraprovincial Weight Carried	Percentage of Intraprovincial Ton-Miles
Quebec	1970	59	76	48
	1972	62	81	49
Ontario	1970	63	87	50
	1972	74	91	69
British Columbia	1970	71	88	63
	1972	63	87	51

Note: Data for other provinces not available. 1 ton-mile = 1460 kg-km.

Table 3. Correlation matrix for equations 3 and 4.

Equation	Variable	Variable y	L	T	D	V
3	y	1.000	-0.097	0.383	0.837	-0.395
	L		1.000	-0.562	0.365	-0.541
	T			1.000	-0.000	0.385
	D				1.000	-0.584
	V					1.000
4	y	1.000	-0.117	0.636	0.616	0.186
	L		1.000	-0.458	0.543	-0.458
	T			1.000	-0.000	0.714
	D				1.000	-0.212
	V					1.000

statistical information, I would like to use sources similar to those constituting the basis for analysis in my earlier article. This proved impossible because of the discontinuance of virtually all the series of reports from which the earlier data were derived. (Canada Bureau of Statistics discontinued Motor Carriers—Freight, Catalogue Nos. 53-222 and 53-223, with the 1969 reports and Motor Transport Traffic, Catalogue Nos. 53-207 through 53-214, after publication of reports for 1964.) Accordingly, more aggregated statistics provided by Statistics Canada had to be used that lumped together the 4 Atlantic provinces and the 3 prairie provinces respectively (5).

The quantitative analysis performed in this study has drawn on material produced by Statistics Canada for 1970, 1971, and 1972. It has been structured in a way to permit estimation of the effects of economic regulation on levels of intraprovincial and extraprovincial for-hire truck charges, and strenuous efforts have been made to overcome problems associated with deficiencies in the available data. [A complete description of the sampled firms and sampling methods will be found in For-hire Trucking Survey 1970 (5, pp. 5-9). In Statistics Canada Daily for August 14, 1974 the following comment appears: "For three years the Transportation and Communications Division has been developing a for-hire trucking survey designed to provide statistics on the origin and destination of commodity shipments. The results of the 1972 survey represent the final year of developmental study and may be useful to provide an indication of commodity flow movements by the commercial trucking industry in Canada. The results should, however, be used with caution as changes in survey objectives, an improved universe, larger sample size and more effective sampling procedures preclude year-to-year survey compatibility."]

Trucking data compiled by Statistics Canada for 1970, 1971, and 1972 have been presented in 2 distinct arrays. One array supplies revenues, tons, and ton-miles for all commodities, unspecified, from major population centers of origin to regions of destination and vice-versa. Use of these data proved unsatisfactory since many shipments would neither originate nor terminate at any of the designated population centers (5, Tables 4 and 5). The second array, based on major commodity "sections" from regions of origin to regions of destination, was selected as having the more suitable properties for the estimation process. Commodities have been classified into 1 of the following 6 "sections" (5, Table 6):

1. Live animals;
2. Food, feed, beverages, and tobacco;
3. Crude materials, inedible;
4. Fabricated materials, inedible;
5. End products, inedible; and
6. General or unclassified freight.

Origin and destination regions for which sectional data were provided included the provinces of Quebec, Ontario, British Columbia, the 4 Atlantic provinces combined, and the 3 prairie provinces (Manitoba, Saskatchewan, and Alberta) combined. Based on the 1970 survey, commodity sections 1 and 6 together accounted for only 3.7 percent of all ton-miles and were therefore deleted from the analysis. For the remaining 4 commodity sections, the Atlantic provinces contributed 1.7 percent of 1970 ton-miles, which afforded a justification for their elimination. These modifications resulted in a data base made up of 4 commodity sections, 4 origin and destination regions, and 3 years (1970, 1971, 1972). The number of commodity sections was subsequently reduced from 4 to 2 by combining section 2 with 5 and section 3 with 4 inasmuch as their shipping characteristics were generally similar.

The assignment of provinces to regulating and nonregulating could not conform to the schedule set forth in the section above because of exclusion of the Atlantic provinces and the merging of the prairie provinces into 1 origin-destination region. An arbitrary determination was made that the prairie region belonged to the nonregulating group on the strength of Alberta's predominance in representing 47 percent of motor truck and truck-tractor registrations (6, Table 2) and approximately 56 percent of revenues (7, Table 1) from truck, tractor, and trailer registrations for the year 1972. Alberta has not regu-

lated intraprovincial or extraprovincial rates or intraprovincial entry (Table 2).

After the above adjustments were made, the breakdown between regulating and nonregulating provinces or regions was as follows:

Regulating	Nonregulating
Quebec	Ontario
British Columbia	Prairie region

Estimation of the relation between economic regulation of intraprovincial and extraprovincial intercity for-hire truck services and the level of charges assessed thereon has been developed quantitatively in accordance with this distribution.

ESTIMATING AND TESTING EFFECTS OF REGULATION ON MOTOR CARRIER CHARGES

It is hypothesized that motor freight charges will be higher in jurisdictions enforcing control of entry and rates than in comparable areas where complete economic regulation is not mandated. Since it is not possible to sustain this hypothesis directly because of the interaction of other variables on the level of trucking charges in a given province or region, an indirect approach has to be used.

This method of isolating the increment of motor freight charges attributable to economic regulation involved the use of multiple regression equations with the average revenue per ton-mile serving as the dependent variable and as a surrogate for price or level of charges assessed by for-hire intercity trucking firms. Average revenues per ton-mile for each commodity section, intraprovincially and extraprovincially, have been computed from data made available by Statistics Canada (Table 2). As previously indicated, commodity sections 2 and 5 and sections 3 and 4 respectively have been joined and entered into the regression equations as 2 sets of observations distinguished by a dummy variable. A linear relation has been assumed, and the basic equation takes the form:

$$y = a + bL + cT + dD + eV + u \qquad (1)$$

where

y = average revenue per ton-mile,
a = constant,
L = length of haul (ton-miles/ton),
T = fuel tax per Imperial gallon,
D = dummy variable,
V = total tons transported per year, and
u = residual causal factors not explained by the specified independent variables.

Any discernible influence on the value of y due to economic regulation should be detected by comparing values of u for the regulating provinces with those values for the nonregulating provinces. [Values of revenues per ton-mile, average length of haul (ton-miles/ton), the dummy variable (1 for commodity sections 2 and 5 and 0 for commodity sections 3 and 4), and total tons transported have been derived from the For-hire Trucking Survey 1970 (5) and the computer printouts referred to earlier. Fuel taxes were based on Statistics Canada data (3, Table 6) and on gasoline and diesel oil consumption data published by the Canada Bureau of Statistics in Motor Carriers—Freight (common and contract), Catalogue Nos. 53-222 and 53-223, 1969 (last year of publication).]

For this purpose, the basic equation is restated as follows:

$$u = y - a - bL - cT - dD - eV \quad (2)$$

Two separate but identical computations have been performed: The first is applicable to motor freight traffic transported within a single province or region, and the second is applicable for such traffic crossing provincial boundaries. [International truck traffic between Canada and the United States was excluded from the data in the For-Hire Trucking Survey (5).]

Intraprovincial Analysis

The equation is based on 24 observations (12 regulating and 12 nonregulating) incorporating the data for commodity sections 2 and 5 combined and commodity sections 3 and 4 combined for intraprovincial intercity truck shipments within the provinces of Quebec, Ontario, British Columbia, and the prairie region for 1970, 1971, and 1972. The values of the coefficients produced by this equation are as follows (the standard errors are shown in parentheses under the coefficients to which they apply):

$$y_t = \underset{}{2.6508L} - \underset{(0.0055)}{0.0242L} + \underset{(0.1253)}{0.3727T} + \underset{(0.6084)}{6.3545D} - \underset{(0.00004)}{0.00009V} \quad (3)$$

The F ratio for this equation is 59.951 (other statistics are given in Table 5). The correlation matrix, given in Table 3, indicates no serious problem due to multicollinearity among the independent variables.

The residuals were divided into 2 groups representing the regulating provinces, Quebec and British Columbia [there has been no indication that the special circumstances justifying the classification of Quebec as nonregulating in the earlier article (1, pp. 340-341) prevailed in 1970-1972], and the nonregulating provinces, Ontario and the prairie provinces (Table 4). A test of statistical significance was conducted to determine whether differences in the values of the residuals for these 2 groups can, justifiably, be identified as costs of economic regulation (8, appendix 1).

The test of significance value (Table 5) shows a relatively weak affirmation of the hypothesis that economic regulation has been responsible for higher intraprovincial trucking charges than would prevail in the absence of regulation in contrast to the finding of strong support for this hypothesis in my earlier article. Several factors may cause this result:

1. Data used in the current analysis covered only 3 years, but data in the earlier article represented a 6-year period;
2. Sources used for the present study provided much less appropriate statistical information in much more aggregated form (Atlantic and prairie provinces treated as single entities respectively); and
3. As cautioned by the issuing agency, Statistics Canada, the method of compiling the data was changed from year to year so that results of a time series analysis would inevitably contain inconsistencies.

In spite of these computational problems and the lack of a statistically significant outcome, evidence indicates that charges in regulating provinces have exceeded charges in nonregulating provinces. The annual increment attributable to regulation in the provinces of Quebec and British Columbia has been estimated at approximately $13 million (Table 5).

Extraprovincial Analysis

Analytical development of the extraprovincial model has proceeded along the same routine as in the case of the intraprovincial calculations already explained. The estimating equation supplies the following results:

$$y_e = -5.0452 - \underset{(0.0007)}{0.0020}L + \underset{(0.1009)}{0.5715}T + \underset{(0.2794)}{1.9861}D - \underset{(0.0002)}{0.0005}V \quad (4)$$

The F ratio for this equation is 35.155 (other statistics are given in Table 5). The correlation matrix is given in Table 3.

Separation of the residuals according to whether they represented regulated or nonregulated movements followed the format employed in the intraprovincial analysis for lack of a better method of differentiating between these categories (Table 4). Hence, shipments originating in Quebec and British Columbia are regulated; shipments originating in Ontario and the prairie provinces are nonregulated. The fuel tax has been averaged between the province of origination of the traffic and the immediately adjoining province or provinces, excluding those in the Atlantic region.

The test of significance value (Table 5) is insufficiently strong to support the hypothesis attributing higher motor freight charges in specified provinces to economic regulation. In view of the data problems described above involving extraprovincial truck shipments, this outcome was not unexpected. Nevertheless, if the significance test result is discounted as caused, partially at least, by inconsistencies in the available data, additional charges experienced on shipments originating in the regulating provinces would amount to about $2 million per year as indicated in Table 5.

SUMMARY AND CONCLUSIONS

The current investigation of Canadian intercity for-hire truck regulations has produced convincing evidence that no major regulatory changes have occurred since the earlier study published in the autumn of 1970 (1). Support for this finding is provided by comparing the regulatory status for each Canadian province in 1963 and in 1971 (Table 1). The principal differences are noted in Table 6.

Despite the enactment of the National Transportation Act of 1967, which was intended to have application to extraprovincial and international services offered by all modes, Part III relating to motor carriers has not been implemented leaving the Motor Vehicle Transportation Act of 1954 in full force and effect as recently as January 1975. (This information was received from W. G. Scott, general manager of pricing, Canadian Pacific Railway, January 22, 1975.) The only consequential revision has taken place in Quebec province where strict controls over entry and rates were found absent in the 1958-1963 period, covered in the earlier article, but apparently enforced effectively in the more recent inquiry.

The quantitative estimates of higher prices paid for trucking in regulating provinces during the 1958-1963 and 1970-1972 periods have proved remarkably similar. Comparisons of the 2 intraprovincial estimates and the extraprovincial estimates in Table 5 tend to substantiate this assertion.

An overall assessment of the effects of governmental intervention in the entry and pricing decisions of the Canadian intercity trucking industry leads to a conclusion that few changes have occurred during the past 15 years. The volume of both intraprovincial and extraprovincial truck traffic subject to regulation has been substantially higher in the current study than in the earlier study. The transfer of Quebec from a nonregulating to a regulating status and the progressive growth of the Canadian trucking industry explain, in large measure, the causes of this phenomenon. As indicative of the growth of the Canadian for-hire trucking industry, annual mean millions of ton-miles reported for the 1958-63 period (1) and for 1970 (5) for Manitoba, Saskatchewan, and British

Table 4. Residuals from motor freight traffic—1970-1972.

Type of Motor Freight	Sum	Mean	Standard Error of Difference Between Means
Intraprovincial			
Regulating	-2.0519	+0.170966	0.41813
Nonregulating	-2.0520	-0.170966	
Extraprovincial			
Regulating	+0.4126	+0.0344	0.19984
Nonregulating	-0.4135	-0.0344	

Table 5. Characteristics of estimating equations—1958-1963 and 1970-1972.

Item	Intraprovincial		Extraprovincial and International	
	1958-1963	1970-1972	1958-1963	1970-1972[a]
Observations	48	24	48	24
Regulating	18	12	18	12
Nonregulating	30	12	30	12
Independent variables	5	4	5	4
Standard error of estimate (σ)	1.1667	1.1188	0.5832	0.5282
Coefficient of multiple determination (R^2)	0.7241	0.9266	0.7404	0.8810
Degrees of freedom	46	22	46	22
t-test value	2.828	0.818	0.646	0.344
Level of significance (1-tailed test)	$P < 0.0005$	$0.20 < P < 0.25$	$0.25 < P < 0.30$	$0.35 < P < 0.40$
Mean excess of truck rates in regulating provinces, cents per ton-mile	0.8672	0.3420	0.5098	0.0688
Mean net millions of ton-miles per year in regulating provinces	1,133	3,845	1,204	3,178
Estimated annual increase in truck charges in regulating provinces, thousands of dollars	9,821	13,150	6,138	2,186

Note: In every case, the dependent variable was revenue or rate per ton-mile. 1 ton-mile = 1460 kg-km.

[a]Includes extraprovincial shipments only.

Table 6. Major differences in regulatory status of provinces from 1963 to 1971.

Province	Year	Status
Newfoundland	1963	Freight motor carriers not regulated
	1971	Entry and rates regulated
New Brunswick	1963	Power to control rates exercised
	1971	Power to control rates not exercised
Ontario[a]	1963	Power to control rates authorized
	1971	Power to control rates not authorized
Saskatchewan	1963	Freight rates prescribed by Highway Traffic Board
	1971	Power to require filing freight rates not exercised
		Power to regulate rates exercised
Alberta	1963	Entry controls exercised without qualification
	1971	Entry controls applied to extraprovincial operators only

[a]Ontario Ministry of Transportation and Communications exercises the power to register licenses and supervise operations and rates.

Table 7. Total incremental motor carrier freight charges ascribable to economic regulation in Canada.

Item	1958-1963[a]	1970-1972
Mean excess of truck rates in regulating provinces, cents per ton-mile	0.6829	0.2184
Mean net millions of ton-miles per year in regulating provinces	2,337	7,023
Estimated annual increase in truck charges in regulating provinces, thousands of dollars	15,959	15,336

Note: 1 ton-mile = 1460 kg-km.

[a]Includes international shipments.

Columbia are as follows (for 1970, Manitoba and Saskatchewan ton-miles were estimated to be 45 percent of total shown for prairie region):

Period	Intraprovincial	All For-Hire Intercity
1958-63	1,133	4,548
1971	2,137	8,729

Combined intraprovincial and extraprovincial data in Table 7 yield increased trucking charges ascribable to economic regulation of $16 million per year on 2,337 million ton-miles (3.4 Pg-km) for 1958-1963 contrasted with average annual increased charges of $15.3 million on 7,023 million ton-miles (10.3 Pg-km) estimated for 1970-1972. At the same time, the increment in the pricing structure per ton-mile for which regulation could be held responsible declined from 0.68 to 0.22 cent between 1958-63 and 1970-72. This would indicate a trend toward greater equality of rate levels between regulating and nonregulating jurisdictions. However, differences in the data bases and sampling procedures used to generate the data in the latter period make comparisons subject to misinterpretations. Tests of significance (Tables 4 and 5) provide only tentative affirmation of the hypothesis that regulation of motor freight services results in a higher level of charges than would otherwise prevail.

Subject to these important qualifications, there appears to be ample evidence to support the conclusion that regulatory policies applicable to Canadian for-hire motor freight operations, as described in the article published in the autumn of 1970 (1), represent with few exceptions the policies prevailing at the midpoint of 1975.

ACKNOWLEDGMENT

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Review of the Canadian Highway Systems Study

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With the exception of the Alaska Highway and the Trans-Canada Highway, the planning and construction of highways in Canada have been predominantly the responsibility of the provincial governments. Inasmuch as decisions regarding highways on the federal level are made on an ad hoc basis, the Cabinet asked for a proposed policy to guide federal spending. This became one of the objectives of the Canadian Highway Systems Study; the other was the definition of a national highway network to orient federal involvement in highways. The study provided an overview of the elements that make up the total transportation system, a definition of the National Highway System as defined by the provinces, and an indication of the 1982 system. As a result of the study, 2 basic options are available: (a) Define and develop a primary highway system based on the Trans-Canada Highway and comparable to the U.S. Interstate System or (b) view federal highway programs as supporting other federal goals and objectives. For either option, the study proved valuable by permitting the provinces to know the federal approach to highways, to accept the need for federal presence in developing the Canadian Highway System, and to accept the legitimacy of federal involvement in highways.

The federal government of Canada has not been involved to a great extent in the planning or construction of highways since, under the Canadian Constitution, highways are predominantly the responsibility of the provincial governments. The exceptions relate to the provision of highway facilities on federal installations, such as airports, military installations, harbors, national parks, and Indian Reserves or in territories administered by the federal government, i.e., the Northwest Territories and the Yukon Territory.

One major exception to this general statement is the Alaska Highway, which was constructed in 1942-43 to connect Dawson Creek, British Columbia, with Fairbanks, Alaska. In 1946 the Canadian mileage, about 80 percent of the total 1,523 miles (2437 km), was placed under the responsibility first of the Department of National Defense, and then of the Department of Public Works, for maintenance and any necessary improvements. The second major exception is the Trans-Canada Highway (TCH), which was largely constructed between 1950 and 1962 and is a major example of federal and provincial cost-shared highway programs. The highway is 4,784 miles (7654 km) long and cost $1.4 billion, of which the federal share was $825 million, or 60 percent. With the conclusion of the TCH agreement in 1971, the question arose whether the federal government should continue to be involved in major highway programs. In 1971 the Minister of Transport informed the members of the Standing Committee on Transport and Communications, "We are now looking for what the ongoing federal role ought to be in highway construction now that the TCH project is just about completed." And he added, "As you know, there is a good deal of feeling that we should not be in the road business at all, and that is the domain of the provinces." The situation at that time was that federal spending on highways was decided on an ad hoc basis although the Minister of Transport had the mandate to coordinate federal and provincial funding and had the

responsibility for a federal highway policy. Since there was an obvious need to rationalize the decision process, a decision was made to undertake a general study of the Canadian Highway System to determine the current and future needs of the system and to provide a rationale for federal government involvement.

THE STUDY

The study, which started in 1971, addressed the following problems: With completion of the then current major highway programs in 1970, the average annual federal contribution toward highways was still approximately $185 million, but decisions were being made on an ad hoc basis. These ad hoc expenditures were not coordinated with overall government expenditures and also lacked any comprehensive transportation planning in a national sense. Thus, the Cabinet asked for a proposal for policy to guide federal spending on highways.

The Canadian Highway System Study (CHSS) was organized and conducted by the Transportation Development Agency, with the cooperation of provincial governments and the assistance of several consultants. In addition to providing data input, the provincial governments provided advice on the conduct of the study by participating on an advisory committee. This committee was constituted in November 1971 and consisted of representatives of the provincial ministries of highways and transport, the Department of Indian Affairs and Northern Development, the Canada Ministry of Transport, the Roads and Transportation Association of Canada, the Canadian Automobile Association, and the Canadian Trucking Association. The main study was carried out by a project manager and project staff supplied by the federal government. It was completed and a preliminary report was released in October 1973.

OBJECTIVES OF THE STUDY

The study had 2 objectives:

1. To define a national highway network, which was related to other transportation modes and which would orient federal involvement in highways, and
2. To form the basis of a national highway policy, which would outline criteria for federal spending in cooperation with the provinces as well as other federal departments.

Conceptually, the study considered highways as links between population or other nodes and distinguished 3 major areas: northern Canada, southern Canada, and the Windsor-Quebec corridor. The nodes selected for the highway system form the social and economic focal points of Canada and consist of the centers of population, economic activity, major recreational areas, natural resource areas, transportation interfaces, and defense bases. Based on the above criteria, 1,045 nodes were identified for the study, and the linkages between nodes form the highway network. In those cases where more than one road joined a number of nodes, the most viable link was selected.

These system linkages were divided into 2 categories: (a) network roads, primary and secondary, and (b) access roads that connect single purpose nodes to the network. The urban highway portions of the system were included only where necessary to ensure continuity.

As a start, the study oriented the highway activity within the overall transportation system. For example, in 1969 automobiles and buses accounted for 90 percent of all passenger miles. Trucking accounted for 89 percent of the total $9.2 billion expenditure for freight shipments. Of the 516,000 miles (825 600 km) of roads, streets, and highways in Canada, roughly 40 percent are municipal roads and streets and 60 percent are provincial and interprovincial highways and special purpose roads. The Canadian Highway System was chosen from this mileage by applying the methodology and definitions mentioned earlier. The 1972 system consisted of 38,916 miles (62 266 km), which is approximately 8 percent of the total roads and highways in Canada.

Total transportation investment, which was estimated to be $30 billion by 1969, is divided into a sixth for terminals, a half for the ways, and a third for vehicles; half of the way expenditures are expended on roads. The highway mode also accounted for 60 percent of the total transportation employment estimated to have been 800,000 in 1969.

Some other interesting data developed at that time indicated that, out of an annual expenditure of $14 billion in 1969, one-third was for freight transportation and two-thirds were for passenger transportation and that 60 percent of the use of highways was for personal purposes and 40 percent was for commercial and public purposes. In 1971 transportation accounted for approximately 10 percent of the total provincial expenditures and was exceeded in amount only by expenditures for education, health, and non-classified uses. However, for 1968, 1969, and 1970, provincial user taxes had a higher yield than the total highway expenditure.

On the demand side, a congestion of the highway system can be expected as motor vehicle registration and the number of passenger car miles increase at a steady rate, especially when one takes into account the seasonal distribution of trips, which reaches its peak in July and August. Although road transportation does not account for the largest proportion of the billions of freight ton-miles, increases in trucking have been substantial, especially within the last 4 or 5 years.

As part of the study, an investigation was also made of the energy performance of passenger and freight transportation modes. In the passenger mode, intercity bus and commuter rail are the most economical in terms of transportation per energy unit; in the freight mode, supertanker and pipelines are the most efficient.

In addition to providing an overview of the elements that make up the total transportation system, the study defined the Canadian Highway System and indicated what the 1982 system might be. We also obtained a forecast of proposed provincial highway expenditures between 1972 and 1982, which were expected to amount to about $800 million per year. In spite of the sometimes considerable differences in data bases and methodology between the provinces, the study achieved a coordinated picture of the highway system in terms of traffic volumes, road categories, and road standards and pointed out significant nodes that at present have no connection to the main highway system (nodes without roads). We also obtained a forecast of anticipated 1982 traffic volumes to provide some advance warning of possible congestion points in the highway system.

CONCLUSIONS AND RECOMMENDATIONS

Based on the Canadian Highway Systems Study, work proceeded to develop a National Highway Policy. There appeared to be 2 basic options available.

1. Define and develop a primary highway system based on the TCH and comparable to the U.S. Interstate System. This option has the advantage that the highway system could be easily identified, could be limited in time and space, and would have a predictable cost. However, it has little flexibility with regard to total governmental objectives and programs.
2. View federal highway programs as supporting other federal goals and objectives. The advantage of this option is that it could identify closely with governmental policies and goals. Its main disadvantage is that it is not particularly well defined and will vary from time to time.

For either option, the Canadian Highway Systems Study has been valuable. It permitted the provinces to know the federal approach to highways, to accept a need for federal presence, to develop the Canadian Highway System, and to accept the legitimacy of federal involvement in highways. This is extremely important since for either option provincial cooperation and coordination are absolutely necessary to achieve common goals and to maintain the continuity of provincial priorities.

As a result of the study the following recommendations were made:

1. Accept the policy option that federal highway programs support other federal

goals and objectives,

2. Have the Minister of Transport continue to be responsible for federal highway policy,

3. Approve the organization of an Interdepartmental Highway Committee to review proposed highway expenditures by all departments of government and to report annually to the Cabinet on all highway activities by the federal government and the achievement of specific objectives of such activities, and

4. Approve guidelines to evaluate highway proposals submitted for federal cost-sharing.

As a follow-up to the Canadian Highway Systems Study, the following socioeconomic criteria were recognized as a basis for evaluation of highway proposals: accessibility to selected areas, promotion of economic development opportunity, elimination of social isolation and provision of mobility, improvement of regional infrastructures, access to recreational areas, and improvement of cultural ties.

The Interdepartmental Highway Committee was created and is chaired by the Ministry of Transport. It has core members from the departments of Transport, Indian and Northern Affairs, Regional Economic Expansion, and Finance, the Treasury Board, and the Privy Council Office and advisory members who represent the departments of Public Works, Urban Affairs, Environment, Energy, Mines and Resources, and Industry, Trade and Commerce and the Canadian Transport Commission. The core members represent the departments with an ongoing concern in all major highway programs, and the advisory members have an ancillary or technical interest only.

One example of a highway program that was developed as a follow-up to the Canadian Highway Systems Study and that originated from the Western Economic Opportunities Conference Agreement is the Highway Strengthening Program in the provinces of Alberta, Saskatchewan, and Manitoba. This program was based on the fact that the provinces of British Columbia and Ontario had permissible gross vehicle weights of 110,000 lb (49 500 kg) and single axle loads of 20,000 lb (9000 kg) and the provinces of Alberta, Saskatchewan, and Manitoba were restricted to maximum gross vehicle weights of 74,000 lb (33 300 kg) and single axle loads of 18,000 lb (8100 kg). By an agreement with the 3 prairie provinces, the truck load limit was raised to a uniform 110,000 lb (49 500 kg) between Ontario and British Columbia and the maximum single axle weight was increased to 20,000 lb (9000 kg). As its contribution to this program, the federal government agreed to provide grants to the 3 provinces over 5 years amounting to $78.5 million.

Another example is the Western Northlands Roadway Program in the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba. This program is jointly funded by the respective provinces and the Canada Ministry of Transport and Department of Regional Economic Expansion. Its purpose is to provide highway infrastructure support for the economic development or social development of the northern portions of the 4 provinces. Interim agreements have been concluded providing an annual payment of $5 million per province. Part of these funds will be used to develop a Northern Transportation Development Program estimated to cost $200 million during 10 years.

Transportation in Developing Countries: Some Sensitivity Considerations

S. Dick Sargon, C. E. Maguire, Inc.

The paper discusses some sensitivity considerations, such as integration of land use and transport, development, and public transportation, used in evaluating transportation in developing countries. In assessing needs, evaluating transport developments, and comparing impacts, policy makers in the developing countries have had to work with only a limited background of statistical information and economic research. Thus, the paper is not a statistical information source, but rather stresses the need for improvement in collection and refinement of transportation data. Transport planning is still in its infancy in these countries and is developing through experience. A large gap exists between planning and execution. The paper presents a number of needs and recommendations for discussion, for example, the need in the developing nations to enhance the concept of comprehensive and balanced transportation planning and development.

The wheel and the rivers have been the backbone of communication of the early civilizations of the Middle and Far East and even Africa. These areas, known as the developing countries, face a new age of transition (1). The forthcoming transition (no more than one generation) will equal the total changes that have taken place in the long history of these nations. The challenges facing these nations are uniquely different from those facing the Western world. Transport routes in themselves and the centers they serve have not changed in many years. The sudden and explosive rise in national income in some of these nations allows them for the first time to stabilize their population explosion, eliminate illiteracy, expand health and social services, and place themselves on the road of long-term survival. Thus, they view transportation as an essential means to achieve these goals and not as an end in itself.

This paper presents some sensitivity issues in transportation for selected developing nations and relates these, wherever possible, to the U.S. scene. The question facing transport policy makers today is not whether to have strategies for moving people and goods but rather what kind of strategies are most appropriate to cope with problems common to the United States, the industrialized world, and the developing nations regardless of their "time lag" in change. Thus, the purpose of the paper is to reflect the needs and development potential of transportation facilities in these countries.

BACKGROUND

The data presented in this report are often approximate and give a broad indication of the scale of activities and trends rather than precise figures. In fact, as a first indication of need and an area of extreme importance, this paper stresses the need for improvements in collection and refinement of transportation data bases and further supports research into the fundamental characteristics of transport in developing countries (2).

Nine countries account for 80 percent of all passenger vehicles (automobiles and buses) in the world. The percentage each country has of passenger vehicles in its region in 1970 was as follows (3):

Country	Region	Percentage
United States	North America	91
Brazil	South America	46
South Africa	Africa	48
Japan	Asia	72
France, West Germany, and United Kingdom	Europe	71
Australia	Oceania	80
Not available	U.S.S.R.	—

Development plans in the developing countries emphasize both development of and need for increased transportation facilities.

The Plan Organization in Iran, strengthened with newly acquired oil revenues and entrusted with the direction and implementation of the latest development plan, has taken measures to develop 6500 km of new roads and highways, 12 000 km of secondary and feeder roads, 730 km of railroads, a new Tehran international airport, 960,000 new dwelling units in urban and rural areas, 1.8 million new jobs, a program to make 7.4 million persons literate, an annual controlled water supply of 9.5 Gm^3, a program to provide 1 telephone for every 33 citizens, and extensive social and health delivery systems.

Saudi Arabia's 5-year plan of May 1975 calls for a total $140 billion investment by the government. The Central Planning Organization, with the assistance of Stanford Research Institute of the United States, has developed a plan that includes 4000 km of paved roads, 1040 km of city streets, a public transit system between Jedda and Mecca, 15 airports, 100,000 housing units for first 5-year plan, new urban and city expansion programs, 1.8 Tg increase in port capacity, 15 public hospitals, 8 sewage networks, extensive industrial development (steel mills, fertilizer plants), and extensive water supply network and seawater desalting.

Iraq plans huge investments to improve water supplies, an extensive land reclamation effort, and a unified roadway network (4, 5, 6, 7, 8).

SENSITIVITY CONSIDERATIONS

In assessing needs, evaluating transport developments, and comparing impacts, we should recognize the terms of reference and limitations that the policy makers in developing countries have set for themselves. Many of the plans have been developed with a relatively limited background of statistical information and economic research. They identify inadequacies and attempt to induce improvements in projections and ultimately accelerate implementation. Transport planning in these countries is still in its infancy and evolving through experience. There is a large gap between planning and execution. The following is a discussion of some sensitivity considerations in evaluating transportation in developing countries.

Transport Management and Positive Planning

In the execution of transportation planning and development, the administrative framework departs significantly from U.S. practice but not from European practice. Overall planning starts at the national level with the development of national criteria for transport development. In many instances, it is even multinational. The role of local and

even regional jurisdictions is normally operations oriented, that is, carrying out the plan. For any area or region, transport policies and plans are drawn up as a schedule of planned objectives for the area's role in supranational, national, and regional contexts. This is especially true in Iraq, Iran, Kuwait, Lebanon, and several African nations. Transport planning and development are closely tied to the overall general plan. Personal mobility and goods movement routes are an integral element of the plan of development. Transportation is one of several uses of land. This approach in administering transportation development is similar to that in many European countries, especially Western Germany and the United Kingdom (8).

In the United States, efforts toward setting up regional administrative frameworks for transportation planning and development are succeeding under the umbrellas of councils of governments and occasionally metropolitan planning organizations. In the field of aviation, the developing countries, especially the Arab nations, are showing the rest of the airline world how things should be done. They have persuaded their members to agree on an open-sky policy for airline service among them, to hold the line on fares, and to observe the ethics of reasonable capacity.

Integration of Land Use and Transportation Development

Transportation and land use development follow and are truly an indispensable element of a public investment plan—the general plan—in the developing countries. Invariably, integrating transportation and land use is discussed not as mandatory and desirable but rather as a matter of fact. Both are one and the same—elements of a universal development model. Thus, transportation at this stage in the developing countries is perceived as a developmental tool. Transportation and other public services provide support for enhancing economic opportunities (i.e., opening land uses). The completion of the Iran-Turkey and Eastern Europe railroad network and the development of the Trans-Arab road network are intended in totality as an instrument of economic development (Figure 1).

Public Transportation

There seems to be an acute shortage of organized public transport both for passengers and for goods. Present regulations, restrictions, physical limitations, and other barriers make this means of transport inefficient (thus expensive), unorganized, and in many instances unreliable. However, it seems necessary in the developing countries, especially in the large urban areas (basically monocentric cities such as Tehran and Baghdad) to formulate the land use and transport models in which the conditions for maximum capacity exploitation of public transportation are met. With extremely low vehicle ownership (due to several reasons including low income per capita), an opportunity to effectuate an integrated public transportation corridor and land use policy, reduce the staggering accident rates (Table 1, 9), and eliminate the undetected and often unrealized environmental problems can be a reality in a short period.

The developing countries come nearest of any culture in believing and accepting that transportation is a public service and hence should be "free." Subsidies—capital and operational—have long been in effect in many of these countries. The public transport system is augmented by some unique private services. In Iraq and Iran, and especially in Baghdad and Tehran, share-a-taxi, double decker suburban bus service, jitney services, and a publico system (similar to that in some of the cities in Puerto Rico) have been operating since the early fifties. Of course, pedestrianism is a way of life rather than a lost art.

The investment of many governments of the developing countries in public transportation is conceived as being beyond realizing only user benefits. In my opinion, free transportation is accepted, if necessary, by the authorities as a public service (moral) obligation with attendant economic, land use, and environmental benefits.

Figure 1. Inter-Arab States regional network of roads.

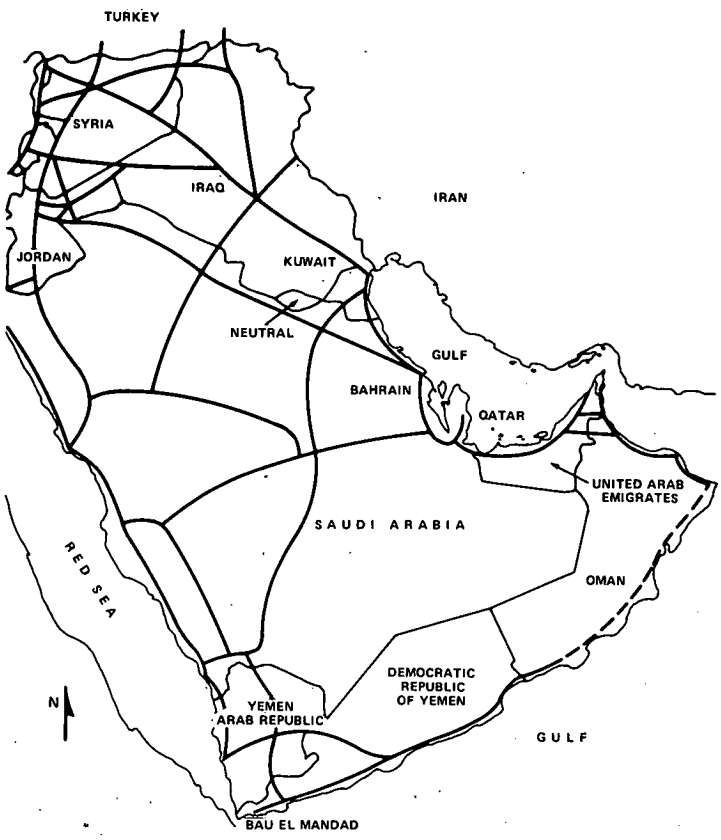

Table 1. 1968 population, vehicle ownership, and accident rates of selected countries.

Country	Population	Vehicles	Vehicles per Person	Fatalities per 10,000 Vehicles	Injuries per 10,000 Vehicles	Severity Index
Australia	12,173,000	4,463,000	0.367	7.58	184.20	0.040
Chile	9,351,000	283,240	0.031	51.00	849.00	5.68
Great Britain	55,283,000	14,446,000	0.261	4.71	237.02	0.020
Jamaica	1,791,000	65,000	0.036	42.73	792.50	0.051
Japan	100,510,000	12,870,000	0.128	12.46	643.41	0.51
India	501,760,000	1,153,586	0.002	84.00	445.00	15.93
Indonesia	114,640,000	623,174	0.006	37.00	177.00	17.45
Iraq	8,766,000	138,406	0.016	60.00	114.00	34.36
Kenya	10,209,000	101,972	0.010	65.70	483.30	11.97
Kuwait	700,000	134,188	0.192	15.00	195.00	7.28
Pakistan	113,000,000	203,165	0.002	81.00	252.00	24.34
Portugal	8,994,000	738,229		16.00	319.00	4.79
New Zealand	2,776,000	1,100,000	0.396	4.75	160.89	0.029
South Africa	19,167,000	1,929,000	0.101	30.00	283.00	9.63
Syria	5,460,000	50,747	0.010	66.00	328.00	16.83
United States	201,152,000	108,000,000	0.537	5.11	185.19	0.027
Uganda	8,000,000	51,000	0.006	100.80	889.41	0.100
Yugoslavia	20,154,000	893,555	0.043	30.00	433.00	6.52

Public Acceptance and Involvement in Transport Policy and Development Formulation

At this stage in the development of transportation facilities in the developing countries, open planning is perceived as being time and cost intensive and at best as having an uncertain outcome. The task of stimulating a sizable proportion of the public out of its apathy has proved deceptively difficult in public involvement processes in the United States and Europe. In the developing countries, the citizen participation process is not foreseen for some time. Even at the official level, the process is vertical and involves little communication.

Quantification of Transportation Impacts

At this stage in the progress of development in developing countries, improvement in the transportation system will not necessarily contribute to a decline in the quality of life. Any transport improvement is worth the cost. A larger population (due to the current and projected birth rates) coupled with improvement in the transport system may mean greater possibilities for division of labor and economics of scale. These possibilities in turn contribute to the growth of income per capita, to better education, and ultimately to better levels of living. But beyond a certain point, quantity and quality become competitive. These countries have yet to reach this point.

One of the main deficiencies of road planning in developing countries is that, in the establishment of investment priorities, quantitative consideration is given only to a relatively small proportion of the whole system. Estimation of the need for improvements to the major portion of the transportation system cannot be considered because of the cost. If this situation is to be changed, then simple methods of identifying areas of transport deficiency are recommended. It is evident (in my opinion) that maximum benefits in all 4 categories are accrued with almost any transport improvement in these countries at this stage of development.

For example, in studies undertaken in Europe and the United States, the value of a vehicle driver's time is perceived to be double the average hourly income for work trips and slightly above the average hourly income for nonwork trips. In the developing countries, the perception of the value of road use time and cost, in most cases, is nonexistent. A value has to be subjectively selected for use in the classical economic benefit-cost analyses (10).

Quantification of user impacts in these countries is a significant sensitivity issue. Review of accident rates (Table 1) in developing countries may at first seem relatively insignificant compared with the more immediate problems of malnutrition, lack of education, and the scarcity of financial and economic resources. Although it is true that the loss and suffering resulting from road accidents are small compared with that caused by poverty and sickness, the problem is more serious than the present figures alone indicate, for a number of reasons (9).

1. The loss to a developing country in economic terms from road fatality may be greater than at first appears since the population involved is not a representative cross section. Many of the fatalities occur to vehicle users, who generally come from the small minority of educated people—statesmen, doctors, teachers, and businessmen whose loss to the country is serious.
2. In developing countries, vehicle ownership, although at present low, is increasing rapidly and will be accompanied by a rapid increase in the total number of accidents, although not necessarily in the same proportion.
3. Countries should give thought to improving the road accident situation while they are in a relatively early stage of development since it is easier to incorporate safety features into roads during construction than afterwards. Furthermore, changes in attitudes and policy on road safety made at an early stage in development are likely to have a profound and continuing influence on the rate at which road accidents increase as road traffic increases.

Case studies of methods of quantifying socioeconomic and environmental impacts in the developing countries are limited. The nature of transportation developments (e.g., roads) has been primarily in open areas, and hence they are mostly considered as developmental highways. The difficulty in determining and quantifying impacts will be a serious issue since transportation is a service without which investment in other sectors of the economy of these countries would be useless. A significant case study of interest for comparative reasons will be the methodology used in impact determination and quantification for the proposed subway system in Tehran, one of the first in any urban area of a developing country.

NEEDS AND CONCLUDING REMARKS

It is evident that the developing countries will be significantly different in terms of their mobility needs in the last quarter of the twentieth century. Analysis of past trends has revealed several gaps and requirements in the transportation data base, travel behavior, and people and goods movement. As different regions in the world have differing needs and rates of growth of transportation by various modes, so does each developing country differ in its needs and requirements. Some of these nations, because of their sudden and expanded national gross income, will be able to plan and implement their overall plan (including transport) much faster than others. These include Iran, Iraq, Saudi Arabia and most of the Middle East, Nigeria, South Africa, Algeria, Libya, and Venezuela. The following conclusions, needs, and recommendations are presented for discussion.

1. World energy supply problems will affect the developed and the developing countries.
2. Price and control of fuel will reduce amounts of transportation or rates of economic growth in almost all the world. Oil-producing countries, including Iran, Iraq, Saudi Arabia, Kuwait, Nigeria, Venezuela, and North Africa, will, however, in my opinion, have the most explosive decade (1975-1985) in their history.
3. Estimates of vehicle ownership, travel needs, and transportation network parameters will have to be restudied and evaluated in a new light. Transport development will parallel growth in the country's economy and will have to compete with the need for housing, medical facilities, education, and industrial development.
4. The concern for the environment will tend to be global. In fact, Iran, Iraq, Saudi Arabia, and other developing countries have taken some steps to control and enhance the quality of the environment in some of their regions through advancement of regional parks concepts, water pollution control, and other programs.
5. In the field of transportation, the largest need in the developing nations is to enhance the concept of comprehensive and balanced transportation planning and development. Technical expertise has to be accelerated, and impact issues should crystallize soon. To this effect, assistance from the outside has been continual. In fact, the Federal Highway Administration of the U.S. Department of Transportation is currently under an agreement of cooperation with the Iran Ministry of Roads and Transport to provide technical assistance in the fields of highway planning, design, construction, research, and maintenance.
6. Two of the most pressing needs in the developing countries are (a) the implementation of their "developmental" highways to realize full economic potential and (b) the reduction of congestion in their urban centers, such as Tehran and Lagos. For example, to effectuate the second requirement, a public transportation system is advocated. Tehran is currently planning its subway system, and Baghdad is committed to expanded bus transportation.
7. Growth of international trade will be reflected in high growth rates for goods movement by road, air, and sea. In the developing countries and regions, this challenge is to be approached on a multinational (regional) basis. Trans-Arab road network, Iran-Turkey and Eastern Europe railroad network, inter-African roadways, and Pan American highways are only the beginning of a continuous, integrated, global trans-

port network.

8. The current birth rate in some of the developing countries will necessitate the advancement of the concept of new towns or new towns-in-town to accommodate the population in the next 20 years. Because of low vehicle ownership (current and projected), this paper advocates a serious attempt to develop for these new towns unique transportation networks that are efficient, economic, and safe and that accommodate the unique cultures of each of the countries.

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