Urban Transportation Management Challenges

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This discussion will focus on managing the infrastructure of the transportation system, urban congestion, financial needs, and human resources.

INFRASTRUCTURE

The condition of the nation's infrastructure has been the subject of several major studies in recent years. As could be expected, Canada has similar problems concerning the condition of the infrastructure. Needs studies undertaken from the late 1970s to the present suggest four major conclusions:

- the nation's infrastructure has been maintained unevenly;
- many public facilities have not been maintained adequately and are in sufficient disrepair to pose risk to public health and safety;
- the problem is widespread, not confined to a few categories or certain cities or geographic areas; and,
- the cost of meeting future demands for public infrastructure will be very high.

Three major national studies conducted by the Association of General Contractors, the Congressional Budget Office, and the Joint Economic Committee show close agreement on the relative ranking of infrastructure needs, and transportation improvements account for between two-thirds and three-fourths of the required funding.

With the interstate system now nearing completion, the transportation professional is changing from a "builder of grand monument" of highway engineering to one who attempts to maintain and rehabilitate the highway system while under duress due to congested traffic conditions and inadequate funding.

One of the key issues concerning the condition of the infrastructure is whether to maintain the system or to construct anew. Modern maintenance practices can significantly influence the useful life of infrastructure. For example, pavement management systems have identified recommended preventative measures so that roads will not be allowed to deteriorate to poor conditions. However, the fact that federal and state governments bear a larger share of the replacement cost than of the maintenance cost of infrastructure reduces the incentives for local government to consider cost-effective, life-prolonging maintenance. Similarly, when operating costs are not subject to grant programs but construction costs are, local governments have a strong incentive to choose capital-intensive solutions to infrastructure problems.

Thus, one of the major challenges of the transportation professional is the management of the transportation infrastructure under conditions of reduced levels of funding, funding programs that are biased toward new construction or
reconstruction rather than life-extending maintenance, and high traffic flows, making roadway maintenance and reconstruction activities complex.

**URBAN TRAFFIC CONGESTION**

In many metropolitan areas in North America, public opinion surveys indicate that traffic congestion has superseded crime, housing, and pollution as the number one concern. The worsening traffic congestion problem is diminishing air quality, wasting fuel, and dampening economic growth. Urban areas in North America are experiencing a second suburban migration. Four decades ago, with the increasing predominance of the automobile as the major mode of ground transportation, families escaped the central city to establish roots in the suburban areas. Today, employment and commercial opportunities are migrating to the suburban areas, creating nodes of higher density development. These might be called "cities within a city". The resultant impact on travel patterns is that trip origins and destinations are widely dispersed; more and more trips begin and end in the suburbs. Travel patterns are beginning to resemble Brownian motion in that they appear random in nature and go in every direction at once. Strategies to address this urban congestion condition can be broadly subdivided into three areas:

- increased investment in the transportation system;
- traffic management programs; and,
- institutional approaches.

The level of funding made available to address traffic congestion problems needs to be more equitable at all levels of government. For example, the current federal-aid urban system comprises 3.5 percent of the highway mileage; it carries about 22 percent of the vehicle miles travelled in this nation, but it receives only about 7 percent of the funds dispersed from the highway trust fund.

Given the mature highway system and the reduced level of funding, the transportation professional will need to become a traffic congestion management specialist. This specialist needs to be an amalgam of a transportation planner, a traffic operations expert, a negotiator, and a communicator.

Urban congestion needs to be approached on a regional basis. A new generation of traffic control systems will be required to cope with the regional traffic congestion problems. This new system, the fourth scenario, will have to take a wide-area view of the traffic situation, coupled with an automatic decision-making capability using methods of artificial intelligence and expert systems. Many innovative and advanced transportation system technologies are currently being developed. The features of the fourth generation traffic control system, as suggested by Davies and Ayland in a recent presentation at the Transportation Research Board (T.R.B.) meeting, are as follows:

- integration of traffic signal control systems with other control systems, e.g., freeway surveillance and control systems, H.O.V. lanes, etc.;
- prompt detection of and response to events;
- ability to predict and respond to origin-destination information to accommodate priority patterns or detours resulting from incidents or construction zones;
- integration with vehicle location/identification/classification systems;
inclusion of artificial intelligence/expert system features to increase flexibility and to reduce the labour-intensive aspects of conventional control centres;
accommodation of demand control and congestion pricing;
flexibility to accommodate different control objectives in different parts of an urban area or during different time periods;
real time communications with motorists;
inclusion of visual surveillance;
variable speed control; and,
provision for headway control.

These features present a tall order for the traffic control system specialists, and they are a major challenge to those involved in the planning, programming, and development of new traffic control equipment and software.

Similarly, there will need to be coordinated jurisdictional approaches to urban traffic congestion. The traffic congestion problems of previous decades resided within the central city, and thus they were the domain of one governmental unit. Boundaries of most metropolitan areas have grown to encompass multiple local jurisdictions and often include two or more states. Current urban traffic congestion haunts these suburban areas.

The federal and state governments are being asked to take part in a broad range of local issues. However, recent hints from Capitol Hill suggest that the responsibility for most or all of the road system be returned to the states. U.S. Transportation Secretary Jim Burnley recently stated that "when the interstate system is completed, most of the future highway needs of the United States will be local in nature and will not require federal involvement". Should this policy be implemented, the state transportation professionals will be on the "front line", working with the city, county, and other regional agencies to address current transportation problems.

In most metropolitan areas of the United States, there is usually only one transportation agency that spans the entire region and this is the Metropolitan Planning Organization (M.P.O.). However, this agency has only planning responsibilities with little direct involvement in transportation system improvement implementation. Therefore, one of the major challenges of urban transportation management is the need for a coordinated approach to planning, the implementation of transportation system improvements, and the operation of the system. This may involve one or more of the following organizational mechanisms:
close coordination/cooperation between state, county, and urban governments;
implementation of a regional government for infrastructure;
development of a regional transportation authority involving all affected governmental units and, perhaps, private interests; and,
the need to upgrade the role and status of the traffic engineering unit in local government.

TRANSPORTATION SYSTEM FUNDING

Finding the funds to address current transportation problems will be another major challenge for the transportation professional. The current effort to reduce government debt levels will require the transportation professional to become
more and more vigilant in ways to save the taxpayers' dollars, to spend money as wisely as possible, and to be more innovative in finding sources of funding.

The primary mechanisms used to fund public works are as follows:
- direct user fees and charges, e.g., highway tolls;
- dedicated revenues, e.g., gas taxes;
- impact and developer fees; and,
- real property tax.

Highway construction, with its heavy initial investment, long-term use, and relatively stable user group, is a logical candidate for toll financing. However, there are restrictions on the use of federal funds for developing toll roads on federal-aid projects. The Institute of Traffic Engineers (I.T.E.) has recommended that such restrictions be lifted and Senator Chiles of Florida introduced a bill last year that would have removed many of these restrictions on toll facilities.

Currently, the combined federal and state gas taxes comprise only 17 percent of the total price of a gallon of gasoline. Four decades ago, the combined gas tax represented more than 25 percent of the cost of gasoline. Therefore, there is room for federal and state governments to generate additional funds through this measure.

Public/private partnerships appear to be most attractive in economically healthy areas where there is sufficient private interest in expanding public works capacity to allow development permits to be issued and where development makes adequate revenue available. Current experience indicates that this source of funding is relatively small, comprising less than 10 percent of the local funding needs.

Furthermore, current funding trends suggest that state and local governments may need to use their own sources of revenue to fund larger proportions of public works in the future. Property tax is a major source of revenue for local governments. Overall, more emphasis should be given to feasible, innovative financing techniques at the state and local levels.

Over the years, highway transportation has evolved through three stages:
- getting out of the mud in the 1920s and 1930s;
- capital expansion and interstate construction; and,
- maintenance and operations in the 1980s.

The primary emphasis now is on maintaining, rehabilitating, reconstructing, and operating the existing system, and special funding provisions have been made for all these with the exception of traffic operations. Therefore, the transportation professional will be taxed in many ways to secure adequate funds to finance current and future transportation system needs.

HUMAN RESOURCES

As more attention is being given to the increasing problem of traffic congestion, the need for more traffic operations engineers and technicians in state and local agencies will increase. A recent T.R.B. report to Congress, entitled "Transportation Professional Needs Study", indicated that the glamour of building totally new systems has been lost and replaced by the more mundane concerns of making the best use of existing resources. This change in the transportation professional's environment seems to have resulted in both public employers and universities having difficulty in attracting top-quality applicants to transportation
in the face of the highly publicized challenges in other fields. The T.R.B. report concludes that there is a need for more traffic operations and control skills in local and regional agencies due to the large number of current professionals expected to retire, the reduction in university graduates, and the increasing urban congestion problem.

Therefore, there is a need to place increased emphasis on education, training, and retention of traffic and transportation professionals for state and local agencies. I.T.E. has proposed that:

- one percent of the annual federal-aid urban system authorization be set aside for education and training of traffic operations personnel; and,
- the establishment of a $10 million per year fund for education and training of transportation professionals.

Coupled with these programs are needs for career guidance, regular contacts between transportation professionals and the students in the university engineering schools, summer employment programs, and other similar activities.

SUMMARY

In closing, the significant challenges that face the transportation professional in managing the transportation system pertain to:

- an infrastructure system that is mature and in need of reconstruction, rehabilitation, and maintenance, while the system is subject to heavy traffic flows;
- the increasing phenomenon of urban traffic congestion resulting in a need for increased highway funding in a period of governments' attempts to reduce levels of debt, fourth generation traffic control systems to be developed to address traffic problems on a regional level, coordinated jurisdiction approaches to address current problems and to implement transportation system improvements, and upgrading the status and role of traffic engineering units;
- greater emphasis on state and local governments to be responsible for the highway system resulting in the need for more innovative financing techniques;
- finding funding sources in a period of debt-reduction strategies; and,
- finding the trained traffic operations personnel and transportation professionals which are required at state and local levels of government.

BIBLIOGRAPHY


