ECONOMIC INCENTIVES TO INCREASE PUBLIC TRANSPORT PATRONAGE – THE THEORY AND THE PRACTICE

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Abstract

This paper reports on an innovative policy for central government funding to local passenger transport services in New Zealand, that ties funding directly to performance.

The new policy, known as Patronage Funding, was developed and implemented by Transfund New Zealand, with assistance from consultants. Under the policy, government funding to the regions for public transport services is based directly on the patronage generated. This leaves responsibility for service planning with regional government, but encourages them to improve services in such a way as to generate additional patronage. The payment rates are based on estimates of both the user benefits and externality benefits of improving services and hence attracting additional passengers. The externality component comprises benefits associated with reduced road congestion, safety and environmental benefits. Hence, the payment rates vary by city, time period (peak/off-peak) and distance travelled.

The paper describes the economic theory and the analyses underlying the new policy, key aspects of its implementation, and experience in the first six months since its introduction in November 2000.

1. INTRODUCTION

This paper reports on an innovative policy for central government funding support to local passenger transport services in New Zealand.

The new policy, known as Patronage Funding, was developed and implemented by Transfund New Zealand, with assistance from consultants. Under the policy, central government funding to the regions for public transport services is based directly on the patronage generated. This leaves responsibility for service planning with regional government, but encourages them to improve services in such a way as to generate additional patronage.

The rates of funding (per passenger) are based on estimates of both the user benefits and externality benefits of improving services and hence attracting additional passengers. The externality component comprises benefits associated with reduced road congestion, safety and environmental benefits. Hence the payment rates vary by city, time period (peak/off peak) and distance travelled.

The paper describes the economic theory and the analyses underlying the new policy, together with key aspects of its implementation, and summarises the experience in the first six months since its introduction in November 2000.

The paper is structured into the following sections:

2: New Zealand public transport system and funding
3: Key features of the Patronage Funding scheme
4: The economic theory
5: Assessment of mode switching benefit rates
6: Assessment of public transport user benefit rates
7: Basis of Transfund payments
8: Phased implementation – the 'Kick-start Funding' scheme
9: Progress and outcomes to date
10: Some on-going issues
11: Conclusions.

2. NEW ZEALAND PUBLIC TRANSPORT SYSTEM AND FUNDING

2.1 Public Transport Regulation and Administration

Public transport services in New Zealand are provided by bus (in all urban centres as well as rural and longer-distance services), rail (suburban 'heavy' rail services in Auckland and Wellington) and ferry (a significant role in Auckland, a small role in several other centres).

Since major regulatory reforms in 1991, all public transport operators have been independent private companies operating on a normal commercial basis.

The 1991 reforms also introduced a 'semi-deregulated' system, with a lot of similarities (but also significant differences) to the UK (outside London) system. The New Zealand system has been described in detail in previous Thredbo series papers (Wallis 1993, 1995).

Key features of relevance here include:

- Regional councils (elected government bodies, 14 covering New Zealand) have the prime responsibility for specifying, contracting and funding public transport services.
- Operators are permitted to register services to be provided on a commercial (unsubsidised) basis. Regional councils may only reject such registrations on specified grounds (eg environmental or traffic management grounds, or having an adverse effect on other subsidised services).
- Regional councils decide what public transport services are required in addition to these commercially registered services. These additional services are specified (in a Regional Passenger Transport Plan) in terms of routes, frequencies, capacities, maximum fares and minimum vehicle quality standards.

- Regional councils then secure these services through a competitive tendering process. Contracts are usually on a 'net cost' basis (ie bidders estimate the expected fare revenue and submit bids on the basis of the net subsidy required; the successful operator is then paid the bid subsidy and retains the fare revenue).

Transfund New Zealand is the central government agency that purchases road and public transport outcomes, funded through dedicated fuel taxes, road user charges (for diesel vehicles) and license fees. Transfund also sets the overall guidelines to be followed by regional councils when competitively tendering public transport services (the Competitive Pricing Procedures, or CPPs).

2.2 The Previous Public Transport Funding and Evaluation System

Recent statistics indicate that about 84 million passenger trips (boardings) pa were made on local commercial and contracted public transport services (excluding school contract services in rural areas) in New Zealand: this is an average of some 31 boardings pa per person in the areas served.

Total public funding (subsidy) for these services was about $82 M pa[1], ie approximately $1 per passenger boarding. Although precise statistics are not available (because of the nature of the commercial system), the services overall have an average fare-box cost recovery in the range 60-70%, which is relatively high by developed world standards. The overall proportion of passengers carried on commercial services is about one third: in the three largest centres, the proportions of bus passengers carried on commercial services are 51% in Auckland, 26% in Wellington and 4% in Christchurch.

Prior to Patronage Funding, Transfund contributed about $43m pa of the total subsidy for **existing** public transport services. This figure had been capped nationally since 1996 based on historic levels. Of this $43m, about $36m was for general public transport and $7m for specific social services. The contribution to general services was based on a funding share of 40% of bus and ferry subsidies, and 60% of rail subsidies. These Transfund funding shares were independent of the level of patronage of the services; and indeed the amount paid by Transfund to each region was dependent on the region's service level and fares policies, and not related to any measure of the benefits of these policies.

Prior to Patronage Funding, the only way that ***new*** passenger transport initiatives could receive funding was through the Alternatives to Road (ATR) evaluation procedures, a cost-benefit evaluation that was introduced in 1997, and was designed to evaluate passenger transport investment and funding in a comparable manner to road investment. The ATR procedures involve an 'efficiency ratio' (ER), which is equivalent to a benefit-cost ratio (see NZIER, 1998), but with benefits and costs measured net of revenue such as fares. During 2000/01 only, passenger transport and road projects with an ER greater than 3.0 qualify for Transfund funding. Transfund's medium-term funding 'hurdle' rate is 4.0 (reflecting Transfund's budget constraints).

An issue that arose was that passenger services with a high efficiency ratio generally were already commercial. By contrast, roads with a high benefit-cost ratio are not made available to commercial operators to augment the Road fund. Roads in New Zealand are fully funded by the government, with no private sector involvement and only one toll road. Thus, under the benefit-cost ranking system, no passenger transport schemes were funded, because high ranking Road projects had first access to the dedicated fund. Patronage funding was developed as a means by which to contribute to passenger transport in the same proportion of benefits generated as roads, irrespective of whether the services were commercial or subsidised.

2.3 Reasons for Changes to the Funding System

The Labour Alliance Coalition Government came into power in late 1999 with a goal to increase national funding of public transport services, and to increase their usage: it sought a simple, low-cost means to achieve that while still ensuring prudent use of funds.

Patronage Funding was developed as the key policy to achieve this goal. Its objectives were to:

- ensure that funding for passenger transport services goes where it is most needed (eg where there is road congestion)

[1] *All figures in $NZ. 1 $NZ is equivalent (June 2001) to about 3.95 NoK, 0.50 Euro or US$0.42.*

- reward regional councils whose passenger transport strategies attract more passengers
- provide the opportunity to fund new passenger transport services.

Unlike other Transfund investments, funding for existing services had hitherto not been related to their value to passengers, nor their effectiveness at providing road system benefits. Three studies, each analysing peak-period public transport services in different key congested traffic corridors, concluded that the subsidy to each service (to provide higher service levels and/or lower fares) had an ER between 2.0 and 3.0, and would therefore not qualify under Transfund's previous funding policies. Other studies had indicated that ***new*** public transport initiatives (eg new rollingstock, improved transport interchanges) would also have difficulty qualifying for funding: prior to Patronage Funding, no new services had in fact received Transfund funding.

Adoption of a system whereby Transfund pays for results rather than shares the cost of inputs, creates a financial incentive for regional councils to take cost-effective actions to increase patronage (eg. through improved public transport services, marketing initiatives or new infrastructure). Transfund is able to take a 'hands-off' approach and leave each regional council free to develop its own strategy for increasing patronage, because each regional council has a strong financial incentive to increase patronage at the minimum cost.

3. KEY FEATURES OF THE PATRONAGE FUNDING SCHEME

Prior to describing the various economic and technical analyses, this section presents an overview of the Patronage Funding scheme adopted as a result of these analyses plus various other (financial and political) considerations. Key features of the scheme are summarised as follows.

Key Principles

(i) Transfund pays regional councils on the basis of the patronage carried on all services in the region, irrespective of the characteristics of the individual services. The funding basis does not differ between modes, or between contracted and commercial services.

(ii) The PF scheme involves:
- a base level of payment for carrying a base level of patronage: these levels are based on the Transfund payment amounts and the total patronage carried in the financial year prior to the start of the scheme (1999/00); plus
- variable patronage–related payment rates applying to any variations in annual patronage from the base levels.

Constraints on Payments

(iii) During a short-term transition period (up to 2003), Transfund will not reduce its funding to any region below the agreed base level, in order to minimise any adverse effects on services or on local funding requirements. Thus the variable patronage-related payments in this period would apply only to patronage increases, not any decreases.

(iv) Transfund requires each regional council to at least maintain its own base level of regional expenditure; and Transfund will in no case contribute more than 80% of total expenditure in any region. (This latter point is only likely to be an issue in the event of strong patronage growth over some years, because Transfund's share of total regional expenditure is currently less than 50%).

Payment Rates

(v) The variable payment rates per passenger are based on 'externality' benefits of improving the public transport system, and thus attracting additional passengers and benefitting existing users:

- 'externality' benefits include the benefits of travellers switching to public transport from other modes (additional to those benefits perceived by the mode switchers themselves): these benefits relate to changes in car traffic volumes (road user travel times, fuel costs, accidents and environmental impacts) and changes in externality costs for other alternative modes (principally safety benefits);
- 'externality' benefits also include the benefits of improved public transport services (required to attract additional passengers) to the existing public transport users (eg increased service frequency, reduced fares).

(vi) The payment rates adopted are as set out in Table 1. There are three alternative sets of variable rates per passenger (boarding), according to different circumstances and preferences:

- All rates differ between peak and off-peak periods and between each of the three main regions and the 'other' regions – principally according to the degree of congestion.
- The basic ('hybrid') rates have a 'flag-fall' (per passenger boarding) component and a 'distance' (per passenger kilometre) component.
- The 'simplified' rates are derived from the 'hybrid' rates based on the average passenger trip distance in each region. Each regional council may choose whether to adopt the 'simplified' rates or the 'hybrid' rates.
- 'Other (smaller) regions were also given the option of choosing a flat rate over all time periods (in order to reduce administration costs).

(vii) Transfund will review these payment rates annually (it has recently confirmed that the 2000/01 rates given will also apply for 2001/02).

Phased Implementation: 'Kick-start Funding'

(viii) To encourage a short-term one-off boost to both patronage and funding, the initial phase of Patronage Funding (known as 'Kick-start Funding') involves Transfund paying not only for additional passengers (applying the above rates) but also a proportion of the input costs for approved additional services (further details in Section 8).

TABLE 1: TRANSFUND VARIABLE PAYMENT RATES BY REGION [1]
All rates per additional passenger boarding

Period	Region			
	Auckland	**Wellington**	**Canterbury**	**Others**
'Hybrid rates' (vary with trip length) [2]				
Peak [5]	$1.45+$0.21*D	$1.05+$0.17*D	$0.30+$0.09*D	$0.20+$0.08*D
Off-peak	$0.15+$0.06*D	$0.15+$0.06*D	$0.15+$0.06*D	$0.15+$0.06*D
'Simplified' rates (averaged trip lengths) [3]				
Peak [5]	$3.00	$2.90	$1.00	$0.90
Off-peak	$0.70	$0.70	$0.70	$0.70
All periods [4] (flat rate)	-	-	-	$0.85

Notes: [1] Rates apply to 2000/01 and 2001/02. All figures exclude GST.
[2] D = trip distance (kms)
[3] Based on 'hybrid' rates by applying average trip length in each centre.
[4] Weighted average of peak and off-peak rates, which may be used in 'other' regions (to avoid the need for records of patronage by peak v off-peak).
[5] Peak rates apply to any period of four hours on weekdays (period chosen by each regional council).

4. THE ECONOMIC THEORY

This section provides an overview of the economic basis for deriving the patronage payment rates. Fuller details are provided in various consultant working papers prepared as part of the development of Patronage Funding (NZIER 2000, BAH 2000).

4.1 Rationale for Subsidy

An individual's decision to travel by public transport or an alternative mode is based on the 'costs' (or disutility) that he/she perceives personally (eg travel time, fares, car operating costs, parking charges, personal safety). Individuals do not generally take into account the 'externalities' associated with their choices, ie the economic costs these choices impose (without compensation) on other parties (eg. increased in road congestion). Given such externalities, and in the absence of optimum road pricing, it may be efficient (ie enhance economic welfare) to subsidise public transport as an alternative to car use.

The economic analysis was concerned with determining the optimum passenger-related subsidy rate that would provide the same marginal economic return as is achieved in the roads sector, through the use of Transfund's benefit: cost evaluation criteria for road projects. Significantly, the road sector evaluation and

funding criteria result in Transfund funding a proportion of the **costs** of road projects; while the Patronage Funding approach is concerned with Transfund's funding to passenger transport being directly related to the **benefits**, irrespective of the costs.

4.2 Warranted Subsidy Rate

For the evaluation of road schemes, Transfund applies 'conventional' cost-benefit analysis procedures to derive a resource benefit: cost ratio for each scheme:

$$R_r = B_r / C_r$$

where R_r = benefit: cost ratio for road schemes
B_r = PV net road user and externality benefits
C_r = PV road provider costs (both capital and recurrent, to government).

Transfund then makes a funding contribution, provided that R_r is at least equal to a pre-determined 'hurdle' rate (H_r). H_r reflects the budget constraints, and is varied from time-to-time depending on the availability of funds; it is currently 3.0, but the medium-term rate is estimated at around 4.0.

For evaluations of public transport expenditure, previously Transfund had derived an equivalent 'efficiency ratio' (ER):

$$R_p = B_p / C_p$$

where R_p = efficiency ratio for public transport schemes
B_p = PV net transport user and externality benefits
C_p = PV net public transport provider costs (to government).

For consistency with road evaluation, Transfund should make a funding contribution provided that R_p exceeds a hurdle rate H_p. Other factors being equal, for optimum allocation of resources H_p should be set equal to H_r – but see below.

To derive the warranted patronage-related payment rate, this formula needs to be inverted, ie:

$$C_p = B_p / H_p$$

where now C_p = warranted payment rate (per additional passenger)
B_p = benefit from that payment (per additional passenger)
H_p = appropriate hurdle rate for public transport expenditure.

That is, the warranted payment rate (per additional passenger) equals the benefit (per additional passenger) divided by the hurdle rate that reflects the scarcity of funds. This result is unsurprising. It reflects that, if payments are made at this rate, then the marginal benefits secured (per $ funds) are equal to the benefits (per $) from funding the marginal road scheme for which the benefit: cost ratio just meets the hurdle rate (H_r).

As noted earlier, the benefits (B_p) comprise two externality components – benefits relating to mode switching (principally to/from car) and benefits to existing public transport users:

$$B_p = B_{pr} + B_{pp}$$

where B_{pr} = road user and related (externality) benefits, per additional public transport passenger
B_{pp} = existing public transport user benefits, per additional public transport passenger.

The basis for calculating B_{pr} and B_{pp} is given in subsequent sections of the paper.

4.3 Treatment of Risk and Irreversibility

For road and passenger transport capital projects, Transfund funds on the basis of estimated benefits. There is a risk that these benefits will not occur, but for typical projects it is usually not feasible to recoup much (if any) of the original funding – it is irreversible. Patronage Funding, on the other hand, is only paid out once the benefits have occurred – that is, once additional passengers have been attracted – so it involves no risk with respect to achieving the benefits.

In order to reflect the lower risk, NZIER evaluated the risk using the real options theory (based on Dixit and Pindyck, 1994). They concluded that Transfund's BCR hurdle rate can be described as:

$H_r = 1 + f + \alpha$

where f = risk premium for irreversibility

α = additional mark-up to reflect funding constraints.

NZIER estimated that (f) for road projects was around 1.0; and hence, by deduction (α) is currently also around 1.0 (corresponding to $H_r = 3.0$), although around 2.0 in the medium-term.

As Patronage Funding involves no irreversible commitments of funds, f=0 in this case. Thus the appropriate hurdle rate for public funding is $(1+\alpha)$, or about 1.0 lower than for capital projects. Thus, for even-handedness with road projects, the appropriate funding rate for the Patronage Funding scheme is equal to $B_p/(1+\alpha)$. If this rate is paid to attract additional passengers, then Patronage Funding will offer as good value for limited funds as road projects.

5. ASSESSMENT OF MODE-SWITCHING BENEFIT RATES

5.1 Overview

This section summarises how we developed ways to assess and quantify the externality benefits of mode switching, as a result of changes in the attractiveness of the public transport system. (The following section covers externality benefits to public transport users).

Key features of this concept include:

- The benefit values relate to marginal changes (increases or decreases) in public transport usage, however caused.
- The benefit values allow for the likely travel behavioural response of public transport users to such a marginal change (ie a proportion of public transport users may switch to/from car driver, and to/from other modes).
- The methods and costs of achieving these benefits (eg through improved services or lower fares) are not relevant to the benefit values.
- The values of interest are the unit benefits per person switching to/from public transport.

Figure 1 sets out the structure of the assessment, which involved:

- Estimation of 'diversion proportions', ie the proportions of any increase in public transport patronage (resulting from enhancements to services) which would be diverted from each alternative mode.
- Estimation of the unit externality benefits, for travellers diverted from each alternative mode, under four categories (environmental, safety, decongestion and parking).
- Weighting of the unit externality benefits by mode by the relevant diversion proportions, to derive the weighted average unit externality benefits, for each category and overall.

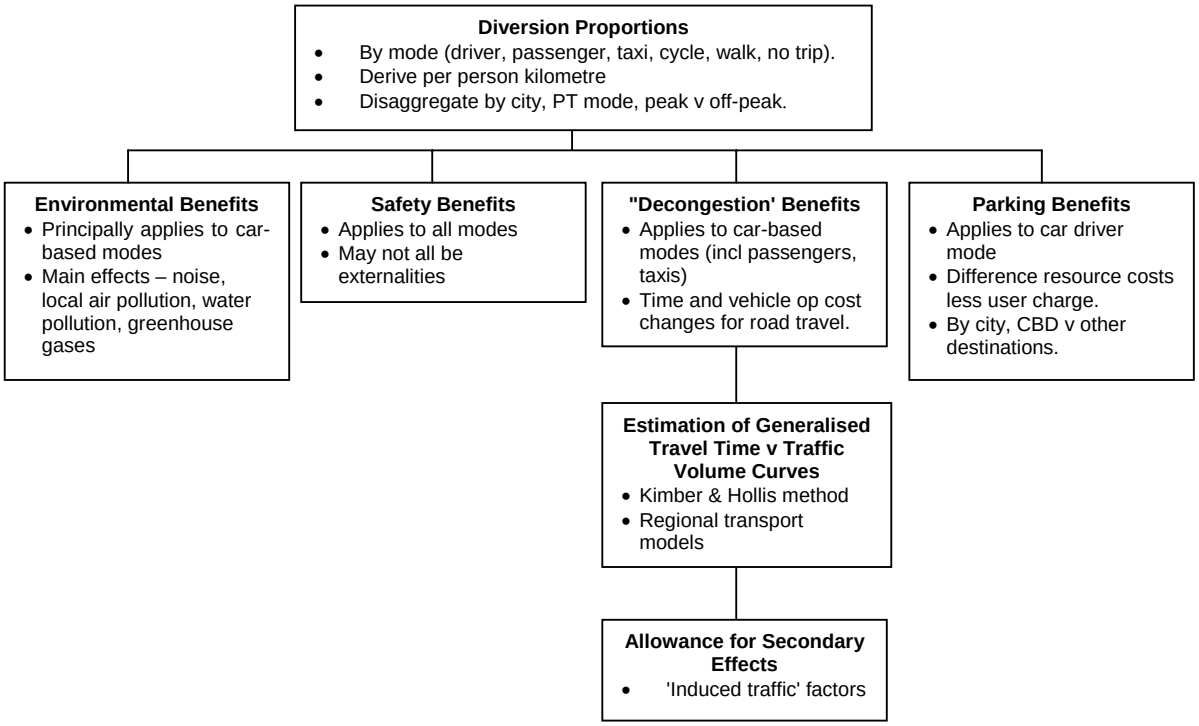
The following sub-sections summarise the work undertaken relating to each of the Figure 1 boxes.

5.2 Diversion Proportions

The 'diversion proportions' of interest here are the proportions of additional public transport users, resulting from a marginal change (from whatever cause) in the attractiveness of public transport relative to all other modes, that would switch to/from each alternative mode.

Of particular relevance to the project are systematic variations in diversion proportions in ways that could be applied to differentiate between public transport services in different areas/corridors, time periods, trip lengths etc. For project purposes, diversion proportions were required on both a per passenger trip basis and a per passenger kilometre basis.

Figure 1: Assessment of Mode-Switching Benefit Rates – Overview



Two main sources of evidence on diversion proportions were used:

- Review of international evidence on diversion proportions in urban areas, undertaken by Booz·Allen for Transfund (BAH 2000).
- Analysis of responses to Customer Satisfaction Surveys of public transport in main NZ urban centres, in particular relating to alternative means of travel if public transport were not available.

Based on review of the evidence, best estimates were derived of diversion proportions, disaggregated by key differentiating variables, ie urban centre, public transport mode used and time of day (peak v off-peak).

Diversion proportions per passenger were then converted to diversion proportions per passenger kilometre, allowing for differences by trip length (longer trips tend to divert to car, shorter to walk/cycle).

5.3 Environmental Benefits

Environmental benefits from the shift from alternative modes to public transport relate principally to car-based modes. The main environmental effects of relevance at the margin were noise, air quality, greenhouse gases and water quality.

A review of key New Zealand and international literature was undertaken to derive appropriate values. It was found that:

- The consensus of evidence is for average valuations for all significant effects in the order of 5¢/vehicle km, but with a wide range of uncertainty.
- Marginal valuations (appropriate for this project) differ significantly from average valuations: for some impacts they will be lower, for others higher. Overall marginal valuations appear likely to exceed average valuations.
- Over all significant effects, marginal valuations seem most likely to be around twice the average valuations, ie in the order of 10¢/veh km.

We concluded that:

- For car traffic, best estimates of marginal rates were 10¢/vehicle km for peak (congested) conditions, 5¢/vehicle km for off-peak (uncongested) conditions.
- For walk and cycle modes, zero environmental externalities were assumed.

- Allowance should be made for the environmental externalities of any buses removed from the traffic stream.

5.4 Safety Benefits

Analysis of marginal safety (externality) benefits was a difficult aspect, for several reasons:

- While we were able to make use of good data on NZ accident numbers and costs (by urban area, mode and time period), adequate data on cost causality were not available.
- The accident cost rates derived are average rates, which do not necessarily apply at the margin. For instance, increased peak-period road traffic results in lower speeds, and most likely in lower accident costs per vehicle kilometre).
- It is unclear what proportions of accident costs are 'internalities' (incorporated in costs faced by the user) and should thus be excluded from the results: we assumed that all accident costs were externalities.

Table 2 presents a summary of the estimated costs per person km by mode (aggregated over all age groups). The very high cost rates for cycle mode relative to bus and car are notable: this has substantial implications for any policies that result in switching of travel mode from bus (or car) to cycle.

TABLE 2: SUMMARY OF ACCIDENT COST RATES (1)

	Social cost rate - ¢/km		
Mode	**Weekday Peak**	**Weekday Off-peak**	**Weekend**
Rate/person km			
Bus	0.0	0.0	0.0
Car	1.8	2.9	2.7
Cycle	33.6	43.5	32.0
Walk	17.6	18.9	19.2
Rate/vehicle km			
Car	2.5	4.4	4.9

Notes (1) Based on NZ Land Transport Safety Authority data for 1997-98 plus related sources.

5.5 'Decongestion' Benefits

This part of the assessment was concerned with estimation of the marginal changes in travel time on the congested peak period road networks in the main centres (Auckland, Wellington, Christchurch), ie. the slope of the travel time v traffic volume function. It was one of the most demanding, but important, parts of the whole assessment.

Two separate approaches were used, and compared:

- The Kimber & Hollis (1979) method, to assess the travel time v volume function on each corridor and at each bottleneck, based on the current prevailing peak period traffic volumes and capacities. This was the primary source of estimates.
- Application of Regional Transport Models (Auckland and Wellington) to establish the peak period travel time v volume functions on a region-wide basis. This was used as a check on the above approach.

Key features of our application of the Kimber and Hollis methodology were:

- The decongestion effects are a function of two variables: the shape of the demand profile over a two hour or longer time period; and the congestion index.
- The 'congestion index' is the ratio of the peak 60-minute demand volume to the ruling intersection or bottleneck approach capacity during the same time interval (ie the peak 1-hour volume/capacity, or V/C ratio). For V/C between 0.85 (no congestion) and 1.15 (stable congestion), marginal changes in travel times increase rapidly from near zero to the upper threshold.
- The slope of the travel time/volume function for each major intersection was estimated directly through a mathematical formulation, incorporating the slope of the demand profile and the 'congestion index'. These estimates were validated against direct field measurements in a few critical cases.

- The total magnitude of the delays within a travel corridor was calculated as the sum of the separate value at each important intersection or bottleneck approach: only a few individual intersection or bottleneck approaches were found to be critical in each corridor.
- The results were derived in terms of the total travel time savings (minutes/day) resulting from a uniform 1% change in peak period traffic volumes, for each major corridor and hence aggregated over the city as a whole.
- Standard values of motorist time savings were then applied, to derive a marginal 'decongestion' cost per marginal peak car kilometre on the road network.

'Secondary' Effects – induced traffic
The above results were based on an assumption of a fixed route assignment, and did not allow for 'secondary' effects in response to changes in traffic volumes in congested urban networks: these effects include re-routing, re-timing of trips, re-distribution etc.

An allowance was then estimated for these secondary effects, based on three sources:

- UK evidence for trunk road project evaluations, comparing the use of fixed trip and variable trip matrix evaluations (these exclude the 're-assignment' response).
- London Transportation Studies analyses, which directly address all feedback responses (including re-assignment).
- Special tests using the Auckland Regional Transport Model, also to address all feedback responses.

The results indicated that the initial travel time benefits need to be reduced by about 50% to allow for these secondary effects.

Impact on vehicle operating costs
Based on examining typical vehicle operating cost functions in congested urban conditions, it was concluded that changes in traffic speed would result in vehicle operating cost increases valued at about 7% of the adjusted marginal time decongestion cost rates.

5.6 Parking Benefits

Many commuters, particularly to CBD areas, do not pay the full (resource) costs of their parking spaces: any such shortfall between price paid and resource costs is an externality appropriate for inclusion in the assessment.

For peak period travel, estimates were made for each main centre of average externality costs for commuters to CBD areas and to other areas. For off-peak travel (for which parking is generally of shorter duration and less often subsidised), parking externality costs were assumed to be zero.

5.7 Results Summary

The results for each of the above four areas of benefit assessment were weighted according to the estimated diversion proportions, and then combined to derive marginal benefit rates per additional passenger kilometre by peak and off-peak periods in each centre. The findings are summarised in Table 3.

Key features of these findings are that:

- Environmental and safety benefits together are relatively constant (8¢ - 13¢ per marginal passenger km) across all centres and peak and off-peak periods.
- Time and vehicle operating cost benefits reflect the levels of traffic congestion, and are only significant in peak periods. In the most congested situations (Auckland, Wellington) these benefits dominate other benefit sources. (Parking benefits have not been fully quantified at this stage).

We note that, at this stage, results for each centre are not disaggregated beyond the peak v off-peak split: while the decongestion analyses would, at least in theory, permit breakdowns of results by major corridor, these have not been applied to date.

We also note that, at this stage, all benefit rates have been expressed on a per passenger kilometre basis. However, 'decongestion' benefits, in particular, are more related to traffic volumes through critical

bottlenecks than to system-wide changes in vehicle kilometres: this refinement is addressed in subsequent sections.

TABLE 3: SUMMARY OF MARGINAL MODE-SWITCHING EXTERNALITY BENEFIT RATES BY CENTRE

Period	Item	Externality Rates – c/Diverted Pass Km [1]			
		Auckland	Wellington	Christchurch	Other
Peak	Envt, Safety	11.4	11.2	13.3	11.9
	Time, VOC	49.9	40.8	5.0	0.0
Off-Peak	Envt, safety	9.1	8.0	11.8	10.1

Notes: [1] Parking benefits not included in these estimates.

6. ASSESSMENT OF PUBLIC TRANSPORT USER BENEFIT RATES

When public transport services are subsidised and improved (in order to attract additional passengers), then benefits accrue to existing passengers, in terms of reduced waiting times, lower fares etc (this is known as the Mohring effect (Mohring 1972). These benefits are the second type of externality benefits referred to earlier.

Extension of the economic analysis outlined earlier (Section 4.2) shows that the benefits to existing passengers per additional passenger attracted by subsidy may be expressed as:

$$B_{pp} = G/e_g$$

where G = 'generalised cost' of the typical public transport trip (ie the weighted sum of walking time, waiting time, in-vehicle time, fares etc)

e_g = 'elasticity' of public transport demand with respect to this generalised cost.

(It may also be shown that $G/e_g = F/e_f$, where F is the typical fare and e_f the fares elasticity.)

The available evidence indicates that e_g is relatively stable for different trip lengths in different cities: typical values would be –1.0 for peak periods, -1.5 for off-peak periods.

G will vary by individual trip, but is broadly a function of trip length. Examination of a range of typical trips (in the NZ urban context) indicated the following variation of G (per passenger) with trip length:

G = \$2.65 + \$0.48 * trip length.

This relationship, and the above values of e_g, have been used to derive the function of B_{pp} against trip length.

7. BASIS OF TRANSFUND PAYMENTS

7.1 Payment Measures and Benefit Rates

When paying for performance (in this case, benefits) based on some performance measure, the specific measure chosen is a key decision because it drives the incentives. To turn the benefit values into a scale of payment rates, Transfund needed to decide how payments should best be related to alternative measures of the passenger task (eg passenger boardings, passenger kilometres). A payment based simply on boardings would encourage, over time, a system of short trips. A payment based on passenger kilometres would encourage extended systems, possibly beyond the distance where congestion was an issue.

The criteria for selecting the measure were that the measure should:

- be a 'driver' of externality benefits (congestion relief, user benefits, etc)
- be measurable (and auditable) on a consistent basis, without unreasonable resource requirements
- be able to be disaggregated by 'corridor' and time period (peak v off-peak principally) and possibly other market dimensions (eg adult v child).

Examining which measures drive the main categories of externality benefits led to these conclusions:

- **'Decongestion'** (time, vehicle operating costs). The most appropriate measure of congestion impacts was firstly passengers across critical cordons (reflecting key bottlenecks, eg round the CBD) and secondly passenger kilometres (as a reflection of traffic congestion more generally). Because passenger count data across cordons were not generally available, this measure could (but less satisfactorily) be

replaced by total passenger boardings. Thus for the average trip length, we selected 50% passenger boardings plus 50% passenger kilometres as the appropriate measure.

- **Environment and safety.** The most appropriate measure was taken as total passenger kilometres.
- **Public transport user benefits**. Analyses of the benefit function (Section 6) indicates that, for average trip lengths, the appropriate measure is ~50% passenger boardings plus 50% passenger kilometres.

Combining these conclusions, we expressed the benefit rates for each of these categories as linear functions of passenger boardings and passenger kilometres. The results are given in the first part of Table 4, for peak and off-peak periods. It is evident that:

- In peak periods, decongestion and public transport user benefits dominate: the total benefit rate is split broadly equally (for typical length trips) between the boarding component and the distance component.
- In off-peak periods, without decongestion impacts, the distance-related component accounts for the major part of the total benefits.

TABLE 4: SUMMARY OF BENEFIT RATES AND PAYMENT RATES (Rates per Passenger Boarding and Passenger km)

Period	Item	Rates by Centre - $ per Pass Boarding (1)			
		Auckland	Wellington	Christchurch	Other
TOTAL BENEFIT RATES					
Peak	Decongestion	3.70+0.40*D	2.46+0.26D	0.24+0.03*D	-
	Envt & Safety	0.11*D	0.11*D	0.13*D	0.12*D
	PT User Benefits	2.65+0.48*D	2.65+0.48*D	2.65+0.48*D	2.65+0.48*D
	Total	6.35+0.99*D	5.11+0.86*D	2.89+0.64*D	2.65+0.60*D
Off Peak	Decongestion	-	-	-	-
	Envt & Safety	0.09*D	0.08*D	0.12*D	0.10*D
	PT User Benefits	1.77+0.32*D	1.77+0.32*D	1.77+0.32*D	1.77+0.32*D
	Total	1.77+0.41*D	1.77+0.40*D	1.77+0.44*D	1.77+0.42*D
TRANSFUND PAYMENT RATES (2)					
Peak		1.45+0.21*D	1.05+0.17*D	0.30+0.09*D	0.20+0.08*D
Off-Peak		0.15+0.06*D	0.15+0.06*D	0.15+0.06*D	0.15+0.06*D

Notes (1) Rates are combination of fixed amount and distance component (D= distance in kms).
(2) Rates based on one-third of (decongestion benefits + environmental & safety benefits + 25% PT user benefits) - refer text. Rates have in some cases been rounded for consistency with rates set by Transfund (as in Table 1).

7.2 Transfund Payment Rates

Under present legislation, Transfund's statutory objective is to fund a safe and efficient roading system, while regional councils have primary responsibility for the funding of passenger transport (but with a contribution from Transfund). In the light of this objective, Transfund's financial assistance policy for 'Alternatives to Roading' (ATR) investments was hitherto to fund 100% of road user benefits relating to State highways and around 50% of benefits for local roads, but not to make any funding contribution towards public transport passenger benefits.

For the Patronage Funding scheme, Transfund decided that it would set payment rates based on the following formula:

Payment rate $P = (B_{pr} + 0.25*B_{pp})/3.0$

where P = Transfund payment rate per additional public transport passenger
B_{pr} = road user and related (externality) benefits, per additional passenger
B_{pp} = existing public transport user benefits, per additional passenger
3.0 = a factor to reflect funding constraints and risk effects

The factor (3.0) is designed to be consistent with the medium-term expected benefit-cost hurdle rate for road schemes (ie 4.0), adjusted to reflect the lesser degree of risk associated with Patronage Funding (Section 4.3).

The factor 0.25 applied to public transport user benefits represents a compromise between Transfund's previous policy of no funding for public transport user benefits and its funding of a larger proportion (50%-100%) of road user benefits. Consequent on this decision, Transfund is currently reviewing its funding policy relating to public transport **capital** (ATR) projects.

The Transfund payment rates that result from applying the above formula are shown in the lower section of Table 4.

7.3 Comparison with Existing Average Funding Rates

Prior to the introduction of Patronage Funding, Transfund's average funding rates (40% of bus subsidy and 60% of rail subsidy – refer Section 2.2) averaged 5¢-6¢/passenger kilometre for bus and rail (contracted and commercial) services in main centres, and about 3¢/passenger kilometre for bus services in smaller centres. These are very averaged figures: for instance, in Wellington the Transfund subsidies were about 9¢/passenger km for contracted bus services, 1¢/passenger km for commercial bus services (relating to concessionary fare schemes), and 4¢/passenger km for suburban rail services.

By contrast, the Patronage Funding payment rates for trips of average length in Wellington are about 40¢/pass km (peak) and 8¢/pass km (off-peak) for bus (average 4.6 km trip length); and 21¢/pass km (peak) and 6¢/pass km (off-peak) for rail (average 23 kms trip length).

Thus the Patronage Funding payment rates are significantly higher in most cases than the average rates for the existing patronage, which developed under the previous input funding system. This is not surprising, given that:

- A substantial proportion of the existing services operate on a 'commercial' basis, with very low subsidy rates. The existing contracted services thus involve a range of subsidy rates higher than the average for all services.
- The major objectives of the Patronage Funding scheme were to increase patronage and to increase the central government (Transfund) share of total public transport funding. In order to achieve these objectives, Transfund's variable funding rates need to be significantly higher than the previous average funding rates.
- Further, given the prevailing cost structures and market demand characteristics (demand elasticities), it was necessary for marginal funding rates to exceed existing average rates if the desired expansion of services was to be achieved (see below).

7.4 Comparison with Incremental Costs

Prior to finalising the Patronage Funding payment rates, Transfund analysed the likely costs and revenues for expanded services in a range of situations, to assess the likely response to the Transfund payment rates (in terms of service and patronage increases).

The main conclusions were:

- Incremental subsidy costs (per passenger km) cover a wide range. The extent of response is likely to vary gradually, rather than sharply, with increasing generosity of payment rates.
- A critical factor influencing response will be the extent of current suppressed demand due to insufficient capacity (during peak periods and in major metropolitan areas). An incremental subsidy rate in the order of 10¢ to 20¢ per passenger kilometre is likely to be sufficient to encourage additional peak services to meet this demand; a lower rate (in some cases zero) would be sufficient to encourage additional off-peak services.
- In the absence of substantial suppressed demand, peak period bus subsidy costs would be much higher, typically in the range 30¢ to 150¢ per passenger km; while off-peak rates would be a lot lower, typically zero to 30¢ per passenger kilometre.

If these incremental (net) cost rates are compared with the Patronage Funding rates (above), it appears that:

- For peak periods, the Patronage Funding rates should be more than sufficient to encourage additional services in cases of suppressed demand, but barely sufficient in other cases.
- For off-peak periods, the Patronage Funding rates should be sufficient to encourage a modest expansion of existing services.

8. PHASED IMPLEMENTATION – THE 'KICK-START FUNDING' SCHEME

8.1 Rationale

The main Patronage Funding scheme (as described up till now) only provides additional funding once additional passengers are generated, and also imposes increased financial risks on the regional councils. Thus, on its own, it would be a relatively slow means of developing the market and increasing central government funding. However, the government wished to increase patronage over a shorter timescale and allocated additional funding to do so. To achieve this, Transfund developed a 'Kick-start Funding' scheme as a short-term transition to the full Patronage Funding scheme.

The broad objectives defined for Kick-start Funding were to expedite new services and other initiatives to accelerate patronage growth, and to share the risk associated with new services. To guide development of the scheme, Transfund set the following criteria that should be met:

- provide up-front funding for initiatives to accelerate patronage growth
- enable regional councils to access funding quickly and simply
- meet Transfund's requirements to evaluate expenditure and achieve value for money
- be consistent with the longer term patronage funding scheme.

8.2 Scheme Description

The following provides a summary description of the Kick-start Funding scheme.

Key Features

(i) Kick-start Funding will apply for the period November 2000-June 2003, along with full Patronage Funding. Thereafter, only Patronage Funding will apply.

(ii) The objective of Kick-start Funding is to provide up-front funding assistance for new services and other initiatives that will generate patronage growth.

(iii) Transfund's funding assistance is based on the following proportions of the net costs of approved new services and initiatives:
- 80% of costs incurred from 1 November 2000 to 30 June 2001
- 60% of costs incurred from 1 July 2001 to 30 June 2002
- 40% of costs incurred from 1 July 2002 to 30 June 2003.
(The combination of patronage funding and Kick-start Funding could provide up to 100% of the net cost of new passenger services, particularly in the initial period to 30 June 2001.)

(iv) Transfund has identified a list of qualifying expenditure items for Kick-start Funding, that includes new passenger transport services and, among other things, marketing initiatives, electronic ticketing projects and other 'capital' items of less than $400,000. Regional councils are able to propose other initiatives, provided they relate to the objective of increasing patronage.

(v) From 1 July 2003, a new base level of funding and patronage will be set for each regional council for the Patronage Funding scheme: this will include the current funding base plus average Transfund payments on Kick-start Funding and Patronage Funding up to 30 June 2003 (excluding certain 'one-off' expenditures). (This gives regional councils a strong incentive to invest Kick-start Funding in initiatives that have the best prospects for growing patronage).

Passenger Transport Infrastructure

(vi) Passenger transport capital projects of $400,000 or less qualify for Kick-start Funding.

(vii) Transfund also continues to fund passenger transport capital projects over $400,000 through its current Alternatives to Roading (ATR) funding policies, adjusted for combined capital and patronage payments to make sure that the same project is not paid for twice.

Applying for Funding

(viii) To apply for Kick-start Funding, regional councils must submit applications to Transfund covering a brief scheme description and estimates of net costs, gross costs, passenger boardings and/or passenger kilometres, plus estimates of fare revenue and a supporting rationale.

Monitoring and Review

(ix) Transfund requires regional councils to analyse and report on the success of their Kick-start Funding strategies in terms of their effectiveness at generating patronage and on the rate of diversion of new passengers from private cars. This information will become part of a valuable database shared with other regional councils (and perhaps comparable with the public transport demonstration projects undertaken in Norway).

9. PROGRESS AND OUTCOMES TO DATE

Eight of the 14 regional councils joined the scheme for 2000/01, representing 99.4% of current funding. Most have joined to ensure they benefit from the Kick-start Funding, but some have expressed concerns about the situation after Kick-start Funding ceases. Certainly, the Kick-start Funding has proved popular and has resulted in many projects being initiated.

Table 5 presents a summary of the funding applications submitted to date and those already approved by Transfund. Of the 67 Kick-start Funding applications received, 43 have been approved so far. Some were rejected because a simplified evaluation indicated that the expenditure was not efficient (ie benefits were less than costs); others were rejected because they did not comply with legal or policy requirements.

Figure 2 provides an indication of the expected impacts of the Patronage Funding scheme (including Kick-start Funding) on total central government (Transfund) funding levels to public transport. In the years 1996/97 - 1999/2000, this funding was capped at 1996 levels (approx $42m). We expect that Kick-start Funding plus Patronage Funding will increase funding by about $12 million pa above previous funding levels. Transfund expects expenditure to increase by $20-30 million pa over the next few years (depending on the success of the scheme in increasing total patronage).

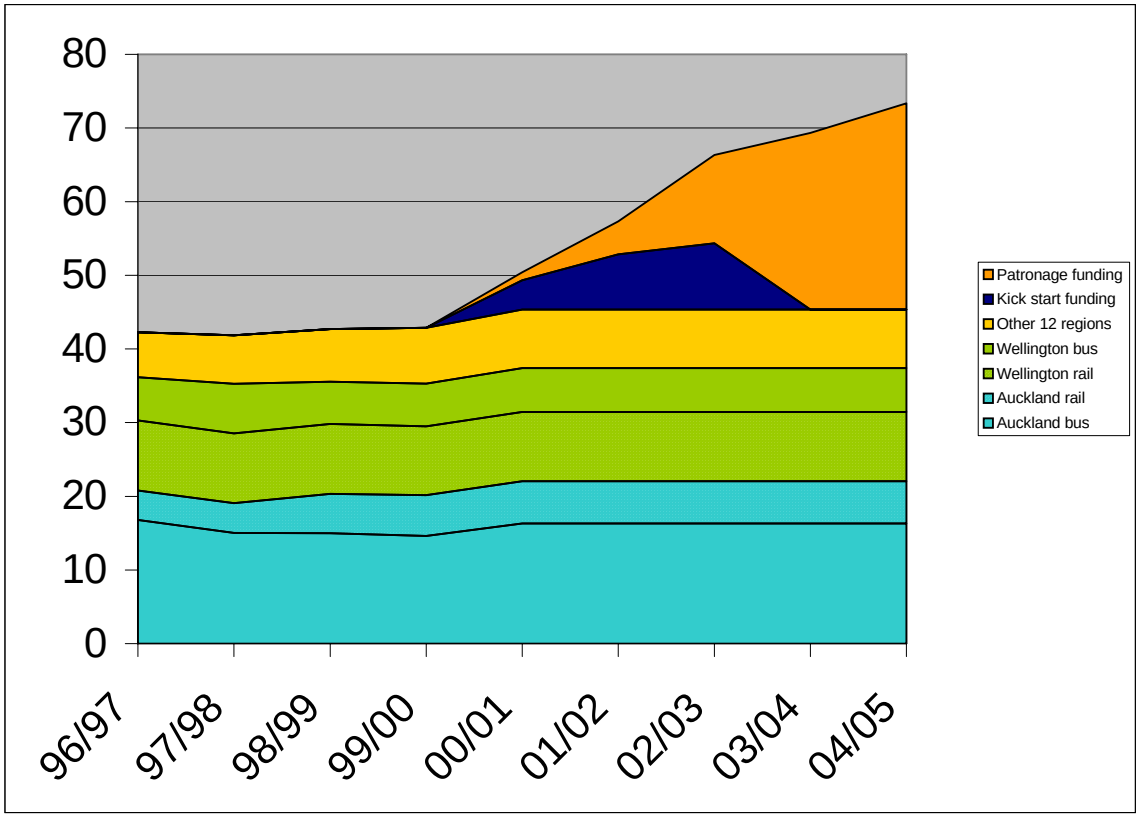
At this stage, it is too early to assess the impacts of the scheme on patronage. Some regions are indicating very good early results: Auckland, Canterbury and Hamilton report up to 10% pa growth rates, whereas established regions such as Wellington and Otago report steady 2% growth. Canterbury's innovative Orbiter service (on a circular route) has had unprecedented success. Auckland is currently implementing a major strategy to expand ferry services. Regions are currently establishing data systems (eg defining peaks) and getting agreement on their funding and patronage baselines.

TABLE 5: KICK-START FUNDING APPLICATIONS RECEIVED AND APPROVED BY TRANSFUND (Figures as at 31 May 2001).

Region	Payment Measure	Kick-start Funding Schemes	Requested ($m)		Approved ($m)	
			2000/01	Total[(1)]	2000/01	Total[(1)]
Auckland	Hybrid	Rideline Website, shelters Bus, ferry & rail service enhancements	0.95	3.23	0.95	3.12
Wellington	Hybrid	Improve rail & bus services Real time information Commuter car parks	1.68	6.49	1.22	2.83
Canterbury	Boarding	Increased services, circular service, integrated ticketing	0.4	1.54	0.24	0.78
Other	Boarding or Flat	Services, shelters, stations	0.34	2.14	0.19	1.45
Total			3.37	13.41	2.60	8.18

Notes (1) Total refers to total Transfund allocation from 2000/01 up to end of Kick-start Funding transition period (30 June 2003)

Figure 2: Transfund Funding Allocations for Public Transport – Actual and Projected



10. SOME ON-GOING ISSUES

10.1 Implications of the Output – funding Approach

The difference in approach between Transfund's previous input-based funding policies (for both roads and passenger transport) and the output-based Patronage Funding policy are reiterated here. The previous policies involved Transfund paying a proportion of input costs for a scheme or service. Under Patronage Funding, Transfund pays an amount (as defined earlier), according to the success of the service in attracting additional passengers. In some cases, this may cover only a small proportion of the incremental costs (if the service is not sufficiently attractive to passengers). In other cases Transfund may cover a large proportion of the costs. The decisions on the services to be provided are left to the regional council, which is given full responsibility for the patronage (and hence funding) risks involved.

10.2 Exogenous Patronage Influences

The theory underlying Patronage Funding is that a targeted patronage-related funding system will encourage regional councils to expand services, and hence generate increases in patronage, where the resulting benefits warrant the additional costs involved.

In practice, patronage is influenced by a range of factors other than service (or fare) enhancements. Such exogenous factors could lead to 'windfall' payments from Transfund to regional councils, without any changes in services. This effect could potentially be a cause of inequity between regions (eg different population growth rates). This is one reason that Transfund requires regional councils at least to maintain their own current payment levels.

Some exogenous factors that cause patronage changes may result in road user externality benefits (eg changes in fuel prices may also cause switching from car to public transport). Such factors may also result in benefits to existing public transport users (eg. if they result in additional services). In some cases, they may

result in neither category of benefit (eg an increase in disposable income may lead to additional off-peak public transport travel but no change in service levels or road traffic volumes). Thus, in some cases the additional Patronage Funding payments may have some justification in terms of the resulting benefits; in other cases they may not be justified in such terms.

Another point in relation to exogenous factors is that, where they cause an increase in patronage, it is most likely (at least in the medium-term) that services will need to be increased to accommodate the demand, and subsidies also increased (at least for peak services). Thus, there is a cost-sharing argument (rather than a benefit argument) for increasing Transfund's funding amounts in such circumstances. In any event, in practice it is not possible to distinguish between extra passengers generated by service enhancements and those resulting from exogenous factors.

10.3 Risk Implications for Regional Councils - Contracted Services

As noted earlier, one implication of Patronage Funding is that regional councils assume increased financial risk compared with the previous system. If patronage increases due to exogenous factors, regional councils will generally receive more income from Transfund (even though their subsidy costs on the services affected may decrease); when regional councils institute service enhancements, their net subsidy costs depend on the success of these enhancements in generating patronage and hence attracting additional Transfund funding.

In cases where service contracts are on a gross cost basis, the financial risk to regional councils is particularly severe: if patronage is below the expected level, the regional council loses twice – it receives lower fare revenue and also lower payments from Transfund. In cases where service contracts are on a net cost basis (the prevalent New Zealand form), the regional council bears rather less risk – it receives lower payments from Transfund, but the fare revenue risk is borne by the operator. This aligns the regional council's incentives more closely with those of the operators.

Regional councils could eliminate financial risk on service contracts by adopting 'back-to-back' patronage-related contracts with operators, ie they could contract to pay the operator on the same formula as they are paid by Transfund, which is a fixed sum plus a patronage-related payment. Such contracts would provide to the operator incentive signals identical to those that Transfund provides to the regional council through the Patronage Funding scheme.

To date, no regional council has adopted such patronage-incentive ('back-to-back') contracts as a result of Patronage Funding: although two pilot contracts of 'output-based funding' are currently operating, these were in place prior to the Patronage Funding scheme (refer Mein 1999). Transfund is encouraging regional councils to develop and implement such contracts and we expect further trials within the next two years.

10.4 Implications for Commercial Services

Currently 'commercial' services form a substantial proportion of the bus services in the main corridors of the larger centres. These service receive a very low (if any) level of public funding, through concessionary fare reimbursement schemes, and are largely outside the influence of the regional councils (Section 2.1). Patronage Funding is designed to increase patronage where the greatest benefits arise, and hence gives incentives to regional councils to enhance services where congestion is most severe, ie in the main corridors of the larger centres at peak periods. A large proportion of these services currently operate commercially.

Analogous to the back-to-back incentive arrangements discussed above for contracted services, a similar form of patronage-related incentive scheme would appear to be appropriate for commercial services. This is the concept of 'subsidised deregulation', under which operators compete in a 'quasi-commercial' market in which patronage-related subsidies are available to all participants. This approach was discussed in a previous Thredbo paper (Wallis 1999).

Some legal issues will need to be resolved before this concept can be implemented in New Zealand. The current concessionary fare reimbursement scheme for commercial services, under which particular users are subsidised, is a limited form of 'subsidised deregulation'. Again, we see this as a concept that should be pursued further.

10.5 Implications for Capital Projects

Prior to Patronage Funding, passenger transport services and infrastructure (capital) projects were funded through two very different systems. Patronage Funding for services has significant implications for the future funding of infrastructure, which are currently being addressed by the government.

Hitherto, infrastructure projects were evaluated using a cost-benefit approach (the ATR procedures), based on forecasts of future patronage impacts and associated benefits. Such patronage impacts (whether from services or infrastructure) are now being funded through the Patronage Funding scheme: this would result in funding the same patronage twice.

At first sight, this 'double-dipping' could be avoided by abolishing separate capital funding, leaving Patronage Funding as the sole Transfund funding mechanism. However this approach raises significant issues and is probably too simplistic:

- Funding infrastructure solely through Patronage Funding would require the regional council (or other investors) to put in up-front capital and to recoup this over time from the increased Patronage Funding. The investor takes all the risk that the infrastructure will generate the forecast patronage growth. For some types of project, this risk may deter investment. The risks would be increased by the potential for future changes in government funding policy (eg. changes in Patronage Funding rates).
- Patronage Funding payments are based on average benefits over a region. Often infrastructure projects are targeted at a particular bottleneck or constraint, so the benefits of such projects may well exceed the net present value of the additional patronage payments. In such cases, it may be appropriate to pay the additional amount as a lump sum capital contribution.
- An alternative approach, which would minimise risks to investors (including regional councils) would be for Transfund to continue to fund infrastructure on an input basis, based on the current (or similar) procedures; but then to deduct the capital payment from the Patronage Funding allocation on an on-going basis.
- In New Zealand context, legal restrictions on regional councils' ownership of infrastructure add to the complexity. Generally infrastructure is provided and funded through a separate local authority. This exacerbates the situation as one party puts up the capital funding, while another receives the Patronage Funding payments.

10.6 Other Regional Concerns

The 14 New Zealand regions may be broadly divided into two groups, each facing different issues:

- Developing systems: areas with current low levels of public transport service and usage, with high medium-term growth potential, but with high short-term costs to expand services.
- Mature systems: areas with relatively high levels of service and lower growth potential, but facing problems of infrastructure replacement and rising costs.

The 'developing' regions face high costs of establishing public transport infrastructure (bus priority lanes, stations, rail lines) and new services, with uncertain patronage forecasts. Kick-start Funding is most appropriate in these situations, because the regions cannot achieve patronage growth without significant investment, and patronage growth can take a long time to get established. These regions have recently been experiencing high patronage growth because of fuel price increases, and can therefore anticipate significant Patronage Funding in the near term. However, these increases may be short-lived.

The 'mature' regions have established systems with a relatively high level of service and high patronage. These systems generally face increased costs over time, but low potential for patronage growth and hence limited Patronage Funding. Some regions face high costs to maintain their currently failing infrastructure, and expect to lose patronage should they fail to replace rail carriages and upgrade facilities. Regions with large proportions of commercial services face the risk of losing patronage if commercial services decline.

All regions are concerned about losing funding if patronage falls as a result of exogenous factors outside their control, such as reduced car and fuel prices, economic downturn or population decline.

11. CONCLUSIONS: MERITS OF THE NEW APPROACH

Patronage Funding is an innovative method of allocating central government funding for passenger transport to regional/local authorities, whereby funding is directly related to the achievement of the benefits of interest to central government. The scheme can potentially cover both subsidy to services and capital investment for infrastructure within an integrated funding basis. The scheme may be accompanied by 'back-to-back' contracting arrangements with public transport operators, although this is not essential.

Transfund considers that Patronage Funding has significant advantages over the previous system of funding passenger transport services in New Zealand. In summary, the key improvements resulting from the move to Patronage Funding are:

- funding for passenger transport services is targeted to the regions where it provides the greatest benefits - for example where there is significant road congestion
- regional councils that are successful in attracting more passengers are rewarded for their efforts
- all regional councils – including those that currently receive little or no funding –have the opportunity to fund new passenger transport services
- regional councils are given the major responsibility in designing passenger transport services that suit their regions and meet users' needs.

It is too early to draw conclusions on the impacts of the new scheme in practice. It will undoubtedly evolve considerably over the next two years: we hope to be able to report further on its success at Thredbo 8.

12. ACKNOWLEDGEMENTS

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13. REFERENCES

Booz·Allen & Hamilton (2000). '*Effects of Public Transport System Changes on Mode Switching and Road Traffic Levels*'. Transfund New Zealand Research Report No. 179.

Booz·Allen & Hamilton (2000). '*Passenger Transport Evaluation and Funding Procedures (Stage 2)*. Draft Final Report to Transfund New Zealand, September 2000.

Dixit and Pindyck (1994). '*Investing under Uncertainty*'

Kimber and Hollis (1979). '*Traffic Queues and Delays at Road Junctions*'. Transport and Road Research Laboratory, Report 909.

Mein B (1999). '*Matching Funding to Outcomes: Incentive-based Contracts for Passenger Transport*'. Paper to Sixth International Conference on Competition and Ownership in Land Passenger Transport, Cape Town, September 1999.

Mohring H. (1972). '*Optimisation and Scale Economies in Urban Bus Transportation*'. American Economic Review Vol. 62(4), pp 591-604.

NZIER (1998). '*Transfund Ratios*'. Report to Transfund New Zealand, May 1998.

NZIER (2000). '*Some Economic Aspects of Patronage Funding*'. Report to Transfund New Zealand, September 2000.

Wallis I P (1999). '*Public Transport Developments in Australasia*'. Paper to Sixth International Conference on Competition and Ownership in Land Passenger Transport, Cape Town, September 1999.

Walis I P (1995). '*Urban Bus Reform Down Under – Six Years of Words, Actions and Achievements*'. Keynote Paper to Fourth International Conference on Competition and Ownership in Land Passenger Transport, Rotorua, New Zealand.

Wallis I P (1993). '*Land Transport Deregulation New Zealand Style: Experience to Date*'. Paper to Third International Conference on Competition and Ownership in Surface Passenger Transport, Mississauga, Canada.