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**FINANCING SCHEMES OF TRANSPORT INFRASTRUCTURE**

Note: The attached document is the reprint of Chapter 10 of the final report of the Canada Transportation Act Review Panel. The Review Panel, constituted under Section 53 of the Canada Transportation Act, has initiated a comprehensive examination of the operation of the Act and related legislation. The Panel assessed the overall effectiveness of the current legislative framework to provide the basis for the kind of transportation system which Canadians need. In conducting its assessment, the Panel consulted with purchasers and suppliers of transportation services and other parties as appropriate. The Review Panel made recommendations as necessary and desirable relative to the national transportation policy and the legislation.

## **The Network and the traffic it carries**

Roads — and the cars, trucks and buses that use them — are the core of the transportation system and likely to remain so for the foreseeable future. In a country with Canada's dimensions and dispersal of activities, aircraft, urban transit, trains and ships play crucial roles in carrying passengers and freight, but roads continue to carry most of the traffic. Most passenger travel is entirely by road, using private vehicles, or, much less frequently, bus service (urban transit, school, chartered or scheduled intercity buses). Of all freight traffic, something approaching half makes its entire journey by truck, and most of the remainder that is hauled by train, ship or aircraft relies on truck transport at one or both ends of its trip.

Canada's public road network extends about 900,000 kilometres.<sup>1</sup> Only about 15,000 km are owned and maintained by the federal Government, mostly minor roads in parks and on other Government property. The Trans-Canada Highway — stretching 7,500 km — was designated in 1949 and its initial upgrading paid for by the federal Government, but it remains under provincial ownership. Some 231,000 km of the national network are owned by provinces and territories, mainly higher-capacity primary or secondary highways, including the segments of major highways running through urban areas.

The remaining 655,000 km are owned and maintained by municipal Governments, including streets and arterials in towns and cities, as well as the extensive sub-network of rural access roads. These latter roads naturally reflect settlement patterns and are particularly extensive across the Prairie provinces, which together have more than half the country's roads, serving their dispersed rural communities. About 65% of the national network is unpaved, in particular much of the rural access network. There are also about 32,000 lane-km of limited-access highways, including rural freeways and urban expressways and some 344 route-km of toll roads.

## **Traffic Trends**

Road traffic totals an estimated 270 billion kilometers annually.<sup>2</sup> It is dispersed very unevenly: an estimated three-quarters of all traffic travels on just one-quarter of the network and 40% travels on just 5%. This includes the 16-lane stretch of Highway 401 through Toronto, which vies with California's Santa Monica Freeway as the busiest road on earth and handles 350,000 vehicles daily — the equivalent of all lanes operating at full capacity for more than 11 hours daily. By contrast, most of the provincial highway network — including substantial stretches of the Trans-Canada Highway — sees fewer than 3,000 vehicles a day, when all have the capacity to handle that many vehicles in an hour. Municipal rural access roads handle much less traffic, of course — probably fewer than a hundred vehicles daily on average.

The road network and its capacity continue to grow. Rapid growth of residential suburbs, along with the more recent phenomenon of dispersing commercial activity away from city centers, have been facilitated by extending the road network, by streets and arterials in newly developed areas, and often by urban expressways linking them to city centers. The intercity network has also expanded, mainly through additional lanes on existing highways, but also through new high-capacity links replacing older secondary roads. The capacity of existing links has also been increased in other ways, including upgraded alignments, added paved shoulders, and continued paving of additional parts of the extensive network of rural gravel roads.

Road traffic is increasing fast. Traffic has expanded almost continuously since automobiles were invented, arrested only briefly in the deepest of economic recessions. Most traffic is passenger travel in cars and light trucks,<sup>3</sup> which has expanded at a faster rate than population or national output. Over many recent decades, truck traffic grew at a rate similar to or slightly less than national output (as might be expected, since the economy expanded largely through the growth of services). But in most of the last decade, truck traffic has grown faster even than the booming general economy, under the twin stimuli of innovations in logistics management and North American free trade.

Traffic has certainly grown faster than the capacity of the network, and faster in particular than the capacity of arterial and expressway systems in and around major cities. In part, this represents a more efficient use of roads, as they have usually been built with much greater capacity than necessary to handle existing traffic and to cater to daily and seasonal peaks; they can accommodate extra traffic, especially when it shifts to off-peak times. But as traffic builds and vehicles increasingly impede each other, traffic growth may well exceed an efficient level. Congestion has become a serious problem in major cities, an impediment to activities, and an important source of added costs for commercial traffic. Congestion is also hindering passenger and truck traffic on some interurban highways, notably those in or close to larger cities and at the busier Canada/U.S. border crossings.

All the underlying trends suggest road traffic will continue to expand rapidly. Car ownership and use have usually risen faster than population, household income, and national output, so increases in all these indicators in coming decades can be expected to stimulate further traffic growth. Recent forecasts anticipate population growth of about 0.9% a year from 2000 and 2015 and annual GDP growth of about 2.4%.<sup>4</sup> If car use follows past patterns, it can be expected to grow by more than the latter figure, or by close to 3% a year. At that rate, total car use would be 50 to 60% higher in 2015 than in 2000. Those that argue this is unlikely — because car ownership must be nearing 'saturation' — need look no further than the United States, where the average number of vehicles per person is about 30% higher than in Canada and still rising. (The average is now greater than one vehicle per person in several states, while in Canada it still averages less than 0.6.<sup>5</sup>) Forecasts of rapid population growth for the largest cities also suggest accelerated growth in car traffic — if, as seems likely, growth continues to be accommodated by expanding suburbs with lower residential density, greater distances to workplaces and services, and less access to public transit than in older residential areas.<sup>6</sup>

Truck traffic also appears destined to grow substantially. It will not likely match the pace of the last decade, when logistics restructuring and NAFTA played such important roles. But federal forecasts are still that trucking growth will be faster than growth in rail or marine freight tonnage, at about 1.9% a year. This would imply a one-third increase in trucking tonnage between 2000 and 2015.<sup>7</sup> Furthermore, if recent trends toward general dispersal of markets and smaller shipment sizes continue, truck traffic in vehicle-kilometers will grow even more than tonnage.

## **Funding the Network**

Governments have recently spent about \$11.6 billion a year on roads; if private toll facilities are included, annual spending approaches \$12 billion. This includes most construction and maintenance and much of the spending on enforcement, safety and policy activity.<sup>8</sup> These amounts are not quite the same as 'road costs' as a business would calculate them. A business would recognize that some expenses (maybe half) are capital costs — that is, expenditures on assets that will be around for a long time — and would use an amortization schedule, based on the projected life of the assets, to account for depreciation. Governments do not normally account for capital assets this way, but simply include capital spending with operational spending.

The most common way of paying for roads is to use general tax revenues — that is, tax revenues collected without specifying a designated use. At the federal, provincial and territorial levels, this means that roads are paid for mainly out of annual appropriations from consolidated revenue funds. At the local level, roads are paid for mainly from property taxes, although senior levels of Government provide grants in some areas. (Exceptions are noted later.)

Dedication of road-related taxes or fees to road uses is rare, but the amount road users pay in fees or charges can be estimated roughly. In 1998-99, for instance, users paid an estimated \$6.8 billion in provincial and territorial special motor fuel taxes, \$4 billion in federal excise taxes on road fuels, \$3.1 billion in vehicle registration and driver licence fees, and about \$0.4 billion in tolls — for a total of about \$14.3 billion a year, compared to the roughly \$12 billion spent on roads.<sup>9</sup>

Clearly, Governments are collecting more road-related revenue than they are spending directly on roads. The focus of the policy debate over road funding is that the federal Government receives the largest part of the excess revenue: its revenues from road fuel taxes are \$4 billion or more, while its recent annual spending on roads has been only about \$200-300 million. Together, then, the other levels of government are receiving about \$10 billion in direct revenues but spending nearly \$2 billion a year more than that. That shortfall is made up by local property taxes.<sup>10</sup>

Faced with these funding realities, some advocates for builders and users of roads suggest — as some did in submissions to the Panel — that the solution to congested roads is simple: use the excess revenues to build more roads, extend the network and expand the capacity of existing roads. They argue that congestion is evidence of the need to do this; reduced congestion costs — the value of the time savings to travelers and businesses — would be sufficient to justify the cost of considerable expansion. Advocates suggest that major additional benefits from roads — such as facilitating trade and economic growth and improving safety — justify upgrading the entire network.

The particular target is the federal Government's net revenues from fuel taxes. Advocates contrast Canadian practice with the U.S. Government's dedication of road use taxes and fees to a Highway Trust Fund and argue for equivalent federal action here. Others point to new institutions for funding and managing roads elsewhere, notably the innovations in New Zealand.

Provincial and territorial departments of highways and transport have supported this approach, arguing that the federal Government's excess of revenues over spending is unjustifiable. They support the claim with their National Highway Program proposal, developed initially in the late 1980s. The proposal entails designating a network of major highways — mainly those linking capitals and major border crossings or ports — as the National Highway System, with a total length of about 24,000 km. This is just 3% of the total road network, but it carries about one-

quarter of national traffic. The proposal specified uniform engineering, construction and maintenance standards for the system. Much of the existing network did not meet the standards, particularly in more remote sections (notably northern Ontario and north to the territories). The cost of upgrading was estimated at more than \$12 billion in 1989. Provincial and territorial transport ministers proposed to the federal Government a cost-shared program to undertake the work over several years. In an updated proposal in 2000, they suggested the required upgrading would cost \$17 billion, again paid for through a cost-shared program; the federal contribution would consist of 2 cents per liter of road fuel excise tax revenues. At current consumption rates, this would approach \$1 billion annually.

The federal Government has not responded formally to the proposal but has continued to provide much smaller amounts of road funding through short-term federal/provincial agreements, usually in the range of \$100 to \$200 million annually, distributed unevenly among the provinces, with no national strategy or analytical criteria to guide the amount, purpose or destination of funds. Most recently, funding of \$600 million over four years, beginning in 2002, was announced as part of the federal infrastructure program. Clearly this is only a small fraction of the amount requested.

### **Environmental Concerns**

Increasing traffic, exacerbated in urban areas by congestion, brings unwelcome social effects: emissions of air pollutants and greenhouse gases, noise and neighborhood disruption, and growing numbers of road accidents. These are also important political concerns, both for their immediate impact on health and the quality of urban life and for their potentially larger long-term implications. They have generated an important debate about whether existing trends in transportation, and road use in particular, are sustainable: can the natural environment withstand them, and will resources — vehicle manufacturing materials, fuel, land — remain available to permit them. Sustainable development has become a stated goal of all levels of government, and a key question is whether road use must be deliberately curbed to achieve it.

That question is prompted partly by the availability of alternatives that might be much more sustainable. Walking, biking and using public transit could replace some urban mobility, reducing congestion and environmental impacts. Buses, and potentially trains,<sup>11</sup> could replace some intercity car (and aircraft) use, again with less environmental impact. Trains and ships could replace some truck use for freight. Some road use might be avoided relatively easily, without switching modes, by combining car trips or raising truck productivity by increasing loading or reducing empty running.

The fact that Canadians are not adopting these alternatives to a greater extent — especially when they would often be cheaper in terms of out-of-pocket costs — shows how much users value the service qualities they get from cars and trucks: speed, convenience, flexibility, reliability and comfort. But it also reflects the fact that road users do not have to cover the whole cost of road use, because of the way governments fund road infrastructure, and because most users do not have to deal personally with some of the unwelcome social effects. If they had to do so — if road users were charged directly on each trip for the cost of maintaining the road network, as well as for the costs of congestion, environmental damage and accident risks that their road use imposes on others — it seems likely that their choices would change and more of the alternatives would be used. This possibility poses crucial policy issues for Governments at all levels.

### **Appropriate Charging for Road Use**

Economists suggest that achieving the efficient amount of road use — and balanced use among all modes — is a question of charging users for the real costs they impose. The technology to permit direct charging exists — as, for example, on Ontario's Highway 407 and many other facilities worldwide — and is developing rapidly. The major obstacles include uncertainties about what the costs and charges should be and, more important, lack of consensus that users should be held responsible for costs.

### ***Infrastructure Costs***

Making users responsible for costs means, first, that users would pay incremental infrastructure costs — the actual amount of road wear the vehicle imposed, valued at the cost of replacing it. This can be estimated from engineering relationships and varies radically with the type of road construction and vehicle characteristics — principally the number of axles and their loads (which determine road surface and structural wear) and the total weight of the vehicle (particularly important in bridge wear). In other words, the cost would be much higher for a truck than a car; for trucks with similar loads it would be higher for one with fewer axles; and for any given truck it would be higher when loaded than when empty.

Then there is the question of how to cover the joint or common costs of roads. As with railways, some large components of road capital costs do not vary with traffic, including some construction costs (land, clearing, grading), as well as significant amounts of deterioration that result from time and weather. The latter are particularly large as a proportion of total wear for more lightly used highways and rural access roads — perhaps as much as 80% of total deterioration.<sup>12</sup> Also invariant with traffic are the opportunity costs of the capital employed in roads, which modal equity would suggest should be represented in charges for roads, as they are for private rail and should be for other publicly funded infrastructure, notably airports and ports.

Whether and how these common costs should be charged to users are as thorny questions for road infrastructure as they are for rail infrastructure. In principle, a differential pricing scheme for roads, based on the value of service, could be economically efficient, as for rail track. But this is an academic abstraction in the absence of controlled access to roads. The efficient solution proposed for roads, and already partially approached in current practice, is to cover common costs through annual network access fees — like motor vehicle licenses.

No thorough analysis of road costs and traffic has ever been undertaken in Canada to reveal how incremental infrastructure costs vary by class of vehicle and class of road and how common costs might be met through annual charges. Such a study would be a prerequisite for designing efficient charges. It would also remedy the perennial lack of data.

### ***Social Costs***

Next, road users would need to face the congestion, accident and environmental costs they impose, even if they do not suffer themselves. Economists refer to these as 'external effects', or 'externalities', meaning that the people who create them do not take them into account (or 'internalize' them) in their decisions. The obvious practical problem is that few of these 'costs' have a dollar value; instead they involve some sort of discomfort or inconvenience — difficult even to measure. Nevertheless, financial values can be inferred for them, for example, by observing the amount of money people are willing to pay to avoid the effects or are willing or accept in compensation for them.

There is considerable research along these lines, but the magnitude and value of external costs remain a source of debate; environmental advocates and community defenders tend to propose much higher values than advocates for road users. The range is broad, with the greatest disagreements centering on the values to be attached to environmental damage and accident risks (although the largest component would probably be time losses resulting from congestion). Costs would naturally be location-specific and time-specific, because congestion changes rapidly and, like emissions and accident risks, varies by location and time. (Examples: damage costs per unit of emission of ozone precursors would vary by season; serious accident risk would probably vary inversely with congestion.) Costs would undoubtedly be much larger in urban areas than on rural highways or local access roads, where they might indeed be negligible. They would be highest in and around major cities, where congestion and air pollution problems are greatest, but even in those locations, they would vary substantially by time of day and season.

Again, incorporating these costs in practical road charging schemes would require further serious work to gain consensus on acceptable amounts and to identify how they vary with vehicle type and traffic conditions.

### ***An Efficient Charging Scheme***

In summary, an efficient scheme to charge for road use, combining infrastructure and externality costs, would vary by type of vehicle, type of road, time of day and season. Annual license fees might be higher than currently, to cover fixed costs. Charges would likely be much higher in urban areas at peak times than on intercity highways or rural access roads. They would probably be higher (relative to what users now pay in the form of fuel taxes) on secondary highways and local rural roads and lower on major highways.

In practical terms, the most obvious components of such charges would be axle-weight-kilometer charges for trucks, eventually differentiated by class of road, and congestion charges per kilometer for all vehicles in urban areas, differentiated by the amount of road space they use.

Even using minimal values for external costs, such a scheme would likely be enough to cause significant changes in road use. The most pronounced effects of congestion charges would probably be to encourage combining of car trips, or shifting them to off-peak times, while increased charges for emissions would induce shifts to more efficient vehicle technologies and alternative fuels. Urban transit would also gain some traffic, and there is potential for increased use of intercity buses as well. Importantly, charging for the full cost of road use should mean that transit would eventually no longer need general subsidies, as its relatively lower social costs

would be evident to users when they compared public transit fares that included all its social costs with charges for road use that did the same.

Charging trucks for road use would probably induce some shift in configurations, to those with lower axle loads, and further efficiencies in operation, through larger loads and greater load coordination. Some shift to train or ship, or to more intermodal trips, might also occur. An interesting detail, given the Panel's consideration of rail network issues, is that appropriate charges for Prairie road wear by grain trucks might influence producers' elevator choices and relative amounts of truck and rail use.

A system based on full charges for road use would generate revenues higher than the current cost of road wear, in that charges would include the cost of congestion and other externalities. A major technical and practical question is whether revenues from congestion charges on urban roads or streets, and from other externality charges, should be added to road investment funds.<sup>13</sup> To the extent that their purpose was strictly to induce appropriate use and modal choice, these revenues should not be spent on roads but should be added to general revenues, permitting reductions in other general taxes. Moreover, efficiency would require that alternatives in other modes that met the same objectives more cost-effectively take priority in allocating the funds.

### **Alternative Road Management and Financing**

Canada has a rich history of highway financing policies, ranging all the way from treating roads like any other privately produced commercial good to treating roads like a public good paid for by the general taxpayer. When interurban roads were first built in the nineteenth century, it was not uncommon to let private interests finance, build and operate them, just as private interests operate the major railways today. But during the twentieth century roads became the responsibility of Governments. As this happened, provinces tried different ways to pay for them. All provinces have at one time or another used various forms of earmarked or dedicated taxes, mainly vehicle registration taxes and fuel taxes. Often, they placed revenues from these taxes in a special account or road fund. Eight provinces have had road funds in the post-war period, and at least four still exist in one form or another — only one is a province-wide fund with earmarked tax revenues; the others are either dormant (they exist but are not used), small-scale (only a small group of users), or an accounting framework (no earmarked or dedicated tax revenues). Four provinces have had broad experience with using tolls to pay for roads (or bridges or tunnels).

After the Second World War, the idea that roads were public goods, to be paid for from general tax revenues, became the predominant view of road finance. The 1950s and '60s saw a resurgence in the use of tolls, notably on Quebec's autoroutes, but with some exceptions, toll roads had largely disappeared by the 1980s.

Today, methods of paying for roads that do not follow the common approach — and are putting roads on a somewhat more commercial basis — include the use of tolls, the use of urban transportation agencies with some form of taxing power or access to road user taxes, and road funds. There can be some overlap among these methods. A brief summary of where these methods are used follows.

### ***Toll Roads***

There are 19 toll facilities in Canada, 12 of which are bridges or tunnels between Ontario and the United States. Four facilities — British Columbia's Coquihalla, Cobequid Pass in Nova Scotia, Confederation Bridge, and Ontario's Highway 407 (the latter demonstrating the technology for all-electronic tolling) — have been built since 1986. The total length of these toll roads (344 kilometers, counting just half the length of the international bridges and tunnels) is not much compared to some other countries. The United States, for example, has several hundreds toll facilities with a total length of 7,589 kilometers. France has more than 6,300 kilometers of toll roads. Nevertheless, the 474,000 daily trips motorists make on Canadian toll roads and their estimated annual revenues of \$279 million constitute a significant part of total road activity. Four more toll roads are under consideration in Quebec, Ontario and British Columbia.

### ***Urban Road Agencies***

At least five major urban areas have either institutions or arrangements that result in a slightly more commercial approach to road finance. In fact, many of these new arrangements at the local level are more concerned with transit services than with roads, but in at least two areas (municipalities around Montreal and Vancouver), urban agencies have new powers to tax road

users. Three other urban areas (Calgary, Edmonton and Victoria) have access to some portion of provincial fuel tax revenues. This makes urban road financing slightly more user-pay than in the past.

### ***Road Funds***

A road fund involves administering road revenues and expenditures separately from general Government finances. At a minimum, this entails merely a separate set of accounts, but it could be extended as far as an autonomous agency responsible for funding and managing the road network.

Some provinces are experimenting with road funds where earmarked taxes or other charges are used specifically to pay for roads. Quebec uses its road fund to put a more appropriate accounting framework on road spending (though it is not funded with dedicated taxes). British Columbia established a transport capital fund in 1993, complete with a new Crown corporation, with dedicated tax revenues used to finance projects, based on evaluations using cost/benefit analysis techniques and other criteria. Saskatchewan has a small-scale road fund — it directs only the spending of permit fee revenues from some trucks — but some of its features are compelling if the goal is to put road finance on a more commercial footing. For one thing, the permit fees deposited in the fund are very specific charges that recognize vehicle characteristics and the attributes of the roads they are using. For another, road users have a say in spending the money raised.

Accurate numbers are not available, but a rough estimate suggests that these three approaches — toll roads, urban agencies and road funds — generate about \$840 million a year from taxes, fees and tolls that are more or less dedicated to road spending. This is 7% of total road spending.

Notwithstanding the current use of road funds and their historical use by at least eight provinces, no province or territory has seriously considered using a full-scale road fund as suggested by the World Bank, with the key aspects of self-sufficiency, based on charges for use, and users approval of spending decisions.

### **Road Funds as the Basis of Future Commercial Management of Roads**

The World Bank has been instrumental in prompting consideration of appropriate road management processes and has encouraged the institution of road funds in developing countries to bring discipline and efficiency to road management.<sup>14</sup> The Bank proposes that a road fund's key components should include:

- network-wide responsibility;
- financial self-sufficiency — with revenues matching spending;
- direct charges reflecting infrastructure costs and potentially congestion and other external costs;
- rational priority setting for maintenance and investments, using economic evaluation;
- independent executive authority (without political decisions on revenue allocation);
- user representation in decisions on charges and spending; and
- third-party monitoring of performance.

All these could be achieved by reorienting traditional Government approaches, but the Bank recommends a separate agency, believing that it would be more likely to pursue efficiency. More direct representation of users is crucial: users who are aware of what they are paying for would be more likely to insist that the network be maintained appropriately — but not be expanded excessively or gold-plated — and more likely to accept charges that induce cost-reducing behavior.

Some 55 countries have some form of road fund, although virtually none has all the characteristics recommended by the World Bank. Indeed, the road fund most familiar to Canadians, the Highway Trust Fund in the United States, is not among the funds recommended by the Bank. The U.S. fund in particular lacks an objective process for allocating spending to projects based on their likely benefits (as anyone observing the politicized U.S. authorization process can attest).

The country closest to Canada in an institutional sense with a road fund that meets World Bank criteria is New Zealand. Transfund New Zealand is a stand-alone government agency that finances roads and alternative modes. Its board consists of five members, two representing the national highway operating agency (Transit New Zealand), one representing road users, one local Government, and one other public interest. Its funds come from the National Roads Fund, a dedicated fund made up of revenues from road users: a fuel tax surcharge, weight-distance charges for trucks, and motor vehicle registration fees. Government still sets all fees, with advice from users, but Transfund is responsible for all spending decisions.

Road safety enforcement is a first charge on this fund. The balance of the fund is transferred to the National Roads Account, which pays for all maintenance and construction costs on state highways and contributes about 50% to the cost of approved maintenance and construction on local roads. Provision is made to fund alternatives to roads, for both freight and passengers, where other forms of transport — bus, rail, ferry or barge — may be more efficient than road transport. Transfund

also contributes between 40% and 60% of the cost of subsidized passenger transport services operated or funded by regional councils. All project proposals are compared using formal cost/benefit analysis and funded in order of priority.

An institution like Transfund embodies several principles the Panel finds commendable. The funding is transparent, and users consent to it. Spending is allocated according to objectively established priorities. Projects in other modes that address the same objectives can compete with roads projects and be funded if they are more efficient. Charges, including weight-distance fees, are related more directly to the incremental costs of infrastructure, and so induce cost-reducing decisions on vehicle configurations and use. As technology to permit location- and time-specific charging becomes more available, it could easily be adopted to fund this type of agency.

Of course, a major difference is that in New Zealand only two levels of government are involved, with the senior one having full responsibility for the agency.

### **Considerations and Recommendations**

National roads policy is at something of an impasse. Under business as usual, demand for road use is expected to keep expanding rapidly, and with it congestion, environmental and social costs. The distortions of current charging policies — promoting an over-extensive network, excessive road use, and under-use of other modes — are widely recognized, yet Governments are not considering any serious proposals for reform. The only formulated proposal on the table, the National Highway Program, calls for major expansion of funding with no change in charging.

The NHP proposal and its predecessors have now been before the federal Government, and presumably Cabinet, for many years without gaining acceptance. We can only speculate on why the proposal has been unsuccessful, but it seems likely that several interrelated issues have been important — apart from the obvious point that the Government would likely relinquish a successful source of general revenue only in the face of an overwhelming argument.

First, it seems unlikely all the spending to upgrade the national highway system would be worthwhile. The NHP proposal includes an analysis of costs against benefits, mainly in time savings and accident risk reduction, converted to plausible equivalent dollar values. This showed that overall the program's benefits would exceed its costs,<sup>15</sup> but it is probable that most of the benefits would be generated by a minority of the projects and that many, if not most projects would not show a net benefit when assessed independently.<sup>16</sup>

Consequently, there is the question of how any new national funds should be directed to projects providing the greatest benefits. These are likely to be in more congested conditions and therefore in and around urban areas, particularly the three largest — Vancouver, Toronto and Montreal. A national ordering of priorities would therefore differ substantially from the combined lists of the Governments that must co-operate in the program. This also challenges the designation of the national highway system, which includes many low-volume rural highways and excludes higher-volume ones in major population centres.

An additional question is whether there are more efficient alternatives to greater road use — either shifts to other modes or efficiencies within road use. It seems clear in particular that some urban transit investments would produce greater benefits than road investments — as the Panel suggests in Chapter 12.

### ***Reforming Transportation Funding and Management***

The Panel believes the way out of the policy impasse is for Governments to co-operate in reforming federal/provincial/territorial roads and transportation funding and management processes. The federal Government should offer to contribute to a funding and pricing solution that improves the efficiency and sustainability of the transport system. The Panel is convinced that road wear and the use of congested road space would be reduced if users were required to pay the costs directly. Investment requirements would also be reduced if the only investments undertaken were those justified by their user benefits and if alternative investments in other modes were undertaken when they produced even greater benefits. In the long term this would allow road network size and quality to be adjusted to meet the demands only of users prepared to pay the costs, as is the case for commercial transport modes.

The Panel is also convinced that the future of highway use charging includes real-time charges and that this will permit differentiation according to the vehicle characteristics and use that determine infrastructure and external costs. Moreover, immediate benefits could be gained through changes in management using existing road charges (fuel taxes and licence fees).

The Panel believes therefore that Governments should establish the institutions and procedures necessary to achieve these efficiencies. We concur with the World Bank's assessment that the necessary reforms could be achieved by reorienting Government departments responsible for administering roads and transportation, but that they are more likely to succeed if new agencies, with new mandates and powers, are created.

Agencies' mandates should include receiving revenues from road use charges and directing spending. Explicit approval of spending by the user community should be required. Users should be included in governance processes — as in the commercialized infrastructure agencies described in Chapter 9 — with at least as much involvement as in the major airports and possibly even involvement in directing the agency, as in NAV Canada. The Panel also believes that alternatives to road spending that meet the same objectives should be allowed to compete for available funds; agencies should therefore have a mandate to consider them on an objective basis.

The major issue in designing the agencies is which networks they would be responsible for. In part this is a question of which roads are sufficiently interrelated that their revenues should be pooled and their maintenance and investments planned jointly. The main highway network is the obvious candidate as the base network, especially as it could clearly be self-sustaining, relying on revenues from variable use charges and annual licence fees.<sup>17</sup> But then decisions would be needed on whether rural and urban local roads should be added. For rural local sub-networks, it seems inevitable that direct charging could not cover the costs and that either a cross-subsidy from the major network's direct charges, or alternative payments from fixed system-wide licence fees, would be necessary.

Alternatively, and notably for roads providing access to remote communities, it is possible that

direct subsidies would be warranted, rather than cross-subsidies from other roads (an issue that applies to all modes). For urban local sub-networks, on the other hand, it seems clear that surcharges for congestion and other external costs could provide more revenues than needed or appropriate for road system spending; thus there is a strong argument for local authorities continuing to administer revenues and make planning decisions.

Some of this discussion is of course academic, given shared jurisdiction for roads — in terms of both raising revenue and spending it — and the difficulties of changing current institutions. The Panel believes nevertheless that removing current distortions is vital enough to transport sector efficiency — and therefore to national economic and social well-being — that ways around the impasse should be pursued. Solutions would require serious negotiation among Governments and probably major concessions. The Panel cannot foresee the outcome but can point toward institutional reforms that could be successful.

### ***Redirecting Federal Fuel Tax Revenues***

Possibly the most important and contentious issue is the future of federal fuel tax revenues. The tax is clearly a major irritant to other Governments, and to organized road users, in particular because it is undeniably part of the price paid for road use, yet one from which they see no benefit. It is arguably just a 'sumptuary' tax, but such taxes have all but disappeared (alcohol taxes are the prominent exception), and public expectations are increasingly that taxes should be non-discriminatory. Provincial/territorial fuel taxes are also exceptional, but can be justified in principle by those Governments' spending on roads. Federal fuel taxes stand out as having no evident justification in the eyes of road users.

Further, as noted by the Technical Committee on Business Taxation, to the extent that taxes on transport fuels are paid by businesses, they can create distortions between those that use fuels intensively and those that do not.<sup>18</sup> The Panel sees this as a legitimate concern about federal taxes on all transport fuels, including those used by rail, domestic aviation and domestic shipping. More particularly, the Panel believes the federal road fuel tax is inhibiting efficient road pricing related to system costs. It would also inhibit creation of road agencies of the type we recommend.

The Panel's proposal is that federal fuel taxes be recognized as part of the price paid for the use of road infrastructure or, alternatively, as charges for environmental externalities. It is certainly plausible that fuel taxes in all modes could be considered charges for greenhouse gas emissions and reasonable that the federal Government would make such charges — that was indeed part of the plan proposed by the Transportation Table for the National Climate Change Strategy.<sup>19</sup> Logically, however, such charges should then be applied consistently to all carbon fuels, in all sectors, based on their greenhouse gas emissions.<sup>20</sup>

The Panel suggests that the Government should be prepared eventually to assign road fuel tax revenues to a transport funding agency (or agencies) of the sort proposed. These federal revenues could seal the intergovernmental partnerships needed to create the agencies that would ensure efficient roads provision.

### ***Options for Funding and Management Agencies***

The Panel sees three broad options for establishing an agency or agencies to improve road system efficiency through charging, management and spending decisions.

At the simplest level, a federal roads and transportation funding agency might be created to address the National Highway Program proposal, disbursing federal funds from the fuel tax to projects proposed by other Governments on a cost-shared basis. Such an agency might be able to introduce some elements of improved efficiency in spending, especially if it could insist that spending proposals be subject to objective economic analysis that included consideration of externalities, and if it could fund spending on other modes where it was shown to be more beneficial.

But such an agency would still be no more than an instrument for disbursing federal funds, not for funding and managing a national highway system. It would not be able to fulfil the major purpose of an innovative agency — determining the appropriate amount of spending and designing efficient charges. Also, as a federal agency, without direct powers to charge for road use, it would have no practical possibility of ever converting fuel taxes to more efficient charges, such as axle-weight-kilometer charges and congestion charges.

A second alternative might be for the federal Government to persuade other levels of Government to share the cost of funding a roads agency responsible for the national highway system (or another agreed designated system). The agency would administer a fund, into which the federal Government would deposit its tax receipts from the designated system. (If it were the national highway system, this would be close to 25% of federal fuel tax revenues, or about \$1 billion a year.) If provincial/territorial taxes and fees associated with use of the designated system were also deposited, the agency would have the considerable advantage of being able to take full responsibility for managing the system, with the possibility of determining the efficient level of charges and spending. Charging and spending policies would be managed by an independent board, with representation from users and the funding Governments.

The agency would be receiving and managing funds from the most lucrative part of the road network, so it would also be necessary to work out whether network inter-relationships justified the agency funding parts of the rest of the network, as seems likely. It would also have opportunities to pursue the technological innovations in charging the Panel sees as necessary.

Further, it could take on a multi-modal role, notably by considering alternatives to expanding the national highway system's congested links through major cities — for example, commuter rail or other forms of public transit — and funding them when they offered superior benefit/cost ratios. In principle, this could also be extended to marine or rail freight infrastructure projects that provided alternatives to highways.

Finally, as a third possible approach, the federal Government could offer each provincial and territorial government an annual sum reflecting federal fuel tax receipts, in exchange for a commitment to establish a roads and transportation funding and management agency. Along the lines of the New Zealand model, the agency would have authority for advising on road charging principles and mechanisms; receiving revenues from charges; and allocating them among operating agencies. The agency would be managed by an independent board, including user

representatives; give the agency a mandate to consider alternatives to road spending in other modes, notably urban transit, and the power to fund those offering greater returns than road investment; and co-operate in an intergovernmental body that would develop evaluation methodology, provide analytical services, and recommend on intergovernmental policy co-ordination.

As discussed in the next two chapters, the Panel believes this option would also offer the possibility for intergovernmental agreements on an even more integrated national transport strategy, across all modes, that included all local infrastructure and services now funded by the federal Government — notably some intraprovincial passenger rail and ferry services, bridges, and possibly the St. Lawrence Seaway. In return for agreed additional payments by the federal Government to the funding agency, responsibility for and authority over these intraprovincial services and infrastructure would shift to the province or provinces concerned.

The Panel does not suggest that institutional change of this scope would be easy to achieve. There would be serious technical issues to resolve, such as the extent and nature of networks intended to be self-sufficient, and how to fund and manage parts of the road system that are not commercially viable but deemed necessary on social equity grounds. Other challenges arise in the design of efficient yet practical road charges and the evaluation methods used to compare the social costs and benefits of competing uses of funds in different modes. These are difficult questions indeed, but the Panel believes they could be resolved by agencies dedicated to efficient management.

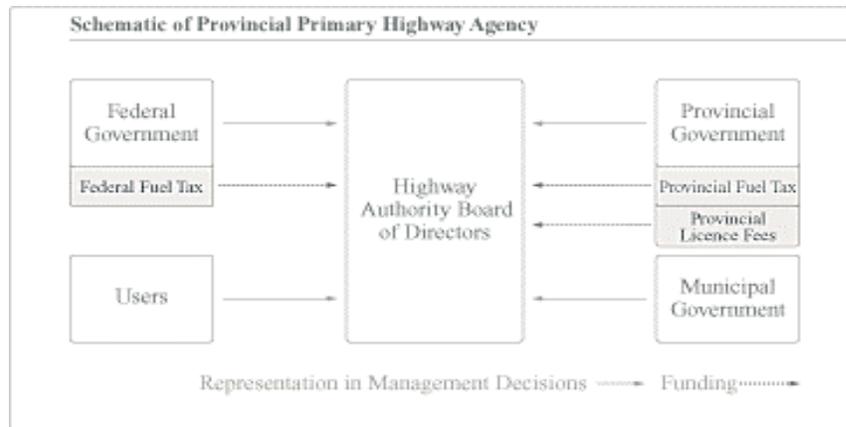
There are probably even greater political obstacles in Governments' commitment to current funding and spending processes and institutions. But the Panel is convinced that the existing system is dysfunctional and that radical reform will be needed eventually. Efficient charging mechanisms and institutions to manage roads and other infrastructure are already in place or under development elsewhere, and they are bound to be adopted more generally, especially as technology improves. Further discussion of the practical possibilities for institutional reform is provided in Appendix 3, and illustrations of two possible organizational frameworks are shown in the accompanying boxes.

### **Provincial Agency for Primary Highway System**

#### *The Concept*

Federal and provincial governments contribute (an estimated) share of fuel tax revenues generated by traffic on the primary highway system, plus licence fee revenues.

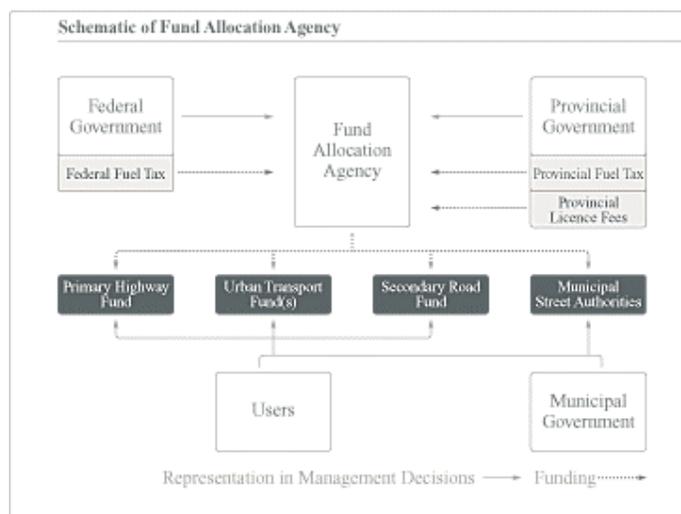
The board of directors of the road authority includes representatives of  
highway system users  
municipal governments  
federal Government  
provincial government



### Possible Four-Sector Roads and Transport Fund

#### *The Concept*

The funding allocation agency receives federal and provincial user fees (fuel taxes and licence fees) and allocates them among three types of fund, each with a board of directors (as described in Illustration 1), and authorities responsible for residual municipal streets. The primary highway fund would manage the main highway network. The urban transport fund(s) would be responsible for an urban region, including roads and urban transit investments that provide greater benefits in relieving road congestion. The secondary road fund would include secondary and remote roads and possibly public transport alternatives. Municipal street authorities would retain primary responsibility for funding local roads, but with some portion of funding from the agency. The funding allocation agency would decide on criteria for allocating funds to the four sectors. (Note: they could not otherwise all be self-financing from user charges, and the agency must effectively re-distribute funds.)



The Government's policy of commercializing transport infrastructure has been innovative and creative. The Panel believes that bold steps are now warranted to make the shift to more commercial management of roads. With the current division of responsibilities and charging procedures, intergovernmental co-operation is essential in designing solutions. The Panel's proposals show how the necessary agreement might be reached, and we encourage all jurisdictions to examine them carefully.

Given systemic and institutional deficiencies, as well as projected increases in road use, the Panel believes that the parts of the road network that are commercially viable should be separated to permit funding and management by users. Roads that are not commercially viable (primarily local municipal and remote roads) would continue to need some direct Government funding, but they too would benefit from separate management, use of objective evaluation criteria, and involvement of users in charging and spending decisions. The Panel's recommendations follow.

### **Recommendation 10.1**

**The Panel recommends that the World Bank/New Zealand concepts of road and transport funding and management agencies be adapted for Canada, including the following features:**

- **users should pay for roads, by means of appropriate charges and fees;**
- **charges for roads should be based on costs imposed, differentiated so far as practical by nature of vehicle, type of road, and amount of congestion;**
- **managers of the road network should have responsibility for both charging and spending decisions;**
- **users should be involved in decisions on charges and expenditures; and**
- **alternatives to road spending in other modes should be allowed to compete for road funds.**

### Notes

<sup>1</sup> Strictly speaking, these measures of road length are in 2-lane-kilometres, rather than route-kilometers. Figures are from Fred Nix, "Alternative Road Financing Arrangements", paper prepared for CTAR, March 2001; and Transport Canada, *Annual Report 1996*, Chapter 7.

<sup>2</sup> To put this number in perspective, it is more than four times the distance to the sun *daily*.

<sup>3</sup> By federal regulation and industry convention, a variety of small vehicles used exclusively or mainly for private passenger purposes are classified as 'light trucks', including passenger vans, multi-purpose vehicles, sport utility vehicles, and pick-up trucks. For brevity, we use 'car' to include all vehicles used for such purposes and 'truck' to mean all vehicles carrying freight.

<sup>4</sup> Conference Board of Canada forecasts, quoted in TAF Consultants, *Freight Transport Trends and Forecasts to 2015*, report for Transport Canada, March 2000.

<sup>5</sup> See U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, annual.

<sup>6</sup> City-specific growth forecasts quoted in Lehman and Associates, "Potential Use of Abandoned Rail Corridors for Regional Rail Purposes", paper prepared for CTAR, April 2001.

<sup>7</sup> TAF Consultants, *Freight Transport Trends and Forecasts to 2015*, report for Transport Canada, March 2000.

<sup>8</sup> Some road expenditures, such as policing, or the enforcement, safety and policy work in provinces with provincially owned automobile insurance companies, are not captured in this figure.

<sup>9</sup> The amounts quoted are for the taxes that generate 'special', or incremental, revenues from road fuels, that is, in excess of normal sales taxes that would be received from spending on other goods. For the same reason, only the federal excise taxes on fuels are included, not the GST, as the latter does not generate incremental revenues.

<sup>10</sup> Road spending by level of Government is more complex than represented here and not reported in any single set of accounts that makes it clear which level pays for which roads. It seems probable that some provincial and territorial governments are also spending considerably less than they receive in fees and taxes and that local taxes are paying a larger proportion of total road costs.

<sup>11</sup> With current equipment and load factors, Canadian intercity rail provides no emissions advantage over private vehicle use, although there is presumably some gain in congestion reduction in larger cities at peak times. See Chapter 17.

<sup>12</sup> F. Nix, M. Boucher, B. Hutchinson, "Road Costs", *Final Report of the Royal Commission on National Passenger Transportation*, Volume 4, pp. 937-1058, Ottawa, 1992.

<sup>13</sup> Academic research suggests that congestion charges on highways would provide both the signal for investment and the funds to undertake it. See K. Small, C. Winston, and C. Evans, *Road Work — A New Highway Pricing and Investment Policy*, Washington, D.C., Brookings Institution, 1989; and D. Newbery, "The case for a public road authority", *Journal of Transport Economics and Policy* 28/3 (September 1994), pp. 235-253. In a practical management system, respecting current jurisdictions, only the sections of intercity highways through cities would be included in a 'highway' management system, and congestion charges on those sections could legitimately be added to highway investment funds. Other city roads would be managed by city authorities, which would need to decide how to use congestion charges.

<sup>14</sup> See particularly I. G. Heggie and P. Vickers, "Commercial Management and Financing of Roads", *World Bank Technical Paper No. 409*, Washington, D.C., 1998; and K. M. Gwilliam and Z. Shalizi, "Road Funds, User Charges and Taxes", Report TWU-26, Washington, D.C., World Bank, 1997.

<sup>15</sup> See Hickling Lewis Brod Inc., "Highway User Benefits Analysis of the National Highway System", National Highway Policy Update Project, Council of Ministers Responsible for

Transportation and Highway Safety, September 1998. The reported benefits approach \$30 billion using a discount rate of 5% annually, but only about \$18 billion using a rate of 10%, which continues to be the rate recommended by the Treasury Board Secretariat as the test rate for Government investments.

<sup>16</sup> This was the conclusion of re-analysis of the initial proposal in ADI Limited, "Analysis of National Highway System Proposals", Report RR-12, Royal Commission on National Passenger Transportation, Ottawa, 1992.

<sup>17</sup> This seems clear from current revenues compared with spending, but also because the network would be able to exploit its monopoly. Agencies should be mandated to charge based on principles of efficiency.

<sup>18</sup> See Department of Finance, *Report of the Technical Committee on Business Taxation*, December 1997 (the Mintz Committee).

<sup>19</sup> See Transportation Table, National Climate Change Strategy Development, *Transportation and Climate Change, Options for Action*, Transport Canada, November 1999.

<sup>20</sup> In this the Panel agrees with the conclusions of the Mintz Committee that existing taxes should be replaced with more broadly based environmental charges.

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