TRADITIONAL AND INNOVATIVE WAYS OF FUNDING PUBLIC TRANSPORT: A REVIEW OF LITERATURE

Muhammad Imran[1] & Jane Pearce[2]

[1]Massey University, New Zealand, Email: m.imran@massey.ac.nz
[2]University of Canterbury, New Zealand, Email: jane.pearce@pg.canterbury.ac.nz

ABSTRACT

The lack of funding for public transport is a serious issue in the cities of developed and developing countries. Traditional methods of public sector funding are not enough to improve public transport infrastructure and services, and innovative funding mechanisms are needed to address this issue. From a review of the literature, this paper explains a number of ways of funding public transport and suggests some options that might be useful for funding public transport in developed and developing countries. Based on this detailed literature review, funding sources are grouped into five categories: beneficiary pays development taxes, polluter pays carbon taxes, public transport operational and infrastructure funds, private sector funding and other funds. These broad categories are further divided into specific funding opportunities and their strengths, weaknesses and experiences of their use in cities across the world are discussed. Finally, appropriate funding options for developed and developing countries have been selected from the range of options presented and their potential contribution is considered.

Keywords: Public transport, funding

1. INTRODUCTION

The development of public transport has been widely recognised to achieve environmental, social and economic sustainability in cities in developed and developing countries (Cervero, 1998; Vuchic, 1999). However, the emphasis on environmental and social sustainability of public transport is frequently compromised due to a focus on financial sustainability (Buehler & Pucher, 2011). Comprehensive public transport infrastructure is expensive to build and costly to operate (White, 2002; Ubbels & Nijkamp, 2002). Moreover, the costs to public transport agencies have increased significantly with the broadening of policy goals and therefore, many public transport systems are struggling for funding.

Traditional methods of funding, such as public sector funding, subsidies and revenue from fares are not enough sufficient to make improvements to public transport infrastructure and innovative funding mechanisms are therefore, demanded. This problem is made more

challenging because public transport is generally not a profitable investment for the private sector. Often public transport systems use low fares as a means of promoting their use which require government subsidies. In large cities, there is growing popular demand and political desire to expand the systems and even develop sophisticated mass transit. As a result, many large cities have started pursuing new and innovative funding arrangements to meet the costs of new infrastructure projects and expanding services. From a review of the literature, this paper explains a number of ways of funding public transport and suggests some options that might be useful for funding public transport in developed and developing countries.

Based on the reviewed literature review of traditional and innovative ways of public transport funding, public transport funding options are grouped into five categories which includes beneficiary pays development taxes, polluter pays carbon taxes, public transport operational and infrastructure funds, private sector funding and other funds The five broad categories are further divided into specific funding opportunities and discussed in terms of their strengths, weaknesses and experiences of their application in cities across the world. Finally, appropriate funding options for developed and developing countries have been selected from the range of options presented and their potential contribution is discussed.

2. TRADITIONAL PUBLIC TRANSPORT FUNDING OPTIONS

Traditional options used to fund public transport include: subsidies, government funding and fare box revenue. The details of these funding options are:

2.1 Subsidies

Subsidies are very simple, a government allocates funds paid in income or corporate taxes to public transport systems that usually run at a financial loss – the subsidies ensure that the systems can continue to operate even if they cannot be profitable (Ubbels & Nijkamp, 2002; Ubbels *et al*., 2001). The major argument for subsidising public transport is the notion of social equity and social inclusion which demands the redistribution of income to the poor, disabled, elderly and other disadvantaged groups (ibid). Recently, subsidies have been used to increase public transport use in order to reduce environmental externalities like air and noise pollutions, greenhouse gas (GHG) emissions and congestion. In this situation, benefits are broadening to those who do not even use the public transport services (Serebrisky, 2009).

A subsidy is generally provided in the form of a direct payment or fuel subsidy (Kiggundu, 2009) to the public transport provider (supply side subsidies) or as a means of lowering the cost of fares and maintaining the operation of unprofitable routes (demand side subsidies) (Serebrisky, 2009). This allows the provision of affordable and accessible services, making public transport attractive to a large proportion of the population in a city. For example, in Hasselt the number of visitors to patients in hospital was reported to increase significantly with the introduction of cheaper fares (Goeverden *et al.*, 2006). Similarly, many cities have reported an increase in tourist numbers due to the availability of free public transport services or shuttles (ibid). Therefore, the role of public transport in making city sustainable is open to debate. For example, public transport is free for students and staff of tertiary education institutes in Palmerston North, New Zealand because it reduces congestion and increases student numbers.

Although subsidies create social and environmental benefits, the economic costs are progressively increasing. For example the provision of low fares through subsidies on public transport in Madrid has decreased the amount of revenue from users yet operational costs are increasing (Manuel *et al.*, 2009). Subsidies can also lead to inefficiencies and are viewed as an inferior good. For example, subsidies often remove incentives for public transport operators to reduce costs which leads to greater deficits and yet more subsidies which is unsustainable in the long-term (Dow, 1997). Typically, 'no ...subsidy programme has made funding contingent on performance standards, cost control, ridership gains, or the achievement of social, environmental, and economic goals' (Pucher *et al.*, 1983, p. 157). As a result, the fundamentals of producing a cheap and sustainable form of mass transit are undermined by 'the very design of transit subsidy programmes which ultimately encourages inefficient use of subsidy funds' (ibid, p. 157).

Subsidies are not very effective as public transport patronage is not increasing as compared to population growth in many cities of the world and meaning that eventually these system will need further subsidies. In New Zealand, local government is responsible for implementing public transport, but due to a lack of sufficient funds, subsidies are generally distributed by central government. The Auckland Regional Public Transport Plan 2010 indicates the region receives well over $100million per year in public transport funding from central government, and this is projected to increase to around $150million by 2014/2015 (Auckland Regional Transport Authority, 2010). This situation is reflected internationally, with the US subsidy increasing from $14 billion (nationwide) in 1991 to $32 billion in 2007 (Buehler & Pucher, 2011). The only exception is in German cities, where subsidies are linked

with improvements in productivity and financial efficiency. As a result, fare box revenue increased from 59 per cent to 77 per cent between 1991 and 2007, whilst subsidies per passenger declined by around 40 per cent (Buehler & Pucher, 2011). In short, subsidies should be used to improve the public transport network rather than being used to support day-t-day operations. As efficiency increases, passenger trips will also increase, resulting in increased revenue, effectively contributing to offsetting the costs associated with public transport. In summary, subsidies have an important role in public transport, but it is not sustainable to expect long-term funding from subsidisation to increase of even remain at the same level. This is due to increasing competition for government funding from the priority areas of education and health.

2.2 Fares

The collection of fares allows public transport operators to reclaim the cost of operating the system. However, the fare box revenue is usually insufficient to pay for both the capital cost and running expenses of a modern mass transit system (Wetzel, 2006). For example, in the US, fares pay for an average of only 35-42 per cent of operating cost (but not capital costs) of public transport, while in Europe fares cover an average 45-48 per cent of total operating costs (Pucher *et al.,* 1983; van Reevan, 2008). Moreover, fares box revenue dropped by more than 4 per cent between 1992 and 2007 in US cities (Buehler & Pucher, 2011). Despite these trends, efficient public transport systems perform very well. The Hong Kong and Singapore public transport systems operate at profit while German cities cover two third of their operating cost from fare box revenue (ibid).

Fares are not usually sold on an at-cost basis and are often subject to further discounts in the form of group discounts, and welfare subsidies for the elderly and disadvantaged groups who are particularly dependent on services (Simpson, 2003; Ubbels *et al.*, 2001; Kiggundu, 2009). Consequently, any increase in fares is likely to precipitate a drop sales which limits the extent to which cost recovery can occur through fare pricing (Simpson, 2003). Goeverden *et al.*, (2006, p.17) observe that 'doubling the fares [was] expected to reduce patronage [by] about 25 per cent' in Europe. In summary, fares can play an important role in funding public transport operation, if an efficient system can be put in place.

2.3 General taxes

General taxation is the most widely used traditional form of funding for public transport (Mills, 1991; Ubbels & Nijkamp, 2002). Although, subsidies are typically funded from general taxation, it is important to recognise that general taxes are also used for wider infrastructure

development (ibid). The most widely used general taxes include income tax, rates (property taxes), and goods and services tax.

This mechanism can raise a significant amount of funds as collection is spread across a broad population base (Ubbels & Nijkamp, 2002). However, the funding of public transport through general taxation is unreliable as it is dependent on advocacy, lobbying, and government priorities. Equity concerns are often raised with this use of general taxation, as funding received from the general population is seen to be directed to large cities (ibid). Similarly, 'there is no direct link between those paying for the facilities and those using them' (Button & Reitveld, 1993, p.258).

On the other hand, general tax has been perceived to be an appropriate approach to mitigate unsustainable transport behaviour as this form of funding message is effective in discouraging private car use. This is because, using taxes to fund public transport means that majority of people, regardless of whether or not they use public transport are paying for and making the service cheaper for patrons (Buehler, & Pucher, 2011). Public transport fundings from general taxation has worked effectively in Copenhagen and Stockholm which are seen as best practice examples (Cervero, 1998).

Increasingly local government authorities are borrowing funds from the open market to finance public transport projects. As a result, local taxes are increasing and people are becoming reluctant to accept the idea of funding public transport through general taxes and rates (Local Government Rates Inquiry Panel, 2007). In short, general taxation should not be considered a stable funding stream for public transport and more diverse source of funding should be explored.

3. INNOVATIVE OPTIONS TO FUND PUBLIC TRANSPORT

Increasingly, fare box revenue, subsidies and government funding are not enough to build public transport infrastructure and operate the system. Therefore, local based innovative charges and taxes have been introduced where some or all of the revenue is directed to public transport (Enoch *et al.*, 2005; Tsukada & Kuranami, 1994; UITP, 2003). These innovative funding options for public transport are assessed under four headings: beneficiary pays development taxes/funds; polluter pays carbon taxes/funds: public transport operation taxes/funds; and private sector and other transport taxes and/or funds. Under each category a variety of options are discussed.

3.1 Beneficiary pays development taxes/funds

Beneficiary pay or public good taxes have traditionally been used to fund services such as police, fire services and ambulances which cannot be provided on a market-exchange basis. Many roading projects and some elements of public transport are also funded on this basis (Enoch *et al.*, 2005). Within this beneficiary pay category a number of options are available, many with their own subcategories. These are:

3.1.1) Property taxes/rates

The public transport development results substantial private property gains. The benefits to the private property can be captured in a variety of ways.

a) Value Capture Tax (VCT): The Value Capture Tax can be collected from the property, land owner and community, as part of the financial benefit they would gain from public transport development. The financial benefit is seen in an increase in property values reflecting improved accessibility and business opportunity (Kennedy *et al.*, 2005; Ubbels *et al.*, 2001). Where this value is captured in a tax, regular or one-off or voluntary amounts will be paid to local government hypothecated to subsidise public transport (Ubbels *et al.*, 2001). VCT is common in North America (ibid).

b) Development contribution: The value capture tax can be gathered by one-off developer contribution or levies (Kennedy *et al.*, 2005). These levies can be based upon: land use charges levied on new property developments; benefit sharing tied specifically to public investment induced property value increase; density bonusing whereby developers may build to increased density as a result of paying a voluntary levy; or a connection charge allowing property developments to be directly connected to a public transport system (Ubbels *et al.*, 2001).

c) Target rates: Local government can gather funds from a developer by setting targeted rates within specific land areas to cover the extra costs of providing public transport services to that area (Local Government New Zealand, 2007). In London, a new Crossrail development to link outer suburbs and Heathrow airport with central London is partly being funded by a business rate supplement levied upon developers and businesses deriving direct benefit from the project (IFWG, 2012). In a variation on this idea, and based on the increase in values associated with proximity to new underground railway extensions in London, Wetzel (2006) advocates a Location Benefit Levy or Land Value Tax (LVT) which would apply to all sites. LVT can be valued annually for the property rental income based on their

optimum permitted use. The tax would therefore, rise with land values and therefore would disincentive to leave land unused. This form of taxation would be both cheap to collect and would dis-incentivise urban sprawl.

3.12) Land acquisition along public transport routes:

Transport authorities can alone or in partnership acquire and then sell land adjacent to public transportation corridors and stations, or rent commercial properties to for instance, shops near to public transport stations and interchanges (Kennedy *et al.*, 2005; UITP, 2009). Car parking spaces along the public transport routes and sites for vending machines can also be leased (Ruesch, 2008), and right of way charges can also be applied to utility and telecom companies (Kennedy *et al.*, 2005).

3.13) Smart tax

Combinations of congestion charging, parking charges and fuel taxes can both discourage use of private transportation and be hypothecated to fund public transport. Singapore, London, Hong Kong and Stockholm provide examples of the implementation of these 'smart taxes' (UITP, 2009) and will be discussed under a separate categories.

3.14) Off-set charges

Offset charges refer to finances that come from big box retailers, who can be targeted to and in the funding of public transport. The local plan could include provisions for big box retailers with 20 car parks or more to provide funds per car park toward public transport each year. This fund could be used to improve the efficiency of public transport in the areas surrounding these big box retailers, increasing the number of customers that visit their stores via public transport. This form of funding incentivizes big retailers to create a positive image by promoting sustainable transportation and returning to their community, as well as making it their goal to reduce the number of private vehicles on the roads (Ref.).

3.15) Student surcharges

Student surcharges can be used to generate increased funding for public transport (Ubbel *et al.*, 2001). This concept is exemplified by an initiative in Berkeley, California whereby a local transit operator has funded a universal pass programme for students by surcharging the University of California student registration fees.

3.2 Polluter pays carbon taxes/funds

Polluter pays carbon taxation uses the tax system to reduce environmental externalities such as greenhouse gas (GHG) emissions by using these public finance pricing mechanisms to internalise those externalities (Enoch *et al.,* 2005). Within this polluter pay category a number of options are available. These are:

3.2.1) Fuel charges

Public transport funding can be achieved by imposing fuel charges such as taxes on petrol, diesel and gas. A tax differential between leaded and unleaded petrol has an environmental justification. Therefore, funds generated from increased fuel prices can be used to increase the availability of public transport thereby reducing car use. Sales taxes on petrol are regarded as being more effective than general sales taxes at dis-incentivising car use and generate a lower financial burden on non-drivers particularly those on low incomes (Sorensen, 2006). The argument that fuel taxes penalise people on low incomes is also refuted by Sterner (2012) who in studying seven European countries founds only very weak regressivity which does not apply when lifetime income is taken into account. Regardless of the benefits, fuel charges are sensitive political issue. Crawford and Smith (1995) conclude that governments are unwilling to place higher taxes especially on the use of diesel due to its industrial uses. They also argue that fuel taxes can change driver' behaviour, but there is little available quantitative evidence that shows fuel taxation improves public transport.

3.2.2) Regional fuel tax

Regional fuel and excise taxes provide a significant revenue source for public transport funding in the US, by simply being added to fuel prices at the local pump (Ubbels *et al.,* 2001). in 2003, Auckland Regional Council proposed a 10 cent tax increase within the region to complete its transport network within 10 years, including a major upgrade to the Auckland Metro Train network. However, this tax was not approved by central government. Goldman & Wachs (2003) have found that these taxes are typical not time-limited or hypothecated for specific projects. While these taxes are easy to administer they generate reduced revenue over time as they are not indexed to reflect price changes or improvements in automobile fuel economy (Sloane, 2008). However, a regional fuel tax has the ability to generate large revenues which can be directly funded into the region from which it was acquired without imposing large costs on the rest of the country.

3.2.3) Road pricing

Charging for the use of toll roads has historically been used to fund road construction and congestion charging has been used to manage road congestion and reduce air pollution. International evidence suggests that the transport challenges generated by population growth can be 'addressed through implementation of the well-targeted road pricing arrangements and supportive regulatory policies' to fund public transport (IFWG, 2012, p.11). Road pricing can be direct (monitoring actual distance travelled) or involve point pricing where charges are made at entry points to cordons (UNCHS, 1997). In some cases tolls have been part (as in Scandinavian examples) or fully hypothecated to fund public transport, such as inter-county bus and ferry services funded from bridge tolls on the San Francisco Golden Gate Bridge (Ubbels *et al.,* 2001). Distance based tolls may be more easily accepted than flat fees and may be more acceptable when applied in conjunction with other reforms such as the provision of more, improved public transportation (IFWG, 2012). Congestion charges have been in use in Singapore since 1975 to support the development of public transport to substitute for car-based transportation (Ubbels *et al.,* 2001). If they are hypothecated to funding new roads rather than public transportation they are likely to delay or halt the decoupling of transport activity from economic growth (Johnson, 2008). In the case of the London congestion charge, eighty per cent of the revenue is used on bus service improvements (Breithaupt, 2008).

3.2.4) Parking charges and fines

Parking regulations can also be used in more innovative ways to help fund public transport infrastructure and services. At Heathrow airport, funds gathered from parking charges have been used to modernize bus stations and create a network of bus lanes into west London (Enoch, 2004). In France since 1973, revenue from parking and driving infringement fines has been hypothecated to public transportation infrastructure (Ubbels *et al.,* 2001). Advantages of this funding mechanism include a certainty of revenue, allowing for a more organised and effective spending plan.

3.2.5) Fee on parking buildings

A tax on parking buildings should be imposed to fund public transport projects. Vuchic (1999) states parking in cities should be short-term, rather than for commuters and that taxes can be applied to commercial parking plazas, as happened in Sydney, Australia. A proportion of annual staff parking fees in the CBD is also earmarked to improve public transport initiatives (Enoch, 2004). Parking policy could therefore be used as another tool to support public

transport in cities such as Auckland, both by funding it directly from parking revenue and indirectly by increasing patronage and therefore fare revenue.

3.2.6) Vehicle registration fee

As well as taxing fuel and parking, it is also common practice in many countries to tax vehicle value, and this can be accomplished by annual registration fees, taxes on vehicle value, weight, type, and age, and through vehicle rental, sales, leasing and parking (Goldman & Wachs, 2003). In the US these funds are often placed in a trust fund to be used for public transport. Higher registration fees on heavy vehicles are used in a number of countries. In Switzerland for example, regulation has shifted from imposing a 28-tonne weight limit on vehicles to a heavy passenger or freight vehicle mileage related fee for vehicles with a total weight over 3.5 tonnes. The majority of the revenue is placed in a fund to finance the development of transalpine railway infrastructure, which enhances modal shift from road to rail and reduces environmental degradation in the Swiss Alps (Rudel, *et al.,* 2005). Examples of taxation on vehicles being successfully imposed can be found in Germany and Singapore, where increased fees for car registration have been used to fund public transport (Buehler & Pucher, 2011).

3.2.7) VKT taxes

In a vehicle kilometres/miles (VKT/VMT) travelled tax system, road use is taxed on the basis of distance driven, commonly making use of GPS technology (Krishen *et al.*, 2010). Research in the US and the UK supports a VMT/VKT tax because it both brings in more revenue than an optimal fuel tax and generates considerable welfare gains in terms of reduced congestion and air pollution (Lindsey, 2010; Parry & Small, 2005). The US state of Oregon has piloted a system where when a vehicle is refuelled the pump is able to calculate the distance travelled in particular zones since the previous refuelling in order to compute a VMT tax to be added to the purchase price of the fuel (Sloane, 2008). However, public acceptance of this form of tax has been shown to vary with an individual's belief about how the generated revenue from the tax will be used (Krishen *et al.*, 2010). The key potential concern of a VKT/VMT is privacy intrusions, implementation complexity, and equity and fairness concerns. There is some evidence to suggest that the introduction of distance based taxes would also encourage public transport use (Whitty, 2007). This would in turn increase fare revenue, further growing funding for reinvestment.

3.2.8) Emission charges

Climate change funds and emissions charges are currently unexplored and underutilised in the transport sector. For example, at the global level, the Global climate fund (CEF), Clean Development Mechanism (CDM), Adaptation Fund (AF), Global Environment Facility (GEF) and the World Bank's Forest Carbon Partnership Fund (FCPF) are available to mitigate transport emissions by funding low carbon public transport (GTZ, 2006). Emission charges can be introduced at the country level. Emission charges set a price on the amount of greenhouse gas (GHG) emissions released from vehicles exhausts (Headicar, 2009). The transport sector has a significant effect on air pollution, especially in large cities. Emissions charges produce incentives to increase the efficiency of automobiles or to seek other modes of transport, thus decreasing greenhouse gas emissions and improving air quality. The funds gained from emissions charges could then be used to fund public transport. Emission charges are an incentive to meet GHG emission targets under international agreements.

3.3 Public transport operational and infrastructural taxes/fund

There are a number of options available to increase funds from public transport operations and infrastructure. These include:

3.3.1) Reprioritising transport funding

One way of 'increasing' the funding of public transport is to find ways of stretching or rationalising the existing funding. Historically, public sector transport funding has favoured road development while looking to the private sector for investment in public transport (Ref). It is time to reprioritise public sector funding in the development of public transport infrastructure and the provision of the necessary support for public transport operations.

3.3.2) Public transport trust fund

In Kuala Lumper public transport is funded by a variety of systems including a public transportation trust fund to generate the revenue needed to supply the city with public transport systems (Kiggundu, 2009).

3.3.3) Railway development fund

Tokyo has been successful in establishing a self-supporting, self-financing and highly profitable transport system due to many of the innovative methods of funding public transport. These include a rail development fund, subsidies for interest payments by private railway companies, and tax exemptions and reductions given to bus operators (Sakai & Shoji, 2010). The Tokyo Rail Corporation engage in many business activities including real

estate development, shopping centre development and hotel ownership and recreation which are usually undertaken near the rail stations (Kiggundu, 2009). The Tokyo Rail Corporation also buys low-priced agricultural land, builds residential apartments and shopping malls on the land, and then either sells or rents it to get the necessary capital to carry out rail projects, which reduces the funding risk associated with building new rail infrastructure (ibid).

3.3.4) Improving public transport network

One of the major sources of funding is to improve the public transport network in a way that provides real alternatives to cars. Public transport patronage can increase significantly if public transport provides a coordinated and efficient public transport network which reduces waiting times and travel times and integrates the schedules of the different modes or networks (Stone *et al.*, 2012). Research shows that people do not mind paying higher fare prices if high quality public transport system are put in place. Supporting land use policies can also help to increase the patronage of public transport, and are ultimately a good source of funding. For example, local government in Tokyo and Hong Kong actively promote high density housing near public transport station and along their routes (Kiggundu, 2009 - a similar system is used in Stockholm (Cervero, 1998). Because so many people have easy access to near-proximity public transport they are more inclined to use it, and the fact that operators can carry more passengers whilst travelling less distance results in reduced costs and higher profits. In short, increasing the fare box revenue depends on increasing patronage by improving the network and developing supporting land use policies.

3.3.5) Multimodal passes

Multimodal passes and integrated ticketing make the use of public transit economically convenient (Buehler & Pucher, 2011). For instance offering strongly discounted seasonal transit tickets which allow multiple transfers across all modes for complete trips is a core element in incentivising people to use public transport. High-usage light-rail systems have been found to have a high percentage of users using integrated ticketing travel cards (Hass-Klaus & Crampton, 2002 as cited in Kennedy *et al.*, 2005). Additionally, incentives can also be in the form of monthly or yearly passes which are significantly discounted.

3.3.6) Higher usage through modern services

Value added services for public transport customers such as cell phone and internet coverage allow passengers to work or use social media whilst travelling, may attract more people onto public transport and ultimately increases patronage and revenue. These services can be provided around public transport nodes, and bus stops to attract more

passengers. A number of train services provide these facilities and in Stockholm for instance, cell phone coverage is provided on the metro and WiFi internet coverage has been extended to covered bus stops (Ruesch, 2008).

3.3.7) Leasing public transport workshops

Historically, large public transport operator built maintenance workshops for their fleets. These workshops provide mechanical services such as mechanic, electric, tin, dye work and vulcanisation which can be leased to other operators and industries. In Finland, a revenue stream has also been exploited by carrying freight in conjunction with public transport; on some routes more revenue is generated from freight than passengers. There is also potential to transport freight through metro tunnels (Ruesch, 2008).

3.3.8) Advertising

Advertising is the main source of supplementary income for most European public transit operators with income varying between 1-11 per cent of total revenue (Ruesch, 2008). For example, 'the annual income from ads for ...transit authorities range from $1,000 in Dayton, Ohio to $17 million in New York City' (Silverburg, 1998, p. 32). The range of advertising possibilities as shown in Figure 1 ranges from the relatively subtle to the complete branding of a whole train or transport interchange (TRB, 1998). While additional revenues are a clear motivating factor for transit agencies allowing advertising on their vehicles and property has implications in terms of control over content issues of visual intrusion, disruption of sight-lines, and advertising in this fashion can also be seen as 'cheapening' transit services. The advertising on a bus may restrict where it can be routed reducing operator flexibility. There may also be additional maintenance costs on vehicles due to paintwork damage when advertising is changed so it is important that these costs are the responsibility of the advertising agency. Moreover, while the 'total dollars [raised from advertising revenue] are significant ...the revenue from transit advertising as a *per cent* of the operating budget is small' (Silverburg, 1998, p. 832) and '...does not fully cover the functioning and the infrastructure costs' (UITP, 2009, p.).

3.3.9) Naming of routes and bus stops (naming rights)

Advertising can be broadened to the awarding of naming rights to routes or bus stops in the same way that businesses purchase the naming rights to for instance public events or sports stadia.

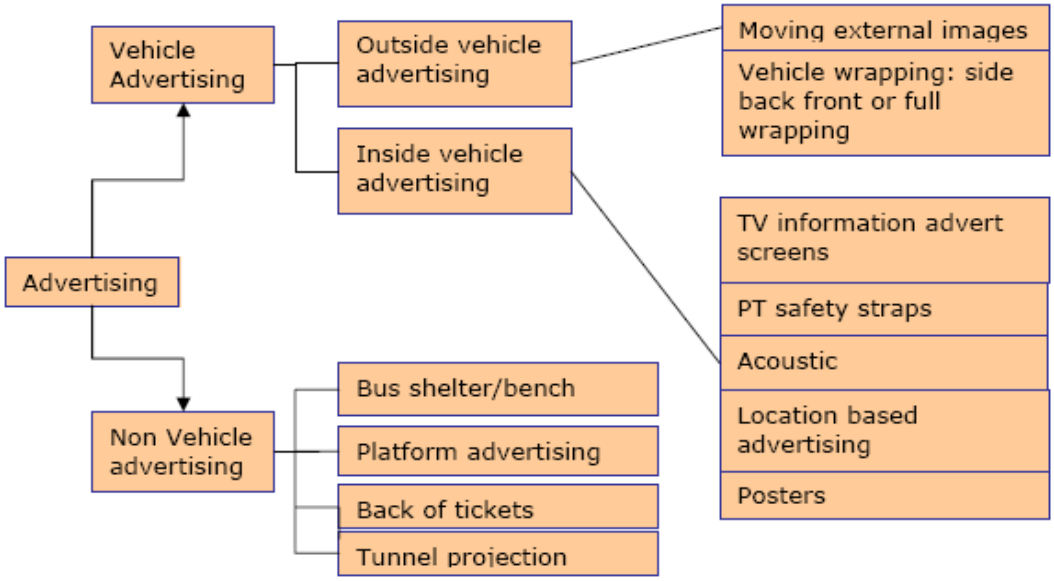

Figure1 Public transport advertising options (Source: UITP, 2009, p.)

3.3.10) Cutting wages of public transport workers

A range of smaller options can be looked. These can include the cutting of wages or increasing the hours of public transport workers in order to reduce employment cost. Buehler & Pucher (2011) provide examples from German public transit agencies where cost cutting measures such as workforce reduction, organisational restructuring and salary decreases have been implemented. These have been achieved by cutting employee benefits not required by law, including pay for breaks and extended leave, additional pay for overtime and anti-social hours and extending normal weekly working hours, and negotiating long-term salary freezes, early retirement options, as well as shrinking the workforce by 25 per cent. The earlier retirement allow new workers to enter the force at significantly lower pay rates. Despite this being an effective means of increasing funds, these methods are not popular. Although the efficiency of the system ultimately benefits it, the extreme reduction in employee numbers does not bode well for public acceptance, especially when the system is publically owned.

3.3.11) Tourism

It is possible to generate alternative funding streams by running sight-seeing buses and selling tourist focused merchandise such as London Transport's network map T-shirts, and other memorabilia such as old station signs and train seats' these are effective means of generating revenue, particularly in cities with high levels of tourism (Ruesch, 2008).

3.3.12) Fee on HOV lanes use

It has been found that outreach programmes are needed to win public support for initiatives such as high occupancy vehicles lanes (HOVs) and congestion charging (Krishen *et al.,* 2010).

3.4 Private sector taxes/funds

The number of options is available to increase funds from private sector organisations. These are:

3.4.1) Public-Private Partnership (PPP)

Public Private Partnerships (PPPs) are becoming a popular source of funding for public transportation infrastructure. PPP are 'joint-funding arrangements' between the public sector (government authorities) and the private sector (business and individuals) to develop a long-term relationship where the private sector invests funds in public transport development while the public sector defines and monitors for compliance, public interest and service quality objectives, and pricing policy (UITP, 2009).

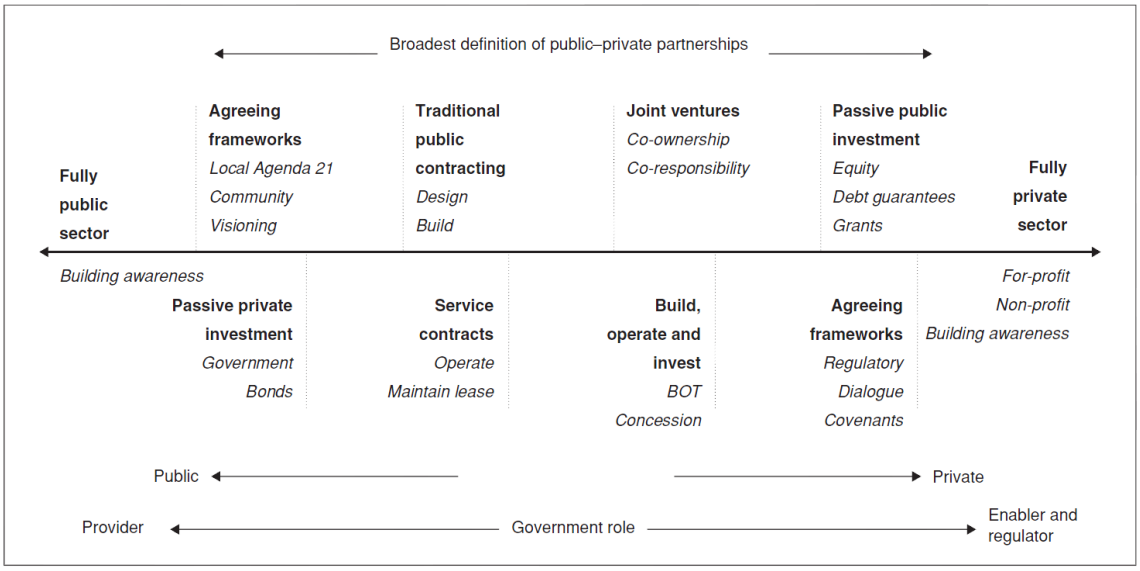

Figure 2 PPP Models (Source: Price 2002, p.72)

The extent to which a project is more public or privately operated in a PPP agreement (highlighted in Figure 2) can be described by one of several categories: the fully owned and operated Governmental Model (far left), the traditional contracting method of the Turnkey Development Model, the co-ownership/co-responsibility Warranty-Concession Model or the fully private sector Profit-Sharing Model (Price, 2002, p. 72-73).

PPPs have been used in many countries to fund public transport services and infrastructure (Siemiatycki, 2010). For example, in the UK between 1992 and 2009 the private sector invested £58 billion into 794 PPP projects. Nearly 85 per cent were in the transport sector (Gannon & Smith, 2011, p. 185). But PPPs have a poor record when it comes to public transport projects as it is difficult for the private sector to generate profit due to high costs and low fare revenues which may cover only a small proportion of costs (Jupe, 2009; Phang, 2007).

When a public/private partnership for the London Underground was being proposed, the argument was made that standards of service would increase whilst two billion pounds subsidies would be phased in each year (Jupe, 2009). However, the plan was flawed as the Government carried over two policies that had failed thus far with public private partnerships – the London Underground infrastructure was fragmented into multiple parts and was administered under complex contracts (Jupe, 2009). Four different companies took over various components of the Underground and one collapsed only a few years later. In this situation, the public private partnership had failed to transfer the risk from the private sector to the public sector. Additionally, PPP agreements in the UK and Malaysia were unable to fund the purchase of new equipment to provide quality services due to pressure to keep costs down and turn a profit (Kiggundu, 2009). This inability to purchase new equipment or upgrade infrastructure can have disastrous results: such as an accident caused by a faulty rail in the UK due to lack of maintenance funds (Jupe, 2009). Public-private partnerships have worked well in Copenhagen for the cities rail services (Cervero, 1998). Private rail services currently supplement state owned services, increasing transit efficiency in the city. In summary, PPP can work in limited situation where governments are allowed to maintain a certain degree of control over operation.

3.4.2) Privatization

From the early 1990s, privatization has been seen as a solution to public transport funding. Generally, Hong Kong is cited as an example of where privatization has made public transport successful (Kiggundu, 2009). However, the experience in other cities has been differently where the privatisation of public transportation has resulted in the servicing of only profitable routes (ICLEI, 2003). In terms of full privatisation, revenue is vital to the private sector. In many cases, private sector has not meet revenue expectations and rising operating costs have demanded a drop in service levels (Kartikeya & Gaddam 2007). This has made privatised public transport systems particularly fragile. There are several disadvantages to

heavy reliance on private funding, including higher lending rates and higher user costs to cover the private businesses profit margin (Kennedy *et al.*, 2005). Therefore, full privatisation of public transport systems is often avoided.

3.4.3) Competitive tendering

Competitive tendering of public transport services has also emerged as a viable option to meet increased funding demands. Competitive tendering refers to the awarding of exclusive rights to an operator on some routes or a network of routes (ICLEI, 2003; European Commission of Energy 2012). Subsidies are then often awarded to the successful operator in exchange for the fulfilment of service standards. The company or operator with the lowest subsidy requirement will generally win a bid. To win a bid, operators will often attempt to increase efficiency, and with this improved efficiency concession prices and costs are often lowered (Velde *et al.*, 2008). Competitive tendering has the potential to serve the less profitable routes by adopting the efficiency advantages of competition in tendering. This system of competitive tendering has worked well in the Netherlands, where a competitive tendering regime has aimed at stimulating services innovation. Competitive tendering can however be problematic if there is no alignment between the aims of local authorities and the operator. For example a local authority may desire an environmentally friendly service and services to low demand areas. Such services will however offer little profit to the operator, making them unattractive to supply (ibid). A correlation of aims between local authorities and operators is necessary to ensure that such discrepancies do not occur.

3.3.4) Private finance initiatives

In 1992, the Private Finance Initiatives (PFIs) were introduced in the UK (Gannon, 2002). PFI infrastructure provision involves the transfer of design, construction, operation and funding of infrastructure from a public authority to a private concessionaire, turning the public sector into a purchaser of services through long-term agreements but with the assets normally reverting to public ownership at the end of the contract (Debande, 2002). A PFI is therefore different to privatisation where the ownership of assets is transferred from the public to the private sector, with in some sectors the public sector retaining a regulatory role. With a PFI the public sector only pays for a service if it meets predefined output standards. Constraints are placed on the concessionaire or project company in terms of pricing structures and environmental performance, and the project company is able to innovate in order to meet those standards. The contractual arrangements are core to the financial risk sharing between the different parties.

In the UK, PFIs need to demonstrate value for money for the taxpayer, transfer significant risks to the private sector, identifying service outputs, whole life asset performance, and performance related payments (Mills, 1991). In Australia, the Infrastructure Working Group recommends that governments should consider adopting flexible approaches to infrastructure risk allocation between public and private sectors including government accepting some demand or financing related risks for infrastructure projects (IFWG, 2012).

Hong-Kong is a good example where new transit infrastructure has been built by private funding (Kiggundu, 2009). By adopting a private sector-based financing system the city has been able to supply public transport at the least possible cost, which avoids the need to have to rely on state funding and it also helps to foster competition among the public transport operators (Kiggundu, 2009).

3.5 Other taxes/funds

These include:

3.5.1) Visitor tax

A range of other tax instruments have also been tried with varying degrees of public acceptance. In the US many states allow lodging or visitor taxes to support the funding of tourism related transportation initiatives (Goldman & Wachs, 2003). Many airports fund improvements to their facilities via passenger facility charges; some, such as the funding of the light rail connection of JFK airport to New York City, fund improved public transportation access to the airport (Ubbels *et al*., 2001).

The tourism industry in New Zealand has expressed a dislike of this form of taxation suggesting that the benefits may not accrue to the payers (Tourism Industry Association New Zealand, 2012). They lobbied against ‘bed’ taxes as they believe that there is no relationship between the payer and the benefits, claiming that benefits from tourism accrue to many sectors but the costs accrue only with the commercial hotel and motel accommodation sector payers (ibid).

3.5.2) Payroll tax

Few cities hypothecate payroll and municipal income taxes for public transportation. The State of Oregon in the US allows transit agencies to generate revenue from payroll taxes, and in France the Versement (CAPRICE, 2008) is an example of dedicated employment tax being used to invest in light rail schemes. The Versement is paid by all businesses with more

than nine employees other than those who provide employee transportation or employee housing on-site (Ubbels *et al*., 2001). Payroll taxes are seen as particularly effective at supporting public transport as, being based on the total salaries paid out by an employer they ensure that commuters into a locality contribute to services which are of benefit to them although these commuters are not represented on the administration that taxes them. Such taxes need to be region-wide to avoid businesses relocating to suburbs to avoid them, and periods of economic downturn can reduce their reliability (Golman & Wachs, 2003).

3.5.3) Cross-utility financing

Cross-utility financing is widely used to fund public transportation. In the US it is most commonly used on a local basis as a levy on the use of a utility. In Europe it is more likely to be invoked to cross-subsidise a loss making public transit facility from a profitable utility such as an energy generator or retailer. As utility companies are privatised this form of cross-subsidy will become less available (Ubbels *et al*., 2001).

3.5.4) Consumption tax

Consumption taxes are imposed on any form of consumable goods whether they be staples, luxuries or utilities, and are commonly levied in the US to fund capital projects or supplement operating revenue (Ubbels *et al*., 2001).

A more innovative form of consumption taxing has emerged, whereby taxes have been placed on gambling activities and used to fund elements of public transportation. The state of Pennsylvania for example, dedicates a percentage of lottery revenues to a free public transport program for persons over 65 years old traveling in off-peak hours (Texas Transportation Institute, 2012). This form of taxation positively influences social behaviours, perhaps discouraging people to partake in gambling activities.

3.5.5) Luxury car tax

Taxes on luxuries items can be used to fund public transport. For instance, a country or state might decide to tax luxury cars and use the income from this tax to fund the construction of a new bus lane (Ubbels & Nijkamp, 2002).

5. DISCUSSION AND CONCLUSION

The role of funding in providing efficient public transport is vital. The purpose of this paper is to identify conventional and innovative funding options for public transport. Accordingly, three traditional funding options have been identified and their strength and weakness are

discussed. The innovative funding options are grouped into five different categories of funding. Beneficiary pays identifies various forms of property taxes, land acquisition, smart tax, off-set charges and student surcharges. Polluter pays carbon taxes find fuel charges, regional fuel tax, road pricing, parking charges and fines, fees on parking buildings, vehicle registration fees, VKT fees and emission charges to be useful funds to support public transport. Public transport operation and infrastructure funding emphasises reprioritising transport funding in favour of public transport, cutting the wages of public transport workers, leasing public transport workshops, tourist marketing, advertising, naming of routes and bus stops, provision of modern services, multimodal passes, fee on HOV lanes use, public transport trust funds, railway development funds and improving public transport funds as useful way to raise revenue. Private sector funds focus on the strengths and weaknesses of PPPs, privatisation, competitive tendering and private finance initiatives. Some taxes do not fit readily into the above mentioned categories and these are listed in other taxes/funds category. These are visitor tax, payroll tax, cross-utility financing, consumption tax and luxury tax all of which can help to support public transport.

Following an analysis of different sources of funding for public transport, one might question which of these funding sources would work effectively in developed and developing countries cities. The application of these different funding options to develop and developing countries is outlined in Table 1. The table shows that many cities around the world need to make use of a number of innovations to increase funding for public transport infrastructure and services. It also shows that there is no single funding mechanism which can suit all cases. Some funding mechanisms are appropriate for implementation in developed countries but would generate perverse outcomes if implemented in cities of developing countries.

For example, property taxes such as value capture methods are suitable for developing countries due to the potential to increase population and employment density along public transport routes. Property orietated taxes might however, not be suitable for cities in developed countries becuase they can be more dispersed. However, they would provide an opportunity to regenerate brownfield sites. In both cases, care should be taken in implementing property taxes so that affordable properties can continue to be available for homes and business.

Funding options to public transport				Cities in developed countries	Cities in developing countries
Traditional funding sources	Subsidies			✓	✓
	Fares			✓✓	✓✓✓
	General taxes			✓✓	✓
Innovative funding sources	1. Beneficiary pays development taxes/funds	Property tax	One-off property betterment tax/ value capture tax/ voluntary value capture tax	✓✓✓	✓
			Development levies and contribution /developer pay	✓✓✓	✓✓✓
			Target rates	✓✓	✓
		Land acquisition and selling along public transport routes		✓✓	✓
		Smart tax	Lower tax for affected area / outside public transport network	✓✓	✓
		Off-set charges (charges from the big box retail stores)		✓✓✓	✓
		Student surcharges		✓	✓✓
	2. Polluter pays carbon taxes/funds	Fuel charges	Tax on petrol, diesel and gas	✓✓✓	✓✓✓
		Regional fuel tax		✓✓✓	✓
		Road pricing	Toll roads	✓✓✓	✓
			Congestion charges	✓✓✓	✓
		Parking charges and fines		✓✓	✓✓
		Fee on parking building		✓✓	✓✓
		Vehicle registration fee	Vehicle registration fee	✓✓✓✓	✓✓✓✓
			Higher registration fee on heavy vehicles	✓✓✓	✓✓
		Vehicle Kilometre Travel (VKT) tax		✓✓✓✓	✓✓
		Emission charges		✓✓✓	✓
		Higher tax on second hand cars		✓✓✓✓	✓✓✓
	3. Public transport operation taxes/funds	Reprioritising transport funding towards public transport		✓✓✓	✓✓✓✓

		Public transport trust fund		✓✓	✓✓✓
		Railway development fund		✓✓	✓✓✓
		Improving current public transport network		✓✓✓✓	✓✓✓✓✓
		Multimodal passes		✓✓✓✓	✓✓✓✓
		Higher usage through modern services		✓✓✓✓	✓✓
		Leasing public transport workshops		✓✓	✓✓
		Advertising		✓✓	✓✓✓
		Naming of routes or bus stops (naming rights)		✓✓	✓✓✓
		Cutting wages of public transport workers	Cutting wages or increasing hours of public transport workers	✓	✓✓
		Tourist attention		✓✓✓	✓✓
		Fee on using HOV (high occupancy vehicle) lanes		✓	
		Fare efficiency and transparency (smart cards) – increase fare box revenue		✓✓	✓✓✓✓
	4. Private sector taxes/funds	Public-private partnership		✓✓✓	✓✓✓
		Privatization		✓✓	✓
		Competitive tendering		✓✓	✓✓
		Private finance initiatives		✓✓	✓
	5. Other taxes/funds	Visitor tax	Airport departure tax	✓✓✓	✓
		Hypotheated tax		✓	✓
		Payroll/employer tax		✓	✓
		Cross-utility financing		✓	✓
		Consumption tax	Gambling tax	✓✓	✓✓
		Luxury car tax		✓✓✓	✓✓✓✓

Note: ✓ represent the lowest and ✓✓✓✓✓ represents the highest level of suitability of funding

Table 1 Public transport funding options for cities in developed and developing countries (Source: Authors)

Toll roads and congestion pricing are an effective way to fund and encourage public transport. However, toll roads and congestion pricing are suitable for countries where a large proportion of journeys to work travel are made in cars. This being the case these funding mechanisms may be more suitable to developed countries. Moreover, a balanced approach is required regarding charging for tolls and congestion pricing, as otherwise it will undoubtedly be met by protest by businesses and residents located within designated charging zones. Fuel taxes and parking charges seem to be an unreliable source of funding due to the fluctuating costs of fuel and changing car usage. However, parking charges are important to restrict car use in cities in developing countries. These pricing methods alone cannot generate enough funds to meet the need of public transport development and therefore should be accompanied with other funding sources.

The efficiency of a public transport system can improve the fare box revenue in cities in developed and developing countries. This reality is generally ignored during the exploration of public transport funding options. Good network planning and sensible fare structures help to raise funds for public transport services.

Private sector funding especially the use of Public-Private Partnerships (PPPs) is a good source of funding for public transport. The private sector has the necessary knowledge and skills to, design, construct and operate public transport systems, while the public sector poseses the regulatory/legal powers to facilitate public transport operation. However, PPPs are hard to implement in the case of developing countires due to a lack of capacity in the public sector. Ccompetitive tendering might be suitable for both cities in developed and developing countries as it allows the public sector to achieve desired public transport services through negotiation and discussion.

Most innovative methods of funding public transport will not be implemented without resistance from involved parties. Therefore, in-depth analysis of potentially suitable funding sources should be conducted at the local level. Analysis should include the ability of government to collect and distribute a particular revenue stream, which might include enforcement ability and transparency. Moreover, public, political and business acceptability is fundamental to choosing an appropriate combination of funding sources.

In summary, all of these innovative ways of funding public transport have pros and cons. Some have more merit than others and therefore, demand in-depth contextual analysis by

linking public transport funding with the environmental, social, economic, and land use policies of a city. In this way, funding public transport will be beneficial not only to public transport but also overall liveablity of a city.

REFERENCES

Auckland Regional Transport Authority. (2010). *Auckland Regional Public Transport Plan 2010.* Auckland, New Zealand: The Auckland Regional Transport Agency.

Buehler, R. & Pucher, J. (2011) Making Public Transport Financially Sustainable. *Transport Policy*. 18(1), 126-138.

Button, K., & Rietveld, P. (1993). Financing Urban Transport Projects in Europe. *Transportation, 20*(3), 251-265.

CAPRICE. (2008). *The Example of the French tax "Versement Transport": a Key Resource of Public Transport Funding in Ile de-France.* Retrieved from http://www.caprice-project.info/spip.php?article30

Cervero, R. (1998). *The Transit Metropolis, A Global Inquiry*. Washington: Island Press.

Crawford, I., & Smith, S. (1995). Fiscal Instruments for Air Pollution Abatement in Road Transport. Journal *of Transport Economics and Policy*, 29(1), 33-51.

Debande, O. (2005). Private Financing of Transport Infrastructure: An Assessment of the UK Experience. *Journal of Transport Economics and Policy*, 36(3), 355-387.

Dow, N. (1997). *Economic Instruments and Regulatory Measures for the Demand Management of Urban Transport.* Narobi, Kenya: Un-habitat.

Enoch, M. Potter, S., & Ison, S. (2005). Strategic Approach to Financing Public Transport through Property Values. *Public Money & Management, 25*(3), 247-154.

European Commission of Energy. (2012). *Better Public Transport for Europe through Competitive Tendering: A Good Practice Guide.* Retrieved from: http://www.managenergy.net/resources/335

Goeverden, C. V., Rietveld, P., Koelemiejer, J., & Peeters, P. (2006). Subsidies in Public Transport. *European Transport, 32*(1), 5-25.

Goldman, T., & Wachs, M. (2003). A Quiet Revolution in Transportation Finance: The Rise of Local Option Transportation Taxes. *Transportation Quarterly, 57*(1), 19-32.

Headicar, P. (2009). *Transport policy and planning in Great Britain.* Milton Park: Routledge.

Jansson, J. (2008). Public Transport Policy for Central-City Travel in the Light of Recent Experiences of Congestion Charging. *Research in Transportation Economics, 22*, 179-187.

Jupe, R. (2009). New Labour, Public-Private Partnerships and Rail Transport Policy. *Economic Affairs, 29*(1), 20-25.

Kennedy, C. Miller, E. Shalaby, A. MacLean, H. & Coleman, J. (2005). The Four Pillars of Sustainable Urban Transportation. *Transport Reviews*. 25(4), 393-414.

Kiggundu, A. (2009). Financing Public Transport Systems in Kuala Lumpur, Malaysia: Challenges and Prospects. *Transportation, 36*(3), 275-294.

Krishen, A., Raschke, R., & Mejza, M. (2010). Guidelines for Shaping Perceptions of Fairness of Transportation Infrastructure Policies: The Case of Vehicle Mileage Tax. *Transportation, 49*(3), 24-38.

Lindsey, R. (2010). Reforming Road User Charges: A Research Challenge for Regional Science. *Journal of Regional Science, 50*, 471-492.

Local Government New Zealand (2007). *Funding Local Government*. Retrieved from: http://www.lgnz.co.nz/library/publications/Funding_local_government.pdf

Local Government Rates Inquiry Panel. (2007). *Funding Local Government: Analysis of Submissions.* Wellington, New Zealand: Local Government Rates Inquiry.

Manuel, V. S., Perez, D. V., Ramon, M. R., & Tomas, S. (2009). Public Transport Funding Policy in Madrid: Is there Room for Improvement? *Transport Reviews, 29*(2), 261-278.

Mills, G. (1991). Commercial Funding of Transport Infrastructure: Lessons from Some Australian Cases. *Journal of Transport Economics and Policy*, 25(3), 279-298

Parry, I., & Small, K. (2005). Does Britain or the United States have the Right Gasoline Tax? *The American Economic Review, 95*, 1276-1289.

Phang, S. (2007). Urban Rail Transit PPPs: Survey and Risk Assessment of Recent Strategies. *Transport Policy, 14*, 214–231.

Price, W. (2002). Innovation in Public Finance : Implications for the Nation's Infrastructure. *Public Works Management Policy, 63*(7), 63-78.

Pucher, J., Markstedt, A., & Hirschman, I. (1983). Impacts of Subsidies on the Costs of Urban Public Transport. *Journal of Transport Economics and Policy*, 17(2), 155-176.

Rudel, R., Tarola, O. & Maggi, R. (2005). Pricing and Financing Transport Infrastructures in Switzerland: A Success Story? *Journal of Research in Transportation Economics*, 15(1), 2005-213.

Ruesch, M. (2008, April). *Innovative Funding and Financing of Public Transport*. Presented at SPUTNIC, Strategies for Public Transport in Cities, working group 3 meeting, Leipzig, Germany.

Sakai, H., & Shoji, K. (2010). The Effect of Governmental Subsidies and the Contractual Model on the Publicly-Owned Bus Sector in Japan. *Research in Transportation Economics,* 29**,** 406-413.

Serebrisky, T. (2009). Affordability and Subsidies in Public Urban Transport: What Do We Mean, What Can Be Done? *Transport Reviews*, 29(6), 715-739.

Siemiatycki, M. (2010) Delivering Transportation Infrastructure Through Public-Private Partnerships. *Journal of the American Planning Association.* 76(1), 43-58.

Simpson, B. J. (2003). *Urban Public Transport Today*. London, United Kingdom: E & FN SPON.

Sloane, S. (2008). *Financing Public Transportation: Trends in America.* Retrieved from http://www.csg.org/knowledgecenter/docs/TIA_PublicTrans_screen.pdf.

Sterner, T. (2012). Distributional Effects of Taxing Transport Fuel. *Energy Policy, 41*, 75-83.

Stone, J., Mees, P., & Imran, M. (2012). Benchmarking the Efficiency and Effectiveness of Public Transport in New Zealand Cities. *Urban Policy and Research,* 30(2), 207-224.

Texas Transport Institute. (2012). *A Guide to Transportation Funding Options.* Retrieved from: http://utcm.tamu.edu/tfo/transit/summary.stm

Tsukada, S., & Kuranami, C. (1994). Value Capture: The Japanese Experience. In Farrel, S. (ed), *Financing Transport Infrastructure, London:* PTRC.

Ubbels, B & Nijkamp, P. (2002). Unconventional Funding of Urban Public Transport. *Transportation Research Part D,* 7(5), 317-329.

Ubbels, B., Nijkamp, P., Verhoef, E., Potter, S. and Enoch, M. (2001). Alternative Ways of Funding Public Transport: A Case Study Assessment. *European Journal of Transport and Infrastructure Research*, 1(1), 73–89.

UITP. (2009, June). *Financing Public Transport: A Political and Economical Challenge*. Paper presented at the International Association of Public Transport Conference, Vienna, Austria. Retrieved from www.uitp.org/news/pics/pdf/MB_Financing_final1.pdf

UITP (2003). The Financing of Public Transport Operations. A position paper.

Van Reeven, P. (2008). Subsidisation and Urban Public Transport and Mohring Effect. *Journal of Transport Economics and Policy, 42* (2), 349-359.

Velde,D., Veeneman, W., & Schipholt, L. (2008).Competitive Tendering in the Netherlands: Central Planning vs Functional Specifications*. Transportation Research Part A,* 42(9), 1152-1162.

Vuchic, V. (2005). *Urban Transit: Operations, Planning and Economics*. Hoboken, NJ: John Wiley and Sons.

Wetzel, D. (2006). Facing the Environmental Challenge: Innovative Methods of Financing Public Transportation. *World Transport Policy & Practice, 12*(1), 40-46.

White, P. (2002). *Public Transport: its Planning, Management, and Operation,* London: Spon Press.

Whitty, J. (2007). *Oregon's Mileage Fee Concept and Road User Fee Pilot Programme Final Report.* Salem, OR: Oregon Department of Transportation. Retrieved from: http://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUFPP_finalreport.pdf