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**International Transit Studies Program**

**Report on the Fall 1998 Mission**

**Revitalizing Urban Public Transport in Australia and New Zealand**

*This TCRP Digest summarizes the ninth mission performed under TCRP [Project J-3](#), "International Transit Studies Program." The report includes information on the cities visited, lessons learned, and discussions of policies and practices that could be applied in the United States. This digest was prepared by Tracy E. Dunleavy of the Eno Transportation Foundation, Inc., the contractor for the project, on the basis of reports filed by the mission participants. For information on prior ITSP missions, consult TCRP Research Results Digests 20, 22, 27, 31, and 33.*

**INTERNATIONAL TRANSIT STUDIES  
PROGRAM**

**About the Program**

The International Transit Studies Program (ITSP) is part of the Transit Cooperative Research Program (TCRP). The ITSP is managed by the Eno Transportation Foundation under contract to the National Academies. The TCRP was authorized by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and reauthorized in 1998 by the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21). It is governed by a three-way memorandum signed by the National Academies, acting through its Transportation Research Board (TRB); the Transit Development Corporation (TDC), which is the education and research arm of the American Public Transportation Association (APTA); and the Federal Transportation Administration (FTA). TCRP is funded annually by a grant from the FTA.

The ITSP is designed to assist in the professional development of transit managers, public officials, planners, and others charged with public transportation responsibilities in the United States. The program accomplishes this objective by providing opportunities for participants to learn from foreign experience, while expanding their network of domestic and international contacts for addressing public transport problems and issues.

The program arranges study missions in which teams of public transportation professionals visit exem-

plary transit operations in other countries. Each study mission focuses on a central theme that encompasses issues of concern in public transportation. Cities and transit systems to be visited are selected on the basis of their ability to demonstrate new ideas or unique approaches to handling public transportation challenges reflected in the study mission's theme. Each study team begins with a briefing before departing on an intensive, 2-week mission. After this stimulating professional interaction, study team members return home with ideas for possible application in their own communities. Team members are encouraged to share their international experience and findings with peers in the public transportation community throughout the United States. Study mission experience also helps to evaluate current and proposed transit improvements and can serve to identify potential public transportation research topics.

Study missions normally are conducted in the spring and fall of each year. Study teams consist of up to 15 individuals, including a senior official designated as the group's spokesperson. Transit agencies are contacted directly and asked to nominate candidates for participation. Nominees are screened by a committee of transit officials, and the TCRP Project J-3 Oversight Panel endorses the selection.

Study mission participants are transit management personnel with substantial knowledge and experience in transit activities. Participants must demonstrate potential for advancement to higher levels of public transportation responsibilities. Other selection criteria include current responsibilities, career objectives, and the

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probable professional development value of the mission for the participant and sponsoring employer. Travel expenses for participants are paid through TCRP Project J-3 funding.

For further information about the study missions, contact the TCRP (202/334-3089) or the Eno Transportation Foundation (202/879-4712).

## About the Report

The following report is an overview of the ninth study mission. It reflects the views of the contributing participants, who are responsible for the facts and accuracy of the data presented. The report does not necessarily reflect the views of the TCRP, TRB, NAS, TDC, APTA, FTA, or the Eno Transportation Foundation.

## REVITALIZING URBAN PUBLIC TRANSPORT IN AUSTRALIA AND NEW ZEALAND: MISSION 9, OCTOBER 30-NOVEMBER 15, 1998

### Introduction

This 2-week mission involved visits to and discussions with transportation providers in Auckland and Wellington, New Zealand and Melbourne, Brisbane, and Sydney, Australia.

In particular, this mission explored the policy and technology initiatives to encourage expanded use of urban public transport in New Zealand and Australia. Similar to the United States and many other countries, New Zealand and Australia have experienced rapid growth in automobile ownership and decreased use of public transport. The major cities in these countries can no longer sustain this growth and have committed policies and resources to revitalizing their public transport systems. Their service standards have increased and patronage has expanded, reversing a trend that existed for many years. Study areas included policy adoption and electorate support; privatization; dedicated bus lanes and prioritized signaling; integrating fare systems; smart card applications; flexible route services, including “on-demand” and “hail-and-ride” minibus services; transport for the elderly and persons with disabilities; express ferry service; and investments in employee training. Major infrastructure projects will be examined, including new light rail projects and new rail links in preparation for the Sydney Olympic Games.

### POLICY OVERVIEW

Profound changes in government attitudes toward public transit are occurring in New Zealand and Australia, prompting regulatory reforms and (in a number of instances) aggressive privatization of service delivery. One of the

primary aims of the Fall 1998 International Transit Studies Program mission was to learn firsthand about these developments, seeking further insights about

- Why these changes are occurring,
- The form of these changes in each place visited, the “lessons learned,” and
- The context of how these changes are occurring so the transferability of these experiences to a U.S. setting can be examined.

### Why Are the Changes Occurring?

The overriding reason for the changes in government attitudes toward public transit was, and is, economic. In New Zealand, the national government led the way, enacting statutory changes in the late 1980s as part of a larger national government effort to stem the nation’s economic slide. In Australia, the changes were state initiated (not federal), reflecting the fact that state governments in Australia wield a great deal of self-governing authority. These differences are important and, therefore, warrant further elaboration.

In New Zealand, a newly elected labor government in the mid-1980s targeted public transportation (as one of several governmental functions) for reform, because there was a strong mandate to curb government expenditures and because government-operated public transportation providers were reportedly inefficient. To bring about reform, the New Zealand government enacted three statutes in 1989 that radically altered the government’s role. The Local Government Amendment Act required the separation of funding and service delivery, in effect compelling the eventual sale of government-owned public transportation assets and prohibiting continued government operation of public transportation services. The companion Transportation Services Licensing Act established rules for public providers assuming services (e.g., competitive tendering of service requiring a subsidy), and the development of plans by regional government entities (“councils”) as a basis for deciding what services warranted subsidies. The third statute, the Employment Services Act, opened the door to individually negotiated labor-management contracts in each locale suited to local conditions.

These statutory changes fundamentally altered the public transportation “landscape” in New Zealand. Briefly stated, the new landscape

- Permitted the government to sell off the public transportation assets it formerly owned, allowing the Treasury to realize one-time revenues, which reportedly amounted to several hundred million dollars (in New Zealand dollars);
- Contained the national government’s subsidy exposure by creating more efficient operations, fostering competition, and confining subsidies to selected routes and customer markets (the subsidy level nationwide is the

same today as it was in 1990, meaning that it has declined in real dollar terms);

- Reversed ridership declines in both Auckland and Wellington because private service providers are more customer focused; and
- Permitted the government to dramatically reduce its capital investment obligations. This is now the responsibility of the private service providers.

In short, the national government curbed its transit expenditures—the principal aim of reform. However, it is difficult to gauge the social cost to date and in the future. It is known that many government workers were laid off (“made redundant”) and received severances, but it is not known how or when they were re-absorbed into the workforce. It is also known that an unspecified number of services were curtailed or eliminated, but it is not known how many users were dislocated or how they coped with the dislocation. Moreover, it is known that the primary private providers have monopolies or virtual monopolies, which naturally raises a number of questions about the long-term prognosis of transit in the country. Finally, it is known that government has distanced itself from service quality oversight responsibility; oversight is now confined to only routes requiring continuing subsidies.

It should be said that the primary private providers appear to be excellent service providers and also appear to have improved service perceptively, notwithstanding the government’s reduced oversight role.

One final observation about New Zealand is warranted here. At the time of the mission visit, the Ministry of Transport was readying an initiative to divest the government of road construction and maintenance responsibilities. Like the public transit reform initiative, the road initiative envisions privatization, with costs defrayed in part by taxes and in part by user fees. The road reform initiative is viewed by Ministry officials as the logical culmination of privatizing the transportation sector so that market forces and private-sector business acumen can collectively drive pricing and investment decisions in a more efficient and equitable fashion. The initiative has led to controversy, and there were indications that it could impact the present government.

The Australian sites visited (Melbourne in the State of Victoria, Brisbane in the State of Queensland, and Sydney in the State of New South Wales) contrast in a number of important respects with the New Zealand situation. Although economic considerations are a common overriding reason for the change in government attitudes about transit, the reforms enacted by the three Australian states and the emerging private-public relationships retain much more continuing responsibility and control by the governmental entities for transit service quality than in New Zealand. Nonetheless, it is important to recognize that the perceptions of inefficiency and the interest in expenditure containment noted in the New Zealand situation also apply to Australia as well. They are at the root of reforms in the Australian states.

The genesis of reforms in all three Australian states was a National Competition Policy drafted in the early 1990s. The policy calls for the “commercialization” of certain government functions to ensure that associated public services are provided efficiently. At its core, the policy is designed to force the restructuring of public service, so there is no inherent economic bias favoring public-sector service delivery, and to provoke a comparative analysis of the cost of service delivery by public- and private-sector providers under restructured conditions. The policy is not statutory, but it has been widely embraced by the states as a framework for government restructuring.

The Victoria reforms began in 1992 when a new government took power. In the throes of an economic downturn, the government issued a new manifesto calling for all public transit services to be privatized, beginning with bus operations (already done) and thereafter extending to both trams and Melbourne-area commuter rail services (still pending). Unlike New Zealand, the Victoria “model” was, and is, to competitively award franchises (rather than to sell government-owned assets) and to retain control over many facets of service quality (e.g., fare pricing, service levels, operating performance standards, and a prohibition against bus-rail competition). A “passenger charter” recently issued by the Minister for Transport describes the quality assurance framework that Victoria will use in letting franchises for rail and tram services in 1999.

Victoria had other reasons for change: public transit performance indicators in the metropolitan Melbourne area were trending unfavorably. The Victoria government saw privatization, coupled with quality controls, as a remedy for dealing with service quality, ridership erosion, and inefficient operations. It had a strong public mandate to effect the changes that are now occurring.

Queensland State’s approach to restructuring differs from Victoria’s because the government continues to be the principal transit service provider in Brisbane. Rail, bus, and catamaran assets are owned by the Ministry of Transport and are leased to separate governmental entities responsible for service delivery (the state’s Queensland Rail and the city’s Brisbane Bus) that must meet performance standards to sustain their operating rights. (Brisbane Bus converted its operation from a license arrangement to a franchise arrangement in December 1998, and Queensland Rail also operates under a franchise arrangement. The franchise terms for Brisbane Bus call for the subsidy to shrink from \$30 million a year to \$25 million a year in 5 years, and for ridership to grow by 3 percent per year.) Private operators hold franchises to operate service in portions of the Brisbane metropolitan area where Brisbane Bus is not a presence (and in other parts of Queensland State), using assets purchased by the operators themselves with limited government support (25 percent of the cost of accessible buses).

Queensland’s subsidy scheme is defined in its State Transport Act of 1994. It calls for continuing operating subsidies for “concessions” (to compensate for the acceptance

of discounted fares for seniors, persons with disabilities, and so forth), and transitional subsidies for 3 years beyond the concession subsidy. This is to provide time for continuing restructuring (downsizing) that ultimately is expected to shrink expenditures to the point that the concession subsidy alone is all that is required. Apparently the state found it necessary to provide more subsidy than the Transport Act envisioned, but significant work force reductions have occurred in keeping with the statutory aim. Only in recreational sites north and south of Queensland (the Sunshine Coast and the Gold Coast, respectively) have bus services been successfully “commercialized” within the 3-year period (the subsidies are now confined to just the “concession” subsidy). No rail services have attained this status.

Another distinctive feature of the Brisbane situation is the fact that the city bears one-half of the overall bus subsidy. The city’s contribution appears to have played a part in the state’s willingness to grant a franchise to Brisbane Transport for the bus service operation without competitive tendering.

In Sydney, the principal service providers continue to be state-affiliated public entities, though the operations have been separated (“commercialized”) so the capital assets are owned by the State Ministry of Transport (New South Wales) and are leased to the operating entities. The state is the sole source of subsidy for the operating entities. Subsidies are contained by the state’s use of performance standards the operating entities must satisfy to retain their franchises and to ensure the continuation of subsidy payments. For example, Sydney’s public-sector bus operator, State Transit, has an obligation to reduce its subsidy requirement by \$25 million (Australian) (the entity’s overall budget is \$400 million Australian) in 1999. Achieving this will depend principally on cost reductions because the operator is not free to raise fares (fares are regulated by the State’s Independent Licensing Tribunal, and fare increases have tended to lag behind expenditure growth rates).

Complementing the public-sector operations are private bus operator franchises located beyond State Transit’s territory. Each franchise area is exclusive to the franchise holder, and New South Wales is making continuing efforts to integrate all the services.

Sydney’s rail system is operated by the state, under the banner of the “State Rail Authority,” with separate operating divisions for long-distance inter-urban services (“Country”) and shorter distance urban and suburban services (“City Rail”). Here again, the operating entity has been organizationally separated from its infrastructure (in July 1996), reflecting the countrywide “commercializing” practice. There is no present intention of privatizing the rail operation, although the State Rail Authority is substantially downsizing itself to meet targeted reductions in the state subsidy over time (5 percent reductions in subsidies each year for the next 5 years). The subsidy reductions, in turn, will be used to help fund system expansion, a key element of the authority’s multi-year agreement with the state.

## Current Status of Policy Reforms

### *New Zealand*

As a result of the Local Government Amendment Act, the nation’s intercity and metropolitan area rail assets were sold to a private consortium (“Tranz Rail”) in 1993, and the government-owned bus assets in both Wellington and Auckland were sold to Stagecoach in 1992 and 1998, respectively. The Tranz Rail purchase included all rail freight assets as well.

Tranz Rail is a profit-making, publicly traded company, thanks in large measure to its freight business. Its intercity passenger rail service is nominally profitable, while its metropolitan area commuter rail service requires continuing subsidies (45 percent in Wellington; 65 percent in Auckland). Capital continues to be in short supply, and there appeared to be a need for additional maintenance. Tranz Rail representatives were upbeat about the railroad’s future, particularly if the road reform initiative happens. They apparently share the Ministry’s view that road reform will create a more “level playing field” that will benefit the railroad industry.

In Auckland, only 25 percent of the routes were financially self-supporting initially; the other 75 percent were directly subsidized to sustain them as part of a prescribed system of services. As a result of cost-cutting efforts and a recent ridership turnaround, 50 percent of the routes are now financially self-supporting. The mandated local government sell-off of transit assets occurred in 1998 as noted, and the winning bidder, Stagecoach, has moved aggressively to effect further changes in operating practices to improve its financial position and to promote increased ridership. New low-floor buses are now being introduced incrementally.

In Wellington, Stagecoach has dramatically improved operating performance since its 1992 takeover. Ridership is up 24 percent, and the subsidy is down to \$6+ million (New Zealand) from its \$15 million (New Zealand) level prior to Stagecoach’s takeover (farebox recovery is 84 percent). Service levels have been increased 10 percent and fares have been reduced. Stagecoach also operates the city’s trams under a sole-supplier contract.

Bus industry officials in Auckland and Wellington expressed the view that the contracting (“tendering”) terms are too limited duration-wise to foster capital reinvestment. As long as the threat of being underbid after a short tender persists, there is an understandable reluctance to make substantial capital investments.

### *Australia*

In Melbourne, 10-year franchises for the metropolitan area’s bus services (including school bus services) were awarded in 1998. The primary franchise holder in Melbourne proper is National Bus Company, a private operator that has held franchise rights since 1993. During this period, bus ridership has grown by 15 percent (and revenue by 25 percent). Management attributed this growth to service in-

creases (20 percent), introducing new buses at the operator's expense, concerted efforts to promote a customer focus in the operation, and the introduction of electronic ticketing. That ticketing permits bus and rail use on the same ticket. National Bus reported that it is exceeding the performance standards stipulated in the franchise terms, and State Ministry of Transport Officials expressed satisfaction with the operations to date.

In Brisbane, the publicly operated bus company (Brisbane Bus) has significantly downsized since 1993 in keeping with cost reduction aims (for example, a 50 percent reduction in support staff) and has experienced a 12 percent ridership growth in the same period. Company management credits service changes, the introduction of new vehicles, and heightened customer focus for this ridership gain. Further gains are foreseen in the next several years as a result of continuing organizational re-engineering, capital improvement plans (e.g., the Southeast Transit Busway), and further major route restructuring. An integrated regional transportation plan (IRTP) prepared by the Queensland Ministry of Transport defines overall transportation aims for the next decade or so and has been prepared to seek public support for a new funding measure. The IRTP was rolled out recently and appears to be very ambitious.

Brisbane's rail system is also experiencing productivity gains as a result of both expense reductions and ridership/revenue increases. Expense reductions amounted to 4.2 percent in real terms when comparing the last fiscal year with the year prior, and ridership/revenue gains amounted to 5.8 percent and 15 percent, respectively. Ridership/revenue gains have tapered off to less than 1 percent in the current year. Management attributed this to growing competition from the automobile. Prospectively, the rail operator expressed optimism about further future productivity gains, citing the IRTP and a variety of management initiatives.

Sydney's public-sector bus operations experienced a nearly 5 percent ridership gain this last fiscal year (and 10 percent the year before), which management attributed to the introduction of new buses and heightened customer focus. Looking ahead, serious concerns were expressed about the effects a massive downtown sidewalk-rebuilding program is having on downtown bus operations. Other concerns have been raised about the national government's tax change proposals, which, if enacted, will lower driving costs and eliminate the operating expense advantage of compressed natural gas (CNG) over diesel. (State Transit is in the process of replacing portions of its bus fleet with CNG-powered buses, motivated in part by the current operating expense advantage.) Favorable prospects were also noted, including the advent of automated fare collection, the effects of the Olympic games, and near-term capital improvement plans (the Liverpool-Parramatta Busway).

Sydney's public-sector rail operator is also achieving productivity gains since "commercialization," reducing employment by nearly 1,000 people (on a base of 9,400) with further downsizing envisioned principally after the Olym-

pics. Ridership/revenue gains were reported (4.5 percent and 11 percent, respectively, for the urban and suburban services in fiscal year 1996-1997), along with gains in on-time performance. Prospectively, the rail operator's chief executive officer (CEO) expressed optimism about further gains, referencing the productivity increases expected from continued downsizing and the near-term capital improvements on the horizon (an airport rail link and a new rail line between Parramatta and Chatswood).

### **Context for Changes in New Zealand and Australia: Applicability to the United States**

As described earlier, the restructuring of public transit services in New Zealand and Australia has been driven by economic considerations. Strong public mandates for reduced government spending made public transit a target for restructuring because public transit was considered inefficient and costly. Cost-cutting has been readily achieved by restructuring, no matter who ended up with the service delivery responsibility, because the transit operations were, in fact, inefficient. Extraordinary reductions in subsidies were achieved in all of the systems visited, and, in all instances, the study team encountered management committed to greater efficiency.

Many but not all of the systems visited also are being driven by a strong conviction that efficiency is not the sole measure of public transit's success. Particularly in Australia, government overseers and service-provider management are clearly cognizant of the importance of public transit to the economic and social well-being of the areas and people served. As a result, restructuring efforts in Australia have coupled subsidy containment and cost-cutting initiatives with performance standards designed to improve customer service, and these standards have been made specifications for operating rights and continuing subsidies.

Reflecting on these restructuring efforts as they might pertain to the United States, there are parallels in our history and some important differences that limit the transferability of these experiences.

The importance attached to efficiency is common to the New Zealand/Australian restructuring efforts and the U.S. experience. There is also commonality between the Australian and the U.S. views about public transit as a public good, with subsidies used to further social policies and performance standards used to hold service providers accountable from fiscal and service quality perspectives. What is different about the New Zealand/Australian and United States experiences is the degree of organizational efficiency. Although rigorous head count comparisons of the systems visited and comparable U.S. systems cannot be made without research efforts beyond the scope of this report, management associated with all New Zealand and Australian systems visited spoke of significant inefficiencies in their operations before restructuring.

All this said, the lessons learned in New Zealand and Australia are that the evolving efforts in the United States to make public transit behave in a more businesslike fashion without losing sight of its “public good” mission is exactly the direction transit should be taking. Moreover, the variety of seemingly successful service delivery approaches in Australia and the United States are proof positive that neither public nor private is inherently “better” as a service delivery strategy. Either strategy can succeed so long as there is competent management, clear performance expectations, and continuing governmental support, both financially and in terms of policy.

Beyond these general observations, there are a number of other, more specific, lessons learned from the site visits that can be applied in the United States, namely:

1. *The importance of strategic planning.* The Australian transit providers in particular are keenly aware that their futures depend in large part on how well they strategically direct themselves and actively seek to shape government policies to benefit transit. The cities that have opted for public providers (Brisbane and Sydney) are industry leaders in this regard. Where service delivery is privatized, special care needs to be taken to ensure that strategic planning is not given short shrift and to be sure the service provider has access and a vested interest in being part of the strategic planning process.

2. *The importance of multimodal service integration.* Although the providers in all the cities visited acknowledged that integration is important, only in Melbourne did it appear that integration is being seriously pursued. Melbourne is furthest along among the cities visited in the adoption of joint ticketing, and the state (Victoria) has mandated no bus-rail competition in specifying the service franchises. The separation of bus and rail service delivery in each of the cities visited adds to the complexity of service integration, although Victoria has not allowed this separation to be a stumbling block. Overall, seeing numerous examples of poor integration and unhealthy competition reinforced the importance of integration, regardless of the service delivery arrangement.

3. *Pricing services neither too high nor too low.* Managers of all the service providers visited clearly recognize the sensitivity of pricing. However, actual pricing practices are constrained by national government policies that place transit at a competitive disadvantage (for example, proposals to relax tariffs on auto imports and to dramatically alter fuel cost differentials to favor diesel in Australia; exacting fare regulations in Australia; and deregulation in New Zealand enabling service providers to charge as they wish for commercialized services). Markets are differentiated in both countries (e.g., “concession” pricing for seniors, children, and passengers with disabilities), mirroring a problem most U.S. transit systems face whereby fares are policy driven. The advent of magnetic ticketing and the introduction of “smart card” technology will enable greater market/pricing

differentiation. However, the application of this capability will require favorable government policies in pricing the competition (such as fuel taxes and parking regulations) and more regulatory latitude for transit providers to exercise pricing discretion.

4. *Fostering transportation-land use integration.* Neither the New Zealand or Australian systems visited appear to have had more success at this than the U.S. systems. It appears that the providers (and their public-sector overseers where the providers are private operators) are relying mostly on their powers of persuasion instead of any authority to shape land use decision making, and there were only isolated examples of successful integration efforts. Consequently, the transportation providers found themselves having to react to new development pressures and trip-making patterns, often resulting in service demands that drive expenditures (and subsidies) upward because of low-density suburbanization.

5. *The importance of labor-management partnerships.* Transit labor has been compelled to adapt to cost-cutting imperatives in both New Zealand and Australia, resulting in significant changes to work practices and staffing levels. Stripped of statutory protections, the culture of transit labor is being transformed. Everywhere the mission group visited, there appeared to be a growing awareness that transit labor’s livelihood depends on continuing efficiency gains. Although past work practices in New Zealand and Australia appear to have been far more inefficient than in the United States, efficiency gains over the past 10 years or so have been dramatic and signify a profound change in labor’s view of what it must do to survive. New Zealand and Australia also appear to be further along than the United States in their gainsharing compensation practices. This is a logical extension of the view that management and labor have a joint interest in/responsibility for achieving productivity and service quality improvements. Gainsharing warrants more serious application in the United States.

## PLANNING

Australia and New Zealand share with the United States a historic separation of planning for each mode of transportation and separation of transportation and land use planning. Efforts to better integrate transportation planning and investment can be divided into three categories: institutional, structural, and policy.

### Institutional

Multimodal planning is hampered by separation of responsibility for different modes. In the United States, road planning has traditionally been the responsibility of a public works organization, while transit planning has been handled by a separate division or authority. Land use planning is

usually separated from both, and the multiplicity of political jurisdictions, each with its own planners, often further complicates the picture. This institutional separation has resulted in a narrow approach to solving transportation problems, usually based on a single-mode solution. The same has historically been true in both Australia and New Zealand, although some progress has been made toward institutional integration that will allow for strategic planning based on broad community needs and goals.

Sydney began the move toward integration of transportation planning in the 1970s when traffic congestion began to increase rapidly. After looking at the impact of urban freeways on U.S. cities, the New South Wales government determined that transit enhancements would be more conducive to preserving the community. During the 1980s, while increasing investments in its rail and bus systems, Sydney began installing an advanced signalization system and undertook a road reconstruction program featuring free right-turn lanes and multiple left-turn lanes. However, by the early 1990s, road planners had identified a 600 percent increase in congestion and determined that it was not possible to build their way out of it with roads. As a result, the focus shifted from “moving axles to moving people,” and an extensive program of bus priority was initiated, featuring dedicated lanes and queue jumpers. One minister now has responsibility for transit, road, and traffic control, resulting in a multimodal approach to solving transportation problems that encourages multiple occupancy to maximize the use of existing infrastructure and decrease the need to construct new facilities.

The Wellington Regional Council has moved in a similar direction. With centralized transportation planning for all modes and a strong commitment to preserving its compact urban form and the quality of urban life, the Council has taken the position that it will not build more roads, but will instead use transit to meet additional travel demand.

Melbourne has combined planning for transit, roads, and land use into one portfolio under the Minister of the Department of Infrastructure. This combination is new for Australia. It is designed to integrate planning so that investments in infrastructure can be strategically targeted to the larger municipal goals of improving regional links and supporting economic and community development.

Institutional barriers to multimodal planning are thus beginning to break down. Unfortunately, a strong tradition among staff of taking a single-mode approach to transportation issues, coupled with existing and difficult-to-change organizational structures, continues to hinder the broadly focused strategic planning required for coordinated transportation investments.

## Structural

There is more to making transit work than building a rail line or putting more buses or vans on the street. Unless

urban roads are designed to accommodate transit, buses are likely to be stalled in traffic along with cars. Also, without good sidewalks, curbcuts, and other amenities to facilitate access, potential transit customers are likely to be deterred. Traditionally, road designers do not address transit needs in their planning, in part because of the institutional barriers discussed in the previous section. However, in all cities visited by the mission, some movement toward transit priority is underway.

Structural enhancements, such as busways to improve transit performance, are discussed in the section on transit priority. However, the institutional fragmentation of transportation planning, as well as the challenge of overcoming what Wellington bus operators describe as “local government inertia” regarding transit, continues to hamper implementation of the full range of bus priorities that can make transit an attractive transportation choice.

## Policy

The design, or often redesign, of policies that integrated multimodal transportation planning and transit use is as important as institutional and structural changes. Having combined transit, roads, and land use planning into one Department of Infrastructure, Melbourne has created the ability to restructure policies to require multimodal planning. The minister who oversees roads, bus service, and rail can direct road planners to include busways and priorities in road projects. The minister’s staff are also required to analyze all new investments to be sure that road projects do not conflict with existing rail lines and that bus operations do not compete with rail for customers, but feed rail lines where appropriate.

In New Zealand, proposals to privatize the road system and increase the competitiveness of transit have raised the awareness of the disparate treatment of the two modes. The Wellington Regional Council, with policy and planning control over all modes of transportation, has taken the position that it will not build more roads in the urban area, but instead will enhance transit service to meet additional travel demand. The council has also adopted policies to promote infill, including one that discourages parking lots in the city center.

Auckland, on the other hand, although it has one of the largest land areas per capital of any city in the world, is doing little to discourage sprawl. Numerous policies, such as allowing employers to provide parking but not transit as an employee benefit, contradict efforts to increase transit usage, despite the active participation of Trans Metro and other transit operators in regional planning.

Brisbane has an integrated Regional Transport Plan, the goal of which is to restrain growth in peak hour, single-occupant vehicle travel by changing the mode split for future trips. Unfortunately, in Brisbane and elsewhere, institutional arrangements continue to be the weak link. There is

no formal policy requiring that planning be coordinated to optimize transportation investments. The result is road expansions that parallel and compete with existing rail lines, particularly along the Gold Coast. Local and state road agency planning is also not well coordinated, making it difficult to implement an integrated system of bus priorities. Local road agencies often fail to take transit into consideration in road designs. For example, speed bumps may be installed that prevent the use of low-floor buses, and bus shelters or lanes that easily could be added in early design phases may be omitted.

“Shaping Up Guidelines” that outline how to better integrate transportation modes and transit into land use plans have been drafted and reviewed, but as yet remain guidelines and not policies. However, Brisbane planners are making a concerted effort to require that new development or redevelopment be transit-friendly. Land use policies have also tried to direct new development into three major centers, and both busways and rail lines are designed with “nodes” that encourage transit-oriented development. Although businesses are very sensitive about changes in parking policies (80 percent of employees in the central business district [CBD] are provided with parking as a tax-free benefit), Brisbane has managed to cap the number of new parking spaces, lots, and structures and is promoting legislative changes that will make transit instead of parking a tax-free benefit.

Sydney also is discouraging the construction of new parking facilities and working to make transit instead of parking a tax-free benefit for employees. For major events in Sydney, parking is severely limited and people are required to buy event parking spaces in advance for a high price. The revenue is used to fund special free transit service to other events. Transit planners in Sydney have made inroads toward better integration of transportation planning by promoting transit as a public service to the city that not only enhances the urban amenity but is also what “makes Sydney work.” The serious traffic congestion in most of the urban area gives credence to this argument. This perception has also fostered increased debate about how to integrate land use planning with related transportation infrastructure investments to make transit use more attractive. However, as in other cities, the implementing of new policies and the regulatory guidelines necessary to make change have lagged behind the awareness of the need for them.

## TRANSIT PRIORITY PROGRAMS

### Auckland: Buses First

The Auckland Regional Government (ARC) and the local governments have specific goals to provide bus prioritization. These are spelled out in their Regional Growth Strategy (July 1998) and Land Transport Strategy (July 1998) that were prepared with the involvement of local gov-

ernments. These documents link the number of people traveling, their distance, and mode to the location and nature of employment and residential areas. The land use policy calls for more intense urban land use patterns with mixed use. The transport strategy is to significantly improve the passenger transport network through rail enhancements, by creating bus priorities on major arterial roads, and by providing more frequent service.

Auckland, while addressing the big picture issues of land use, new modes (light rail is being considered), and the potential introduction of road pricing, is also seeking to introduce low-cost items such as bus priority measures. The ARC has embarked on a 3-year education and marketing program for bus prioritization, known as “Buses First,” which features posters, stamps, and buttons with the Buses First logo.

Existing bus priority measures are found on eight arterials and motorways. In the Central Isthmus and CBD area, bus priority measures are available on Dominion Road, which is 5 mi long, and on Mt. Edam Road. Parking is removed during peak hours, and the curb lane is marked for exclusive bus use. The Dominion Road bus priority lane operates from 7 to 9 a.m. and 4 to 6 p.m. At peak hours, buses run every 3 min, at off-peak hours they run at 15-min intervals. The bus now saves 6 to 7 minutes along the 5 mi, and takes 18 to 19 min. By car, the ride is 35 to 40 min. Direct nonstop service begins at a free park-and-ride lot at the end of the line, although it is believed that a limited stop service would be more successful.

The initial evaluation reveals that the bus on-time performance and reliability have improved significantly through the day. Ridership has gone up and public perception has been generally positive. The bus travel time along Dominion Road was greatly reduced in the morning peak period, but not during the evening peak period. Officials attribute this to the fact that the bus-only lane works well in the morning because businesses are generally not open and parking violations in the bus lanes by commercial and private vehicles is not a problem. In the evening rush hours, bus lanes are often blocked by illegal parking and stopping activities and must merge with adjacent traffic. This degrades the performance of bus priority treatments.

On the strength of their initial success with Dominion Road, the local governments and the ARC want to move forward with more bus priority lanes. This will be done under a process of corridor studies that will bring wide public involvement into the process and product. The ARC has identified 11 additional arterial streets for corridor studies where bus priorities will be examined. The Buses First corridor study program seeks to implement the following seven major concepts throughout the city:

- Bus lanes;
- Bus bypasses - special lanes at intersections;
- Bus advance areas, or queue jumpers at traffic lights;
- Signal preemption;

- Bus borders - stops in traffic lanes;
- Peak-hour parking restrictions (clearways) and intersection upgrades; and
- Real-time traveler information.

Bus priority measures are designed to complement fare integration and acquiring new low-floor buses in attracting new riders.

*New Priority Facilities.* A busway is under construction along the North Shore Motorway. Currently, the shoulder is used for buses. The project involves roadway widening and the building of permanent bus stations. A complementary strategy looks to improve capacity on the Auckland Harbor Bridge approaches into the CBD. The Auckland Bridge, which has had a movable barrier system for more than 10 years, does not reserve that space for buses or HOVs. That would change with implementing the “tidal flow concept,” which features an added lane, to be reversed by time of day, and reservation of all added capacity for buses.

The bus priority plan includes an Advanced Traffic Management System (ATMS) for the motorway and major arterials. The ATMS would be used to improve incident management services and provide real-time traveler information. It could incorporate a regional traffic control center, detection and video surveillance equipment, changeable message signs, lane-use control signals, highway advisory radio, and bus priority measures. Elements of the ATMS are essential for the operation of the priority lane.

The city is implementing a signal pre-emption system using transponders and loop detectors. This will be centralized on the SCATS system at the traffic signals control center. Administrators hoped to find a way to measure the number of persons on a bus so that bus priority treatment could be applied dynamically at certain passenger threshold levels. In return for these city improvements, the bus operator, Stagecoach, has committed to provide an increased frequency of service.

Signal priority for buses was tested on the Great North Road as part of the Buses First program. The system works through loop detectors in the road sending information to the signal controller when a bus equipped with a transponder passes over the detector. The signal sent to the controller tells the traffic light that a bus is on the way. If the traffic lights are about to turn red, they are instructed to stay green until the bus passes through the intersection. If the lights are red, then the green signal is brought forward earlier. Basically, this is a window-stretching strategy to facilitate buses going through the signalized intersections with less delay.

In 1997, the Auckland City Council undertook a manual test of the signal priority to evaluate the adverse effects the system would have on general-purpose traffic. It found there was little disruption caused by this system and more than one-half of the buses received some form of priority treatment.

Auckland further tested the BLISS signal priority technology in 1998 at a major intersection. The technology de-

veloped in Brisbane proved to be compatible with the SCA signal system operated in Auckland. As a result, Auckland decided to move forward with an implementation plan using transponders and loop detectors.

*Lessons Learned.* Within the institutional context created since privatization, issues of traffic management remain mostly with the local governments. With the encouragement of the ARC, local governments have sought to develop a growth management and a transport policy that gives greater emphasis to attracting patronage on public transportation. Many of their strategies are similar to those sought by the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) in the United States.

The public education and involvement processes are integral to their corridor studies. High-quality information materials explain why bus priorities are needed, what would be involved, and who would be affected. However, merchants along some sections of Dominion Road objected to taking street parking, which prevented full implementation of the scheme. Enforcement remains inconsistent.

### **Bus Priority in Brisbane**

Brisbane recently completed a structural review of its bus system that focused on seven corridors. The first set of changes was implemented in July 1998 and the balance will go into effect in 1999. The changes include

- Providing a bus lane network (including \$600 million [Australian dollars] for a busway similar to Ottawa’s);
- Management of travel demand;
- Improved service and coverage; and
- Improved urban amenities, such as crosswalks, stations, pedestrian malls, and parklands.

The Queensland Directorate of Public Transport has prepared a bus priority plan for which it intends to provide 50 percent funding, in partnership with local governments. State roads will provide ramp metering, bus queue jumping, and transponders for signal preference. Signature projects to implement this new approach include

- The South East Transport Project;
- Busways along freeways (\$520 million [Australian] by 2001); and
- Transit and HOV lanes.

Queensland Transport plans to use design-build-operate-maintain (DBOM) procurement for a center-city rail system. Government will pay the capital cost, but privatize operations.

Brisbane completed its own 5-year Transport Plan following publication of the Queensland Integrated Transport Plan. Bus-prioritization elements of the Brisbane plan include providing an inner-city bypass and a 200-km system

of busways that may later be converted to light rail. Brisbane officials plan for the busways to connect with bus and transit lanes in local roads and for strategic upgrades and special treatment for buses at interchanges near major centers. The officials believe busways are ideal for the low density of the built area. The guided busway in Adelaide was rejected because the curves are too tight and it would add unnecessary costs to vehicles for the side wheels.

The integrated land use transport concept will create three centers connected by line haul routes. Community systems such as dial-a-ride would link to the line haul routes at transit centers. Integration will be completed in phases.

One of the first of those projects, the South East Transit Project, is planned to open in mid-2001. The project runs within the Pacific Motorway Corridor between Brisbane's CBD and Loganholme. It is being constructed in six sections and is 30 km in length. More than 160,000 people live in the 28 suburbs along the route. Eleven new elevated busway stations will be constructed. The plan is also to increase the frequency of bus service and comfort for bus riders.

The next busway under impact assessment will be the Inner Northern (from Queen Street Bus Station to Royal Brisbane Hospital) which connects to the South East Transit Project, bringing it further into the city.

When both projects are in place, the Queen Street Bus Station will have exceeded its capacity. Changes will be made to improve the station flow and appearance. In addition, new intermodal transport centers will be created at Indooroopilly and Garden City, lessening the demand on the Queen Street Bus Station.

Brisbane plans to upgrade its traffic control. Although Brisbane uses the BLISS technology that features dynamic timing, the state operates a separate system with separate technology. Plans call for combining these into a single coordinated system. In total, more than \$950 million (Australian) will be spent on the bus prioritization programs in Brisbane.

### *The Brisbane Rapid Bus System*

In an effort to copy the successes of its commuter rail system, Brisbane initiated a rapid-transit-style suburban bus system called Cityxpress. Like rapid transit, the bus stations are named, designed to look permanent, and are provided with passenger amenities. Half-hour headways are maintained all day. Low-floor buses allow comfortable boarding and faster service.

Most Cityxpress services are provided on arterial streets in a mix of general traffic, queue jumpers, and bus lanes. The routes traverse nonrail corridors, ending in the CBD area. A "Great Circle Route" serves the intersuburban trips.

An easily recognized image has been adopted for buses, shelters, timetables, and maps. Cityxpress won the Australian Transport Industry Award for 1984 and 1988. Accord-

ing to Mass Transport, approximately 40 percent of the users of the Cityxpress network are new to public transport. The fare-recovery ratio is 70 percent for this service compared with a system-wide average of 40 percent.

### **Bus Priority in Sydney**

State Transit has identified continued new vehicle purchases and bus priority measures as the best ways to continue to attract patronage and to reduce costs. Implementation of a city loop was instantly popular. To increase bus prioritization measures, State Transit must work with local councils and with the roads and traffic authority. Targeted areas include Victoria Road, Epping Road, Military Road, and Oxford Street.

State Transit has started providing limited stop and express services on all Northern Beaches routes and from the center city to Abbotsford and Mortlake. Service improvements have been made on Epping Road to Marsfield. The line from Bondi Junction to East Gardens now has 5-min headways. Bus priority measures are typically provided during peak hours, but can be for 24 hours. State Transit has proposed two roads for buses only, but the proposal has not been implemented. Bus prioritization is achieved by removing on-street parking, adding loading bays in select locations, and improving signage.

The eight-lane Sydney Harbor Bridge has had a 24-hour bus/taxi lane since 1992. The actual lane used shifts during peak periods. Considered a success story, upon implementation, bus patronage grew 23 percent. Feeder arterials, such as York Street, connecting to the Bridge have bus priority treatments in some sections where the traffic engineering is feasible.

Some Sydney roads use the "B" signals, extending green time within the cycle, taking it from the least needed segment. By using a queue jumper system at signalized intersections, they are able to get 2 to 3 buses advanced through the lights. The mission participants observed two 24-hour bus lanes, one in the city, and one on city loop notable for its red aggregate paving. The colored paving reduces the lane violation rate, which brings an automatic \$140 fine.

It is believed that Georges Street, one of two main arterials running through the city (Elizabeth is the other) is clogged with buses. The main problem appears to be with the private buses that take 9 sec/passenger to load, versus State Transit's 2 to 3 sec (using low-floor buses).

With the end of building new roads in the city and the establishment of signal controls, bus prioritization has become the next logical step. Officials feel there is beginning to be some backlash against bus prioritization and they must do more to ensure enforcement.

The Liverpool-Parameter Transitway along Hoxton Park Road is the first exclusive transit facility being proposed. Its two terminals are at major bus stations. Its rapid

bus would run every 5 min for 30 km, making 34 stops. The facility would consist of both exclusive sections and shared-use sections. After its Environmental Impact Study (EIS) is completed, opening is projected for 2003. The cost is estimated at \$140 million (Australian). A cycleway would be constructed parallel to the transitway.

The Olympic Games offer yet another opportunity to showcase what can be done with transport. A new rail station has opened on the Homebush Olympic grounds. Surface transport will come from buses run by State Transit. They seem ready for the challenge, having learned from other cities (notably Atlanta), and have practiced on their own big-crowd special events such as Easter Day.

## ACCESSIBILITY

The Australian Parliament passed the Commonwealth Disability Discrimination Act (DDA) in 1992. The DDA is similar to the Americans with Disabilities Act in the United States. However, the accessibility standards for transit as outlined in *Accessible Public Transport Disability Standards* are still in draft form and have not been approved. If approved, the standards will probably feature a 20-year window for compliance. Some states such as Victoria have gone further than the Commonwealth. The Victoria Anti-Discrimination Act of 1991 states that every newly purchased bus should be wheelchair accessible.

Although legislative mandates are not as strong as in the United States, low-floor buses have been adopted voluntarily for economic reasons. The voluntary acquisition of low-floor buses will gradually improve accessibility.

### New Zealand

In New Zealand, the Human Rights Act of 1994 addresses disability, but there is still no mandate to operate wheelchair-accessible service. The Total Mobility Act addresses the need for providing accessible service, but does not require it. Both Auckland and Wellington provide transit for passengers with disabilities using taxis with a 50 percent subsidy voucher system. The ARC is exploring an electronic smart card system to reduce fraud.

Stagecoach Auckland and Stagecoach Wellington are purchasing low-floor buses for improved accessibility, but also for economic reasons. The low-floor buses have clear passenger advantages, even beyond accessibility. According to an article in the New Zealand's Bus and Coach Association's August 1998 newsletter, the original attraction of the low-floor configuration is economic. Flat floors and no steps for passengers to climb mean faster loading and disembarkation of passengers during peak operating hours. This, in turn, creates shorter stop times and greater line capacity. A comparison test of various low-floor buses done for that association noted the unfortunate aspects of the vehicles. They included engine noise and restricted headroom

toward the rear contrasting with open spaciousness in the front of these buses.

The ARC has long defined accessibility as transportation availability, with no particular focus on riders with disabilities. In a deregulated environment, however, market-driven decisions include purchase of low-floor buses for passengers in general. The vehicles are more attractive for parents with young children, especially for those using strollers, and boardings and deboardings are facilitated for the elderly as well. Accordingly, the low-floor buses have been used as a marketing tool for Auckland's Buses First program along Dominion Road. The busway project committed that buses would have priority lanes and signaling and also frequent, reliable service. Although the emphasis was on service accessibility instead of passenger mobility, the new buses purchased were low-floors. Service quality issues were highlighted because of the public perception that there was no good passenger transport alternative in Auckland.

The ARC and private operators have established "quality service partnerships" that call for specific commitments from both the oversight body and the provider. The ARC has agreed to invest in infrastructure, such as bus stop upgrades and real-time information, and make policy decisions regarding dedicated roadways. The Yellow Bus (owned by Stagecoach since August 1998) has agreed to provide low-floor buses and to guarantee service frequency and high-quality information.

### Australia

In 1992, the Australian Parliament passed the Commonwealth Disability Discrimination Act (DDA). The DDA seeks to eliminate discrimination, as much as possible, against people with disabilities. Public transport is covered by the DDA. The DDA is similar to the Americans with Disabilities Act (ADA) in the United States in that it has specific standards that address access for passengers with disabilities on public transport as well as commercial property. The standards are outlined in the draft *Accessible Public Transport Disability Standards* that mandate full accessibility within 20 years.

Taxis are the primary source of mobility for people with disabilities in Melbourne. Melbourne uses the 50 percent subsidy voucher system, and about 5 percent of the 3,200 taxis in the city are specially constructed for wheelchair passengers. Trains are equipped with ramps, because most stations are not accessible. Braille tiles have been installed at rail stations and tram stops, and every fourth rail station is a "premium station" that is staffed at all times and is fully accessible. Some urban buses are accessible, and lifts have been installed on buses that operate in the country. Trams are not accessible.

About 40 percent of the buses in Brisbane are accessible. For the others, if a passenger can walk sufficiently to board the bus, the operator will help load a folding wheel-

chair. Brisbane has been focused on reducing costs in recent years, not on improving accessibility. However, Brisbane is purchasing ultra-low-floor buses as standard fleet replacement vehicles. Queensland Transport has added ramps to all of its trains to facilitate boarding at stations that have not been made accessible.

Like other Australian and New Zealand cities, taxicabs provide the majority of transit service to persons with disabilities in Sydney. Riders with disabilities are eligible for 50 percent off the metered fare, up to \$25 (Australian). Sydney Buses operates accessible equipment on 27 designated routes. All ferries are accessible, as are 12 of 33 wharves. CityRail is developing a network of 33 “easy access” stations at high boarding volume locations that feature lifts or ramps, hearing assistance devices at ticket offices, continuous handrails, additional lighting, and special signage.

In general, transit service for persons with disabilities has been dealt with in an inconsistent manner. Most cities lack a comprehensive action plan. Without direction from the state governments and input from persons with disabilities, the conversion to accessible service will likely be slow.

## **FUELS POLICIES**

### **New Zealand**

Energy pricing is controlled in New Zealand. Whether energy is derived from gasoline, diesel, natural gas, or liquefied petroleum gas (LPG), the cost per unit of energy is nearly equivalent. Government taxation also plays a role through the method of collection of vehicle use and license fees. The roadway system is supported through a gasoline tax for passenger vehicles and a road use tax, based on weight and mileage, for light trucks, heavy trucks, and buses. There is no exemption for public transit vehicles. Essentially, heavier vehicles are charged more for each mile driven on the roadway system. Consequently, public transit operators are very concerned about vehicle weight, as a matter of cost-effectiveness. This consideration tends to lessen operator interest in forms of alternative fuels that may contribute to excess vehicle weight.

Internationally, New Zealand is known as an environmentally “green” nation. The topographic and climatic features of the country contribute to excellent air quality, even in urbanized areas. Consequently, the public is concerned about air quality, but does not actually experience the negative effects of poor air quality to the same degree as other countries. This relegates the goal of improving air quality through using alternative fuels to a position of lesser importance than in many urban areas around the world.

The largest public transit operator in New Zealand, Stagecoach Auckland, operates a fleet of 620 buses out of eight garages. Two of the garages, or depots, are outfitted for operating buses on compressed natural gas (CNG).

There are currently about 30 buses outfitted to operate on CNG. The program is a remnant of a late 1980s effort by the New Zealand government to develop an alternative fuels program and take advantage of New Zealand’s substantial natural gas reserves. The actual number of operable natural gas buses is difficult to assess due to the age of the vehicles and level of maintenance. Stagecoach Auckland reported that when the buses are in operation they work well. The buses require about the same level of maintenance as any of its buses of similar age. However, vehicle space and weight limitations limit the number of CNG fuel cylinders, so each vehicle must be fueled twice each day.

Despite a relatively smooth operation, Stagecoach has decided to phase out the CNG-powered buses as they reach the end of their useful lives, because they are not economical for the company. First, Stagecoach is a multi-national transit operator and has a master contract for buses with a supplier whose primary model is a diesel-powered, low-floor bus. Although a CNG-powered bus is possible, the additional capital cost has very little, if any, trade-off in operating cost, based on current operations. Second, given the government leveling of energy prices, there is no practical price advantage to the use of CNG in New Zealand. Third, the logistics of fueling buses twice a day adds costs to the operation, and last, the weight penalty of the CNG tanks places the buses at an economic disadvantage due to the structure of the road use tax.

The lessons learned from New Zealand about CNG buses include the following:

- If alternative fuel decisions are based on purely economic grounds, the regulatory environment has a substantial bearing on the bottom line.
- CNG is an alternative fuel technology that can withstand sustained use in a transit environment.
- The economics of any alternative fuel decision must be carefully analyzed within the context of the entire energy market.

### **Australia**

Much like New Zealand, the Australian federal government has chosen to level energy prices. Here again, the taxing structure for motor fuels has affected decisions on alternative fuels. In the past, the taxing structure favored development of alternative fuels. Gasoline and diesel are subject to a motor fuel tax, but natural gas and LPG are not. The federal government plans to reform the taxing system and modify this difference by repealing the motor fuel tax and a number of other special taxes, replacing them with a general sales tax on all sales, including natural gas and LPG. This proposal, along with the policy of controlling energy prices nationally, will make the costs of transit fuel choices nearly equivalent.

The Sydney bus system is predominantly operated by State Transit. Spurred on by air quality issues and the lure

of lower operating costs, State Transit began investing in a CNG-powered bus fleet in the mid-1990s. The alternative fuel program was equal in success and size to some of the larger programs in U.S. transit agencies. The State Transit CNG fleet now stands at 104 buses, operating from two maintenance facilities. The buses are equipped with 11-L, turbo-charged engines modified to operate on CNG. The range of the bus is 220 km (176 mi). This means the buses must be fueled twice each day to meet the required duty cycle. The buses are fueled to a pressure of 2,900 psi, and the tanks are fiber-reinforced spun aluminum.

A unique partnership between State Transit, a natural gas supplier, and Sulzer Proprietary Limited has provided the fueling infrastructure required for this operation without capital investment by State Transit. The compressors, fuel cascades, and fueling dispensers are owned and maintained by Sulzer. State Transit pays for the gas at the fueling nozzle. This arrangement has allowed the transit agency to concentrate on bus operations and maintenance without also having to develop expertise in high-pressure compressors and CNG fueling apparatus. The fueling compressors and associated hardware are very similar in size and speed to the fast-fill facilities that have been developed by U.S. transit agencies.

The introduction of this fleet of CNG buses has not been without problems. Similar to the experiences in North America, failed pressure-relief devices and overheated exhaust systems have created problems in maintaining the fleet. Even with the growing pains of the program, State Transit considers it a success. The mission participants observed that the operators and maintainers of the CNG-powered buses were happy with their introduction, supportive of the concept, and committed to the success of the program.

State Transit presented the economics of its CNG operation as follows: a diesel bus consumes fuel at the rate of \$0.31 per kilometer (Australian). A CNG bus consumes \$0.20 per kilometer (Australian). Roughly converted, this equates to \$0.32 per mile (U.S.) and \$0.21 per mile (U.S.), respectively. Additionally, the CNG buses cost an additional \$0.03 per kilometer to operate, or about \$0.03 per mile (U.S.). As mentioned previously, the central government is about to reform the fuel tax system. This change will bring the cost of operating the diesel fleet and the CNG fleet to within \$0.01 to \$0.02 per mile of each other.

Despite the shift in the economics, State Transit will continue its CNG program and expand it. State Transit is committed to a continued effort to look for operating economies and contribute to cleaner air in Sydney. Through operating experience, it has found its CNG buses to be over-powered for Sydney's topography, which features gently rolling hills and few steep grades. The buses are also over-weight in comparison to the diesel fleet. These findings have led to another order of 100 CNG buses from a different manufacturer. The new fleet incorporates several lessons learned through operation and maintenance of the original fleet. State Transit set two goals for the new fleet: reduce

fuel consumption through reducing the overall weight of the bus and the engine displacement and achieve great enough range that fueling will only be required once per day. The new buses will be equipped with a 7-L, naturally aspirated engine with lower gearing. The top speed for this bus will be 80 km per hour or about 50 mi per hour. For the urban Sydney application, this equipment will meet the needs of customers and State Transit while offering greater fuel economy. The new buses will also be equipped with new generation composite fuel tanks to reduce weight and increase fuel volume. State Transit believes these changes will recover some of the cost advantage lost by the shift in national taxing policies and meet its goals.

The CNG lessons to be learned from Sydney include the following:

- Serious examination of nontraditional methods of providing fueling infrastructure for CNG should be conducted in the United States. If the cost-effectiveness of build-operate-maintain fueling stations can be replicated in the United States, there could be significant advancements made in providing alternative fuel infrastructure that today forms a barrier for many transit agencies.
- Replication of the typical diesel bus power train may not always produce the best results when converting buses to operate on CNG.
- As small buses have been found to have useful applications in many areas, it is possible that buses with lower power could also have application within transit fleets.
- Support and buy-in from all levels of an operating entity are important to the success of alternative fuels programs.

## **PASSENGER TERMINALS AND DOWNTOWN CIRCULATION**

Many U.S. cities are exploring ways to improve transit passenger connections within their CBDs. The growing interest in "seamless transportation" involving easy movement between different modes is prompting cities in the United States to consider new downtown intermodal facilities. The strategies adopted by Auckland, Brisbane, Melbourne, Sydney, and Wellington can be instructive for U.S. cities looking for ways to improve transit access to downtown commercial districts.

### **Brisbane**

The center of Brisbane Transport's bus operations is a unique underground terminal located under the Queen Street Mall. The center was completed in 1989 and includes four passenger waiting areas and 18 bus bays. The four platforms are signed using Australian animals and each bay provides information on when the next bus will arrive. The underground station was built in conjunction with the surrounding retail properties so transit passengers have easy

access to Brisbane's premier shopping district. The center includes automatic doors that remain open just long enough for passengers to move from the waiting area to the door of their bus. The underground station's exhaust system exchanges air from the bus waiting area every 70 sec, so there is no smell of diesel fumes at the passenger platforms. Surveillance cameras are located throughout the transit station with security personnel monitoring these cameras and moving about the facility. The center contains not only an attractive staffed information center, but also touch-screen kiosks for route and schedule information.

Brisbane is at the center of an extensive commuter rail system called "Citytrain." Citytrain operates over a network of six lines using 350 railcars serving 137 stations. Citytrain averages 733 services each weekday. Citytrain's central station is within easy walking distance of many of downtown Brisbane's major passenger generators. Rail passengers have access to a full range of customer services such as dry cleaners, drugstores, and Citytrain's Travel Centre. The underground boarding platforms have comfortable seating areas and additional food and drink retailers. For 70 cents, Brisbane Transport's City Circle 333 connects the Central Station to other downtown locations beyond walking distance.

Citytrain operates a centralized public address system that provides accurate information on train departure times and any unscheduled changes. A visual train information system, installed at the central station and two other downtown stations, displays train times, departure platforms, and train stopping patterns. To ensure passenger safety, waiting platforms are equipped with "help points" that link rail customers to assistance at the touch of a button, 24 hours a day. Brisbane has first-class bus and rail stations in its downtown area. Brisbane Transport's underground terminal facilitates bus movements through its downtown area by providing them their own rights-of-way. American cities considering building new downtown bus facilities should study Brisbane's center, particularly its integration with the surrounding development, passenger signage, and customer amenities. Brisbane Transport's Queen Street Station illustrates how a downtown bus center can project a very positive image for customers. Brisbane's city government is exploring expanding the underground terminal by converting several floors of an adjoining municipally owned parking garage to transit use. This expansion is necessary as Brisbane embarks on building 120 mi of bus rapid transit (BRT) facilities that will increase the number of buses entering the downtown business district.

## Melbourne

Melbourne City, the capital of the State of Victoria, is the world's southernmost urban area with more than one million people. Melbourne's public transit network includes electric trains, buses, and electric streetcars known as trams. An estimated 50 percent of the 150,000 commuters traveling daily to Melbourne's CBD use public transit.

Melbourne's tram network is the fourth largest in the world and the world's largest outside of Europe. The trams operate in the center of wide streets in downtown Melbourne. Thanks to traffic signal priority and restrictions on vehicles stopping in tram clearways, the trams achieve a consistent travel speed through downtown. Because of the tram service, very few buses operate in the central city.

Tram passengers wait in a narrow (approximately 5 ft) area in the center of the street, separated by a metal barrier from vehicular traffic traveling in the opposite direction. Although major tram stops have simple shelters for weather protection, most boarding locations have no customer amenities. Representatives of the Victoria State Government commented that few pedestrian accidents occur despite the presence of so many tram passengers standing in the middle of very congested streets.

In 1981, Melbourne's suburban electric railways were extended through an underground loop to serve more of the downtown area. Three underground stations were built to provide direct rail access to key locations such as Parliament. The Victoria government is currently upgrading two long-standing commuter rail stations, at Spencer Street and Flinders Street, to improve customer amenities and comfort.

A popular way to move about downtown Melbourne is the City Circle Tram. This free service operates in both directions along a loop of the downtown, connecting the Flinders Street and Spencer Street Rail Stations. The tram operates weekdays between 10 a.m. and 6 p.m.

The tram network in Melbourne makes it very easy to move about the city. Although the location of passenger waiting areas in the center of busy streets would not be considered by many American cities, it is working in Melbourne and the system relocates waiting passengers from standing in front of stores and offices, as they do in Sydney. The Victoria government will investigate how to provide access to persons with disabilities along the tram "clearways" in response to a national legislation for access by persons with disabilities.

## Sydney

Sydney Buses, a subsidiary of the state government, is the city's largest bus operator with nearly 1,500 buses. There also are 35 private bus companies that operate services under 5-year, performance-based contracts with New South Wales. Three private bus companies, plus Sydney Buses, operate in Sydney's primary business district. Bus operations in downtown Sydney are focused along two primary streets, George and York. Most buses are through-routed and encounter tremendous delays because of traffic congestion and passenger loading problems. Sydney City is widening the sidewalks in the downtown area for the 2000 Summer Olympics. This construction has created so much frustration with traffic delays that operators for Sydney Buses actually quit working during part of 1998. Passengers

wait for the bus in the doorways of stores, and there is significant sidewalk crowding during peak hours. A long-range improvement being considered by New South Wales involves designating two “bus-only” streets to enable buses to move through downtown much faster. A shorter-term project, which has already begun along selected streets, involves designating bus priority lanes, particularly during peak hours. However, Sydney Buses and the three private carriers continue to experience delays, even with lane-use restrictions because of illegally parked vehicles.

State Rail provides commuter rail services in Sydney through two operations: CityRail and Countrylink. The CityRail system consists of nine lines with Sydney’s Central Station at the heart of the network. Most commuter trains loop Sydney’s downtown district connecting with five rail stations in addition to the Central Station. State Rail is upgrading each of the five downtown stations to improve accessibility for passengers with disabilities prior to the 2000 Olympics. A major element of the upgrade will be improved passenger information technology. The current information system is outdated and is difficult for a newcomer to the rail system to understand.

In contrast to the efficiency of Melbourne’s tram network, Sydney’s buses encounter major delays due to downtown street congestion. New South Wales’s study of bus-only streets and designated bus lanes illustrates how serious the problem has become in terms of schedule adherence and customer satisfaction.

Sydney has two privately built and operated circulators for moving persons around its downtown area. In the late 1980s, the Van Roll company of Switzerland completed a 2-mi monorail to connect the city center with the Darling Harbour entertainment area. More recently, a 2-mi, double-track light rail link was opened between Sydney’s Central Railway Station and the Pyrmont redevelopment area. Because fares for each of these privately operated services are quite high, ridership levels on both services have been lower than expected. American cities weighing implementing short-distance CBD circulators may wish to review Sydney’s experience with these two projects.

## **Auckland**

The focal point of Auckland’s downtown bus operations is an off-street terminal connected to a parking garage. The center includes canopies to protect boarding and alighting passengers, and there is a small, enclosed waiting area which can accommodate about 100 passengers. The center includes several retailers, but much of the commercial space is unoccupied. At present, the transit center and the buildings around it appear run-down.

Tranz Rail’s downtown commuter rail station is located about 3 mi from the center of Auckland and the bus terminal. The rail terminal consists of a series of waiting platforms with canopies and a small enclosed waiting area where

rail passengers can buy tickets or get information. Buses pull adjacent to the rail platform in order that transferring passengers can change modes under the canopies. The commuter rail station, like Auckland’s bus station, is not an appealing place for passengers with most having to wait outside. There are few customer amenities or services.

The City of Auckland recognizes the shortcomings of its current facilities and has developed plans for a \$150-million public/private underground station and mixed-use development at the site of the current bus terminal. As part of this construction, Tranz Rail’s commuter lines would be extended about 3 mi via a tunnel to the new station. Auckland has begun to contract for the early phases of center construction, but the project’s cost and development scale have generated controversy. Two controversial issues surrounding the center involve the financial risk to Auckland City as a public partner in the venture and the construction of 3,000-car parking spaces as part of the project. U.S. cities considering major rail/bus intermodal facilities may want to follow Auckland’s progress to learn how it resolves these issues.

## **FARE COLLECTION**

This section begins with general observations about fare collection in New Zealand and Australia, followed by a closer look at practices in each of the five cities visited. Both Australia and New Zealand follow similar practices.

- There is a policy of providing an extensive array of fares covering time of day, distance traveled, the mode, or combination of modes used, and even for social purposes such as discounted fares for students and retired persons.
- Most of the ticket types are available only at designated locations such as station ticket booths or retail outlets. Single-trip tickets can usually be purchased from the bus driver; in most cases, exact fare is not necessary. Distribution through retail outlets is strongly encouraged.
- The bus drivers handle cash and there are no undue concerns on the part of management regarding security or theft. In New Zealand, cash is handled by the bus driver without the need for any special security measures.
- All cities visited had multiple modes of transportation—trams, ferries, and buses. With the exception of Melbourne, no integrated ticket system exists. Each company issues its own tickets; there is no integration among companies. It is common that a single trip may require using more than one company and more than one ticket. The public appears to accept this, and the concept of integrated ticketing remains a distant goal. In general, free or reduced cost transfers are not available.
- The approach to fare collection is to encourage the use

of tickets rather than cash. Once the ticket is obtained, reliance is placed on voluntary validation of the tickets by transit patrons using validating machines inside the buses and trains. Backing up this voluntary compliance is an inspection system performed at random or with cause by inspectors empowered to assess significant fines on the spot. The inspectors are also charged with observing other violations such as smoking and littering and the same high fines apply to such violations. Fines of \$100 are common. Those penalties are prominently advertised in the media and in the stations and buses. In general, management of the several properties visited believed there was no need to implement exact fare or electronic fareboxes on buses. It was the general opinion that lost revenues are at an acceptable level without such measures.

### **Auckland**

Bus service is provided mainly by Stagecoach Auckland, formerly known as the Yellow Bus Company. Stagecoach is a private company. As many as eleven other companies provide bus service in the area. Fares are based on distance, but the fare zones are determined on a route by route basis. As many as seven zones exist in some of the routes. Tickets are purchased from the bus driver who handles not only ticket sales, but also accepts cash fares.

Several tickets are available and in general depend on the issuance of a Yellow Pass. That pass can be programmed as a Flexi Pass, valid for 1 month of travel, as a multi-journey valid for 10 trips, or on a stored-value basis in terms of multiples of \$10 (New Zealand). Special tickets covering family travel and unlimited daily travel are also available. Yellow Passes are also available at many retail outlets. There are numerous discounts for students, senior citizens, and others.

Fares range from 50 cents for a single trip in the downtown area to a maximum of \$7.20 (New Zealand) for a seven-zone bus trip. Train service is provided by Tranz Metro, mainly for suburban travel. Fares are also based on zones with a total of six zones. Fares range from \$1 (New Zealand) for a single trip in one zone to a maximum of \$4.30 (New Zealand). The usual discount fares are also available. Ferry service is also available and is presently integrated with bus service under The Yellow Bus Company.

### **Wellington**

Bus and trolleybus service is provided by Stagecoach Wellington, which, as is the norm in New Zealand, is a private company. As many as six fare zones exist with fares ranging from \$1 (New Zealand) for a single trip in the downtown zone to \$2.90 (New Zealand) for a trip covering all six zones. Additionally, 10-trip, downtown-only, and monthly

tickets are available. Discounts are given to widows, war veterans, students, and senior citizens.

Cash tickets for a single trip can be purchased from the bus driver or from the ticket collector on the trains, but all other tickets need to be secured at ticket offices or by mail. A limited number of retail outlets also carry tickets.

Commuter rail service is provided by Tranz Metro, with a similar range of ticket types. Fares for single trips range from \$1.60 (New Zealand) to \$7.50 (New Zealand), depending on distance traveled.

### **Melbourne**

Of all the cities visited, Melbourne has the most integrated ticketing system. Designated as the Metcard system, it is now under initial implementation on all bus, tram, and train lines there. The implementation process is quite complex and requires an extensive public information program. Newspapers, handouts, posters, phone information numbers, and other methods are used to make this process as people-friendly as possible. Although the initial phase uses magnetic stripe cards, the use of smart cards is under serious consideration. All automatic fare gates are connected to a central computer.

The conversion is scheduled for completion in about 1 year, and the phased approach appears to be working. The fare media, magnetic stripe based, will be used in all transport modes after the project is completed. Because the automated ticketing area is limited to downtown, both the Metcard and the old-style tickets can be used all over the system. Paper, scratch, and magnetic tickets are all in use.

The variety of available tickets is large and, as part of the Metcard project, some rationalization and reduction may occur. However, at present, tickets of many types are available such as short-trip, 2-hour, daily, weekly, monthly, and yearly. Also discount tickets are available for students, group travel, family travel, or senior citizens.

The fare structure itself is complicated and based not only on time but also on distance. The metropolitan area is divided into three fare zones within Zone 1 covering downtown and the other two zones cover the suburbs. On weekends, however, the zone system does not apply and all tickets are valid in all zones. Tickets can be purchased at train stations, on board trams and buses, and at 800 retail outlets. However, onboard purchases are limited to single, 2-hour, and 60-plus tickets. As many as 2,400 ticket vending machines will be in service shortly. Fares range from \$2.20 (Australian) for a single, 2-hour ticket to a maximum of \$5.20 (Australian) for an all-zone ticket. Fare compliance is monitored and enforced by Revenue Protection Officers who constantly patrol the system.

### **Brisbane**

Brisbane Transport has a wide variety of tickets, including single, transfers, 10-trip, and off-peak tickets. In

addition, weekly and monthly tickets are available. As is the practice in other cities, discount tickets are provided for students, senior citizens, group travel, and family travel.

Travel pricing is based on time of day and also distance with a total of five fare zones covering the metropolitan area. These zones are designed in a concentric pattern centered on downtown Brisbane. Fares range from \$1.40 (Australian) for a single-trip, single-zone ticket to a maximum of \$3.20 (Australian) for an all-zone ticket.

Tickets for a single trip can be obtained from the bus driver but all others are available at customer service centers, operated by the government, or at many retail outlets. Transfers between bus routes or between buses and ferries are available.

Rail services are provided by Queensland Rail (City Rail), with a similar range of ticket types and a heavy reliance on ticket vending machines. However, these machines only accept coins. Although the machines do issue change, the lack of acceptance of paper money is a disadvantage.

An integrated ticket system covering all properties, public and private, is now under staged implementation. The first phase is now in place and covers the South East Explorer Line to the suburbs. The system uses magnetic stripe cards at present. However, the possible use of smart cards of the contactless type is under consideration. The plan is to implement the ultimate system under contract to a private entity that will be responsible for all phases of the operation, including revenue collection.

### **Sydney Metropolitan Area**

The Sydney metropolitan area is served by Sydney Buses, Sydney Ferries, and the CityRail network, under the government of New South Wales. In addition, up to 35 private bus lines also operate in the area. Several private ferry services also exist. There is no integrated ticketing except within the government-operated services. The Day Rover ticket is a good example of integration because it is valid for travel on a single day in all transit modes, including ferries.

There are an extensive variety of tickets to serve the different needs of the transit patrons. Tickets are available in many combinations of services. The services include bus and rail, bus and ferries, and bus, rail, and ferries. Ten-trip, weekly, monthly, and yearly tickets are also available. Because the wide array of tickets can be and sometimes is confusing, the operators have issued charts to explain the nature of the available tickets and to facilitate selecting a specific ticket type for a specific travel purpose. Each ticket is assigned a specific number and, if necessary, the movement of a ticket within the transit system can be monitored for operational or statistical purposes. In addition to the standard tickets, there are off-peak, family-travel, student, and senior-citizen tickets. In general, cash single tickets can be purchased from bus drivers, but the practice is discouraged. Multiple-ride tickets of all types are sold at the InfoKiosks, many retail outlets, and at ticket vending

machines installed at some key stations such as Circular Quay in downtown Sydney. Some train stations have automated fare gates that accept magnetic stripe tickets. Extensive use is made of ticket vending machines. Tickets are of the magnetic stripe type and require validation at machines located in all buses and trains. Tickets are subject to inspection at any time and fines of \$100 (Australian) are levied on the spot, if necessary.

Fares range from \$1.20 (Australian) for a single-trip, single-zone ticket to a maximum of \$4.60 (Australian). Fares are based on zones with as many as 27 zones existing in the Sydney region. Actual fares are determined by an independent tribunal that, incidentally, recently allowed a 15 percent fare increase.

### **CONCLUDING OBSERVATIONS**

Multimodalism was a strong feature in all cities studied. Each has a bus and a rail system. The heavy rail systems typically served commuter trips, and bus and light rail served both commuter and city circulation routes. Several cities have ferry systems that served like bus lines on water and were frequently operated by the bus agency.

Multimodalism appeared enhanced by privatization, not competitive. Pricing and farecard integration was a major tool to achieve transit objectives. Another benefit of the strategic approach was to isolate characteristics that attract riders to transit: service logo identity, upgraded stations, seamless transfers, and fare integration. These features were applied to all modes, and bus transit has benefited from these upgrades.

Therefore, it is natural that all cities were trying out different examples of bus prioritization. Exclusive lanes, by time of day, were the most common technique, typically coupled with some type of "rapid bus" service, characterized by fewer stops/express style service. Exclusive lanes were found on city arterial streets and on regional highways, as well as on major bridges like the Auckland Bridge's moveable barrier lane and Sydney's Harbor Bridge toll facility.

Traffic signal prioritization was being practiced everywhere, Australia being among the most advanced nations in computerized signal timing. The latest innovation was to attempt to count passengers in vehicles, thereby basing preferential treatment on the principle of moving people faster, not vehicles. Cities had also tried the "B"-signal and queue jumper lines to give added time for buses to get through intersections ahead of automobile traffic.

Any of these cities is well worth study by U.S. cities interested in bus rapid transit corridors. What they showed is that bus prioritization works best when it is integrated with land use planning and when it is part of a coordinated multimodal approach to public transportation.

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## APPENDIX B: MISSIONS HELD TO DATE

- **Enhancing the Attractiveness of Public Transit.** Location: Europe (London, Manchester, Amsterdam, Paris, Stuttgart) September 9-25, 1994. Leader: Ken Gregor
- **Innovative Roles for Transit in Creating Livable Communities.** Location: Europe (Vienna, Salzburg, Munich, Zurich, Freiburg, Strasbourg, Paris) May 18-June 4, 1995. Leader: Bill Millar
- **High-Tech Solutions to Transit Problems.** Location: Asia (Tokyo, Yokohama, Nagoya, Hong Kong, Singapore) November 1-18, 1995. Leader: Ed Colby
- **Exemplary Urban and Regional Bus Operations in Small & Medium Cities.** Location: Europe (19 cities in Switzerland, Austria, Germany, Belgium, the Netherlands) May 9-26, 1996. Leader: Dick Ruddell
- **Canadian Urban and Regional Transit Innovations.** Location: Canada (Quebec City, Montreal, Ottawa, Toronto, Calgary, Vancouver, Victoria) October 14-27, 1996. Leader: Bob Lingwood
- **Public/Private Partnerships and Innovative Transit Technologies in Scandinavia.** Location: Europe (Finland, Sweden, and Denmark) May 23-June 7, 1997. Leader: Shirley DeLibero
- **Applications of Intelligent Transportation Systems to Public Transit in Europe.** Location: Europe (London, Southampton, Paris, Berlin, Munich) October 10-26, 1997. Leader: Lou Gambaccini
- **Private Urban Transit Systems and Low Cost Mobility Solutions in Major Latin American Cities.** Location: South America (Buenos Aires, Montevideo, Porto Alegre, Curitiba, Sao Paulo). April 17-May 3, 1998. Leader: John Bartosiewicz
- **Revitalizing Urban Public Transport in New Zealand and Australia.** Location: New Zealand and Australia (Auckland, Wellington, Melbourne, Brisbane, Sydney) October 30-November 15, 1998. Leader: Tom Kujawa
- **Technology and Joint Development of Cost Effective Transit Systems in the Asian Pacific Region** Location: Japan and Hong Kong (Osaka, Kobe, Nagoya, Tokyo, Chiba) April 8-25, 1999. Leader: Minnie Fells Johnson
- **Integration of ITS and Mobility Management in Medium-Sized European Cities.** Location: Europe (Geneva, Lausanne, Toulouse, Bilbao, Porto, Lisbon) October 15-31, 1999. Leader: Pete Cipolla

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