

Urban Transport Finances

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ABSTRACT

To address urban growth mobility challenges governments must develop sustainable transport systems through sustainable financial schemes, which guarantee continuous investment to build new infrastructure and maintain and operate existing one. Financial sustainability depends on revenue sources quality and transport projects characteristics. This research carefully analyses revenue and investment characteristics to understand the conditions that give feasibility to sustainably financing sustainable transport systems.

Based on the analysis of case studies and relevant literature, this research focuses on assessing existing financial instruments for urban transport such as public sector funding, funding by users, road and parking tolls, private sector participation, employer contributions, land value capture, property tax, and public-private partnerships. The assessment of the instruments is based on a standardized analysis framework considering financial sustainability attributes (stability, political acceptance and administrative ease) and transport sustainability aspects (economic efficiency, social equity and environmental impact). With this basis we carry out an analysis regarding the suitability of each instrument for funding specific transport projects and components.

Our main findings suggest that a good analytical framework for identifying suitable funding mechanisms for urban transport projects could be constructed from the identification of the expected benefits and beneficiaries of transport projects and the systematic application of the “who benefits pay” principle. Evidence suggests that revenue sources that capture direct and indirect benefits generated from transport projects have a high revenue potential. Charges to direct beneficiaries (passengers or drivers), although they might be politically and administratively inconvenient, efficiently achieve sustainable transport goals. In financial terms, direct beneficiaries instrument generate a continuous revenue flow which can stably be used to address operation and maintenance requirements. . Charges to indirect beneficiaries (developers, landowners) perform slightly less efficiently on transport sustainability but are generally stable and convenient for raising ex-ante large amounts of revenue for capital investments. However, a mix of financing instruments –international, national, and local– is needed particularly for capital investments, with an important emphasis on grants and loans for the government from funding agencies or through the private sector (PPPs) to finance large project that create wide benefits for society. Therefore, sustainable financing schemes should be based on combinations of multi-level innovative revenue sources that promote efficient pricing schemes, increases in overall revenue and investment in sustainable transport projects.

1 Introduction: the Urban Transport Finances Challenge

In many cities in Latin America and the developing world congestion is endemic and public transport has a low quality. The majority of trips take place by public transport but they take a long time. Car trips are a minority of the trips and yet streets are congested and many streets are in poor shape. Public transport is hurt disproportionately because of the need to share congested lanes. The low quality of public transport, the relatively short mass transit networks, and the poor condition of roads and sidewalks along many streets indicate that the urban transport system is not receiving the financial

resources it needs to cover all its investment, operations, and maintenance costs. Therefore, most cities in Latin America and the developing world have a structural financing gap because revenues do not match the system-wide costs. To aggravate matters, cars are implicitly subsidized while public transport is in dire need of larger investments. The financing gap is therefore larger than imagined and even more so when key investments needed to catch up are considered—expanding metro and bus rapid transit networks, toll roads, and infrastructure for non-motorized transport. Additional financial pressure is related with the recurrent expenditures associated with the need to maintain and operate the existing infrastructure and what needs to be built. While improving urban transport in developing country cities is critical, the financial gap is a reality that impedes cities from achieving a more promising potential.

The existing literature on urban transport finance identifies the increasing financing gap as the main difficulty faced by governments trying to improve transport systems. In very general terms, the different authors associate the shortness of revenue, which creates the financing gap, with three primary factors: (i) limitations of the existing financing mechanisms to generate sufficient revenue; (ii) inefficient pricing and economic distortions; and (iii) an unbalance between investing responsibilities and financial capacity at the city level. To better understand these issues and identify strategies to overcome the financing gap different approaches have been taken. A first line of research, for instance, undertakes a wide approach that analyses all types of financing mechanisms. Sakamoto,¹ for example, argues that the “sustainable” part of the urban transport system can raise enough revenue to cover all its costs. His approach focuses on the analysis of financing mechanism, classified by government levels, to define a financing strategy that achieves sustainability through a combination of multi-level financing instruments that reflects transport real costs, integrates financing into the wider policy and overcomes political and economic barriers. CODATU’s comprehensive approach also analyses all the main financing instruments to define a financing strategy, in which instruments are combined to allow a balance so that all costs are borne by a certain party. CODATU places special attention on the institutional capacity required to support an innovative financing strategy arguing for the involvement of levels of government above the city level, the national government for instance, to help cover much needed capital costs. But this approach leaves outside the recurrent side of the problem—operations and maintenance. A second approach for addressing urban transport financing gap, argues that the potential extra revenue capacity of existing financing instruments is limited therefore there is a need of creating new mechanism (i.e. tax surcharge earmarked to the urban transport system).² Yet this approach tends to be politically acceptable only for megaprojects, such as metros, and typically for capital costs. And when accepted for other parts of the transport system, the sole existence of earmarked sources can hinder—paradoxically—the tapping of other sources of revenue that could also finance the transport system. The reason is political opposition on the grounds that there is already a large and steady source—no matter if it is insufficient. Moreover, on the creating revenue sources approach, many authors³ have focused on analyzing specific types of financing mechanisms such as Land Value Capture instruments or Public Private Partnerships (PPPs) analyzing them as effective pricing strategies to raise revenue and redistribute the investment responsibilities and risks among different sectors. These instruments apply to specific projects.

Finally, the literature highlights the need to correct urban transport pricing distortions to increase revenue by making users pay the full cost of the service and incentivize efficient demand levels for the different modes. However, a practical framework to build a path towards this objective is not thoroughly developed. Although the literature that focuses on specific financing mechanisms develops conceptual frameworks to analyze efficient pricing and revenue increases, this analysis has no consideration of the

¹ See Sakamoto (2011)

² (World Bank, 2001) (Gwilliam, 2001)

³ (Calimente, 2012) (Junge & Levinson, 2012), (Medda, 2011), (Peterson, 2009), (Zegras, 2006), (Zhao, et al., 2009)

impact of the mechanism on the overall financial or transport system sustainability. The existing literature therefore tends to take a partial approach to the issue of reducing the financing gap of urban transport.

This paper gives a novel perspective to the question of urban transport finances by combining the two existing trends of analysis. The proposed analysis framework acknowledges the double impact that financing mechanisms can have, from the revenue side to increase funds and as policy instruments to promote use of sustainable transport modes. More specifically, the analysis from the revenue side perspective acknowledges that the observed underfinancing of the transport sector stems from the existing price distortions that have tacitly contributed to subsidize certain modes inefficiencies, particularly the private car. Therefore, the proposed financing strategy should aim at setting financial instruments as prices that charge users for the total costs of using a given infrastructure or transport service.⁴ This pricing will correct market distortions, improve user behavior, and increase revenue to an equal or higher level than the expenditures.

In parallel, from the expenditure side, wiser project selection refers to investing in transport projects that are coherent with sustainability goals. Until recently, governments wanting to develop their transport system to address urban growth would have to choose between two options: building more roads or investing in mass transit.⁵ With the final decision being mostly dependant on the funding availability.⁶ However, the wiser investment approach requires that governments understand the effect that a transport project can have on their city⁷ in aspects such as land-use patterns, urban sprawl, spatial and social segregation, exclusion of low-income population and, consequently, in overall economic growth.⁸ Hence, a comprehensive financing scheme must be able to reflect the effect that investing on unsustainable modes will have in the long-term. For example, having to provide infrastructure and services to low density, car-dependent, fossil fuel-intense and sprawled cities will increase initial investment requirements. On the other hand, sustainable, inclusive, low carbon modes, such as mass transit or non-motorized modes, allow a more efficient use of scarce resources, such as land, promoting densification processes that can have positive impacts on economic vitality, access to opportunities and overall prosperity of the city. Hence, investing in sustainable transport projects has the possibility of starting virtuous cycles in which cities become more attractive for investment of different actors such as the national government⁹ or international agencies, reinforcing transport system's overall financial sustainability.

In summary, this paper defines beneficiaries and measures of benefits associated with each of the financing instruments. Second, the paper considers indicators for the quality of the revenue sources studied, including stability, acceptability, administrative ease, efficiency and impacts on the environment and equity. Third, the paper looks at all the instruments to assess their suitability for financing a series of elements of the transport system that range from the sidewalk to the megaproject. Within this analysis capital, maintenance, and operation costs are treated as separate units of analysis

⁴ In that case fuel prices should charge for resources and environmental costs; differentiated tolls should charge for congestion and road maintenance; emission fees will be charged to account for environmental costs; and non-distorting lump sum taxes will be charged for redistributive purposes. (Zegras, 2006)

⁵ (Zegras, 2006)

⁶ the resources needed to develop a project, referring not only to the initial investment but to the future flows associated with operation and maintenance costs

⁷ "The durability of transport equipment, the longevity of its infrastructure, and high fixed costs mean that current investments lock in the modal structure of transport for decades" (World Bank, 2012)

⁸ (CODATU, 2009)

⁹ One example is the Transmilenio BRT project in Bogota which attracted national government contributions for phases 2 and 3 (Ardila & Ortegón, 2007)

considered in parallel. The paper arrives at the conclusion that financial sustainability for urban transport systems can be achieved mainly through two strategies: innovative multi-tier financing and wiser investment. Innovative financing refers to the revenue side, which can increase if different financial instruments are combined and managed effectively. Wiser investment, associated with the expenditure side, refers to strategically choosing to develop cost-effective projects that contribute to solve short term difficulties whilst working to achieve long term transport sustainability goals.

2 Understanding the urban transport system financing conundrum

The financing of the urban transport system has characteristics that add complexity to the financial sustainability problem, such as: (1) Economic rationale conflicts regarding who must provide transport services given their public and private good characteristics; (2) Market distortions created by inefficient pricing system in which users do not pay direct and accurate prices that fully account for transport costs;¹⁰ (3) Diversity of funding sources involving both private and public sectors, and different levels of government (local, national, global), and (4) Varying investments periodicity which requires large amounts of capital in the short term and continuous streams of funding in the medium and long term. A sustainable urban transport financing scheme has to be structured to address these conceptual difficulties.

Until recently, however, the main, if not the only, objective and criteria for selecting sources of revenue was to increase transport's sector income. And, although this still is a main objective of the financing scheme, in light of sustainability criteria, a different understanding of financing sources is needed. The new approach to defining financial schemes has to aim at understanding how financing instruments can have impacts in demand and supply sides of transport systems, influencing demand and travel behavior, or encouraging service suppliers to find technological alternatives. This approach requires governments to unbound the financing requirement from specific projects and their corresponding budgets and move towards identifying long-term planning objectives and required changes in policies, institutions and the economic instruments that would allow the achievement of those established goals.

What are the possible sources of revenue for the urban transport system?

Table 1 presents a summary of the main revenue sources for the urban transport system. In principle, governments should be able to afford transport investment through public budgets, which come from taxation and user fees as primary sources of revenue. However, the revenues generated by the urban transport system have been usually insufficient due to high sunk costs for new infrastructure development, high operational cost and implicit subsidies to inefficient modes. Therefore, governments have had to complement public budgets with other sources of revenue such as grants, bonds and loans from institutions such as multilateral agencies or through the involvement of the private sector. The financing scheme that aims to attract private sector funding provides an approach that moves towards an efficient distribution of benefits and costs and funding and managing responsibilities. Examples of these efficient mechanisms include public-private-partnerships¹¹, or land value capture mechanisms, which are mechanisms to obtain resources from the private sector.

¹⁰ (Zegras, 2006), (Zhao, et al., 2012), (Medda, 2011)

¹¹ (Zhao, et al., 2012)

Table 1 Main Revenue Sources in Urban Transport

Type	Sources
From Public Sector: Managed by main players in areas such as infrastructure and operation	<ul style="list-style-type: none"> • General budget funded through taxation • Taxes on fuel, vehicle ownership (allocated to transport when permitted by legislation) • Parking, toll revenues • Taxes on the payroll of private and public employers • Loans from banks, funding agencies • Grants from international funding agencies or bilateral aid.
From Users: Users of the different modes paying for the service they are receiving. Such as public transport passenger that pay a fare that goes directly to fund the operation costs) Car users that pay tolls and taxes which revenues can be directly allocated to the transport sector (if the country's legislation has earmarked the source), or otherwise it goes to general budget which makes very difficult to define which part of the revenue is actually allocated to the sector.	<ul style="list-style-type: none"> • Public transport users ticket purchase • Users of individual motorized vehicles payments such as tolls for the use of infrastructure (bridges or urban motorways), congestion charging to access areas such as a city center, parking charges, taxes on fuels, fines. • Users of soft modes of transport, such as bicycles, rental charges when using self-service systems or secure lock-ups
Other people that benefit from the improvements and effects generated by a transport system even if they are not users	<ul style="list-style-type: none"> • Companies whose employees make use of the system contribute to the funding of the investment and the system's operation through a tax on payroll (in certain countries such as France 0.5%-2.6% of payroll) • Contributions in the form of direct assistance to the employee when a firm covers a share of employees' daily transport costs; • Business activities productivity increase (traveling customers or firms that mobilize goods) • Land value increases for local residents and traders • Recovering a share of the capital gains to fund mobility can be an innovative method which has already been used in a number of cities

Source: Authors based in CODATU (2009)

Who benefits from urban transport service provision?

The innovative financing schemes for transport systems should aim at defining an efficient revenue scheme in which charges, fees and taxes reflect prices that cover the costs of using any specific infrastructure¹² or service so that all costs are borne by certain party.¹³ Moreover, following the “benefit principle” (which is fairly equivalent to the user pays principle), the share of cost financed of transport infrastructure or transport services should be proportional to the benefit received.¹⁴ The “benefit principle” is also effective for identifying who must be charged for the development, maintenance or operation of any specific service or project. The principle dictates that, whoever receives the benefit must pay for it or contribute partially. Therefore, using the benefit principle as a conceptual framework requires the identification of the types of benefits, beneficiaries and measures of benefits. Since

¹² (Zegras, 2006)

¹³ (CODATU, 2009)

¹⁴ (Zhao, et al., 2009) A similar common standard to define user fees, known as the “rational nexus test”, includes the following criteria: 1.The service needs must be directly attributable to those bearing the cost; 2.The costs must be allocated proportionally to benefits; 3.The facilities funded must be part of a comprehensive plan; The fee must account for taxes paid toward transportation so property owners are not double-billed; and 4. the fee revenues must be used for their intended purpose in a timely manner (Altshuler et al. 1993).as cited by (Junge & Levinson, 2012)

transport projects have wide impacts on society, several benefits and beneficiaries can be associated with one specific project.

Although highly dependent on the context of each city, generally, transport projects will create three type of benefits: (1) **General benefits** which are received by society in general and therefore must be paid by public authorities as representatives of general public; (2) **Direct benefits** which are received mainly by users of the transport system (services and infrastructure) and can be directly charged to them; and (3) **Indirect benefits** which are received by people which are non-users of the system but still receive benefits from the improvements in accessibility, mobility and increases in business opportunities associated with the development of transport projects. The different benefits should be identified and measured so that they can be paired with a specific financial instrument designed to capture the added value created by the benefit.

The need to combine financing instruments

For efficiency purposes, governments should charge user fees for those services with private good characteristics for which beneficiaries can easily be identified. Conversely, where user fees are difficult to estimate, taxes and transfers should be more appropriate. Therefore, governments need a blend of funding sources according to the variety of services they provide¹⁵ which must come from different government levels based on local political and institutional context.

Blending financing instruments is also needed because to develop transport projects and provide services, governments have to cover capital, operational and maintenance expenditures. These three types of expenditure require different amounts of resources with different periodicity. In general, expenditure levels can be associated with the size of the city and its population. Although capital investment can take advantage of economies of scale, normally, infrastructure costs increase as service area increases and operational costs increase as the number of users increase. The development of new projects requires large capital investments on a specific moment. In turn, maintenance of new and existing infrastructure and operating expenditures¹⁶ are continuous in time and their value increases periodically according to increases in population, inflation or others factors. To guarantee financial sustainability, financial instruments must consistently respond to the time variations of expenditures.

Consequently, the variety of financing sources must respond to the time characteristics of the investments, which, as mentioned above can be one time large capital investments or recurrent investments. The amount of resources, and the type of financing instruments, required for each investment item is largely related with the level of development of the transport network.¹⁷ Highly developed transport networks would have mainly recurrent operational and maintenances expenditures, whilst less developed transport networks will require in the short term large capital investment and recurrent funding sources in the long-term.

The following tables present, classified by type of benefit, a summary of the main financing instrument available, the government level commonly associated with each instrument, a proxy of a measure of the benefit that it generates, and whether the instrument may finance capital investments (C), Maintenance (M), and/or Operation(O) and its periodicity or recurrency. The three tables suggest a correspondence of the revenues and the expenditures periodicity. Hence, financial instruments with ongoing revenues

¹⁵ (Bird, 2001).

¹⁶ day-to-day operations of the municipality and include expenditures on wages and salaries, benefits, the purchase of short-life equipment, repair and maintenance and servicing of long-term debt (principal and interest)

¹⁷ (Sakamoto, 2011)

can finance, for the most part, recurrent operation and maintenance expenditures. On the other hand, financial instruments that generate large lump-sums can be used to cover large capital investment required to develop new infrastructure.

Table 2 captures the principle that sustainable transport projects bring major economic, social and environmental benefits to society’s overall wellbeing and consequently show how National, International or Global institutions, on behalf of society, are responsible for contributing funding to these initiatives. It is important to highlight that within this context only public transport projects (not private-vehicle infrastructure) generate sufficient benefits to justify the need that society as a whole pays for them.

Table 2 Financial Instruments funded by General Public

BENEFICIARY	FINANCING INSTRUMENT	GOV LEVEL INVOLVED	COMP	MEASURE OF BENEFIT	UP-FRONT	RECURRENT
Society	Public Transport Subsidies	Local/National	M/O	Accessability, equity, environment health. Increases in productivity, economic growth. General tax base growth		●
	Property Tax	Local/National	C/M/O	Increases in productivity, economic growth. General tax base growth		●
	National and International Loans and Grants	Local, National, International	C/M	Increases in productivity, economic growth. General tax base growth	●	●
	The Clean Development Mechanism (CDM)	Global	C	Greenhouse emission reductions	●	●
	The Global Environment facility	Global	C	Greenhouse emission reductions	●	
	Clean Technology Fund	Local, National	C	Greenhouse emission reduction		●
	Multilateral and Bilateral Climate funds	Global	C	Greenhouse emission reductions	●	
	PPPs for Public Trasport	Private/Local/ National	C/M/O	Accessability, equity, environment health. Increases in productivity, economic growth. General tax base growth	●	●

Source: Author based on (Zhao & Levinson, 2012)

Table 3 shows that financing instruments funded by direct beneficiaries are recurrent given that they are directly related with the use of the system. In that same sense, it seems both politically and administratively correct that these instruments are mainly managed from a local level and used for recurrent expenditures such as operation and maintenance.

Table 3 Financial Instruments funded by Direct Beneficiaries

BENEFICIARY	FINANCING INSTRUMENT	GOV LEVEL INVOLVED	COMP	MEASURE OF BENEFIT	UP-FRONT	RECURRENT
Users/Vehicle Operators	Parking Charges	Local	C/M/O	Zonal Access Rights		●
	Road Pricing	Local	C/M/O	General access rights		●
	Congestion Charges	Local	C/M/O	Demand controlled access rights		●
	Fuel taxes/surcharges	National	C/M/O	Gas Consumption, Driven miles		●
	Vehicle Taxation	Local, National	C/M/O	Owned vehicles/types		●
Users/Transport System Passengers	Farebox Revenue	Local, Private	O/M	Ridership, amount of trips, accessibility		●
Users	PPPs for Urban Roads	Private/Local/National	C/M/O	General access rights	●	●

Source: Author based on (Zhao & Levinson, 2012)

The Financial Instruments funded by indirect beneficiaries, presented in Table 4, do not show a direct relationship between periodicity and involved government level. Since most of the financial instruments funded by indirect beneficiaries are related with the development of real estate projects it is expected that large up-front sums are generated at the initial stages of the projects and ongoing revenue will be obtained once the projects start operations.

Table 4 Financial Instruments funded by Indirect Beneficiaries

BENEFIT	BENEFICIARY	FINANCING INSTRUMENT	GOV LEVEL INVOLVED	COMP	MEASURE OF BENEFIT	UP-FRONT	ONGOING
Indirect	Advertising Companies	Advertising	Local, Private	M/O	Sales increases due to more exposure		●
	Companies	Tax on Pay-rolls	Local	M/O	Use of Public Transport by employees		●
	Landowners	Land Value Tax	Local/National	C/M	Land Value Growth/Property Tax Growth	●	●
		Tax Increment financing	Local	M/O	Property tax revenue growth (within TIF district)	●	
		Special Assessment	Local	M/O	Assessed special benefits	●	
	Developers	Transportation Utility Fees	Local	M	Trasportation Utility		●
		Development Impact Fee	Local/National	C	Off-site development opportunities	●	
		Negotiated Exactions	Local	C/M/O	On-site access benefits	●	●
		Joint Development	Local/National	C	Development Privileges	●	●
		Air Rights	Local/National	M/O	On-site development opportunities	●	●
		Public Private Partnerships	Private	C/M/O	Development Privileges	●	●

Source: Author based on (Zhao & Levinson, 2012)

3. Evaluating the quality of the financing sources¹⁸

The previous section identified a series of financing instruments and analyzed and classified them under the benefit principle into general, direct, and indirect beneficiaries (Tables 2-4). That section also carried out a first assessment of each financing instrument according to its suitability to cover capital, operational, and maintenance costs and to be an up-front or an ongoing (recurrent) source of revenue. This section evaluates in more depth each financing instrument using the set of attributes shown in the following table. These attributes seek to gauge the effectiveness of each instrument as a source of revenue (i.e. financial sustainability) as well as its impact on reaching the goal of transport sustainability.

Framework for evaluating the financing sources

ATTRIBUTE	DESCRIPTION
General characteristics	
Benefit	General, Direct or Indirect
Beneficiary/Funder	Identifies the agent which perceives the benefit and, therefore, is responsible for funding the mechanism
Govt Level Involved	Local, National or International
Financial Sustainability	
Stability	The stability is when there are moderate variations in the long term revenue raised and revenue is relatively unaffected by economic cycles (is it cyclical or counter-cyclical) and therefore supports long term planning.
Political Acceptability	The political acceptability is related with how clear the benefits generated by the instrument are so that they can be easily communicated to the general public. The instrument's political acceptability increases as the intentions regarding adoption, implementation and tax burden are clearly identifiable and complied by the public. The size of the base rate as an indicator of the amount of people that might have to pay the tax could also indicate some measure of acceptability.
Convenience and Administrative Ease	Convenience and Administrative ease can be regarded as a form of efficiency ¹⁹ associated with the portion of the revenue that has to be invested on the administrative and compliance costs of the scheme.
Transport Sustainability	
Efficiency	Specifically related to economic efficiency, corrective "charges" internalize the externalities generated by transport projects. This approach of efficiency focuses on assessing positive externalities perceived by individuals (<i>benefit-received principle</i>) so that they are charged a cost equivalent to the benefits they are receiving. As perceived benefits are proportional to imposed costs this attribute evaluate if the mechanism is effective in correcting the effects of existing economic distortions caused by market failures. The attribute also evaluates the instrument's ability to equate marginal benefits to costs of development.
Equity	Associated with fairness, it refers to horizontal and vertical equity. Horizontal equity sets that individuals who are in "essentially similar economic circumstances" should be treated the same and pay the same. Vertical Equity, with regard to income and social class ²⁰ , defines that individuals who have greater ability to pay, or who receive greater benefits should pay more ²¹ . Therefore equity is related to the incidence of the financing mechanisms on different populations groups, such as different income groups regarding the distributive effect (progressive if it favors disadvantaged groups or regressive, otherwise) ²² , population with different location or of different generations.
Environmental Impact	Related with the environmental effects of the financing mechanisms and its capacity to correct distortions and amend the adverse effects of transport on the environment ²³ . The attribute evaluates if the instrument helps internalize external costs and promotes investment in sustainable transport modes and strategies.
Other Consideration	
Associated risks	The effect of introducing certain charges varies according to local context. Nonetheless, from the experiences on different places around the world common risks can be identified and highlighted for policy makers. The risks can be associated to unexpected secondary effects that can have negative repercussions on other financial or transport sustainability issues.

Source: Authors based on (Sakamoto, 2011), (Zhao & Levinson, 2012) and (Litman, 2012)

¹⁸ The definitions for the attributes is based on (Sakamoto, 2011) and Mikesell (2003), as cited by (Junge & Levinson, 2012) and (Zhao, et al., 2009)

¹⁹ (James & Nobes, 2009)

²⁰ (Litman, 2006)

²¹ (Bird & Enid, 2004)

²² (James & Nobes, 2009)

²³ (Button, 2010)

Using the above assessment criteria we evaluated the 24 financial instruments presented in Tables 2-4. Tables 5-7 present the results of the assessment. We use a qualitative scale of Low (Red), Medium (Yellow) and High (Green) to show how each financial instrument achieves the respective attribute. For example, in Table 5 Public Transport Subsidies are considered to have low stability, high political acceptability, and low administrative ease. We found public transport subsidies to have medium economic efficiency, high equity, and medium environmental impact. The assessment comes from what we identified from relevant literature, case studies and our own experience. Notice that tables 5-7 can be analyzed both vertically and horizontally. The vertical analysis shows how a specific group of financial instruments behaves for each attribute. The horizontal analysis shows which are the strengths and weaknesses, or the contradictory effects, that might be associated with each financial instrument. These criteria are key elements to identify which financial instruments are appropriate to give feasibility to specific sustainable transport systems' objectives.

In the general benefits financial instruments (Table 5), the instrument with the best overall performance is National and International Loans and Grants, because the agencies that provide this funding are concerned with all the analyzed sustainability attributes and, therefore, provide both institutional and technical capacity advice on several areas together with the delivery of funds. Second, the financial mechanisms associated with "environment and climate change finance" have a medium impact on equity issues and low performance regarding financial stability. Regarding equity, the medium performance happens because the funding goes to projects that promote cleaner public transport systems and non-motorized transport modes, which in developing countries are used mostly by lower income population. The low financial stability of the instruments is due to the need to have frequent replenishments which developed countries can halt at any time. The property tax is also worth mentioning because of its broad use and stability.

Table 5 General Benefits Financial Instruments Assessment

FINANCING INSTRUMENT	GOV LEVEL INVOLVED	RESOURCE LEVEL	STABILITY	POLITICAL ACCEPT.	ADMINISTRATIVE EASE	EFFICIENCY	EQUITY	ENVIRON. IMPACT	COMPONENT
Public Transport Subsidies	Local/National								M/O
Property Tax	Local/National								C/M/O
National and International Loans and Grants	Local, National, International								C/M
The Clean Development Mechanism (CDM)	Global								C
The Global Environment facility	Global								C
Clean Technology Fund	Local, National								C
Multilateral and Bilateral Climate funds	Global								C

Source: Authors based on CODATU (2009), Sakamoto (2011), Zhao, et al. (2012)

Financial Instruments funded by direct beneficiaries, presented in Table 6, are the instruments which best represent the benefit-pay principle. Most of the instruments are good revenue sources and they help reach a sustainable transport also. In terms of financial sustainability the less favored attribute is political acceptability, which might be related with the difficulty associated to start charging for something that was considered as a "right" and therefore was perceived as "free" in out of pocket terms. Observe how *Farebox Revenue* shows a medium performance for all attributes but is exclusively designated to cover the operational and maintenance costs of the system.

Table 6 Direct Benefits Financial Instruments Assessment

FINANCING INSTRUMENT	GOV LEVEL INVOLVED	RESOURCE LEVEL	STABILITY	POLITICAL ACCEPT.	ADMINISTRATIVE EASE	EFFICIENCY	EQUITY	ENVIRON. IMPACT	COMPONENT
Parking Charges	Local								C/M/O
Road Pricing	Local								C/M/O
Congestion Charges	Local								C/M/O
Fuel taxes/surcharges	National								C/M/O
Vehicle Taxation	Local, National								C/M/O
Farebox Revenue	Local, Private								O/M

Source: Author based on CODATU (2009), Sakamoto (2011), Zhao, et al. (2012)

Most of the indirect benefits financial mechanisms (Table 7) provide good level of resources but have medium performances on both financial and transport sustainability with the lower performance observed in relation to attributes of equity and administrative ease. The low performance on equity has to do with the tendency of the private sector to further develop areas which are already economically attractive and vital rather than investing on deprave areas of the city in which the welfare impact of the benefit might be higher and it certainly more needed. The administrative difficulty has to do with the institutional capacity issues and transaction costs associated with the coordination of several agents.

Table 7 Indirect Benefits Financial Instruments Assessment

FINANCING INSTRUMENT	GOV LEVEL INVOLVED	RESOURCE LEVEL	STABILITY	POLITICAL ACCEPT.	ADMINISTRATIVE EASE	EFFICIENCY	EQUITY	ENVIRON. IMPACT	COMPONENT
Advertising	Local, Private								M/O
Tax on Pay-rolls	Local								M/O
Land Value Tax	Local/National								C/M
Tax increment financing	Local								M/O
Special Assessment	Local								M/O
Transportation Utility Fees	Local								M
Development Impact Fee	Local/National								C
Negotiated Exactions	Local								C/M/O
Joint Development	Local/National								C
Air Rights	Local/National								M/O
Public Private Partnerships	Private								C/M/O

Source: Author based on CODATU (2009), Sakamoto (2011), Zhao, et al. (2012)

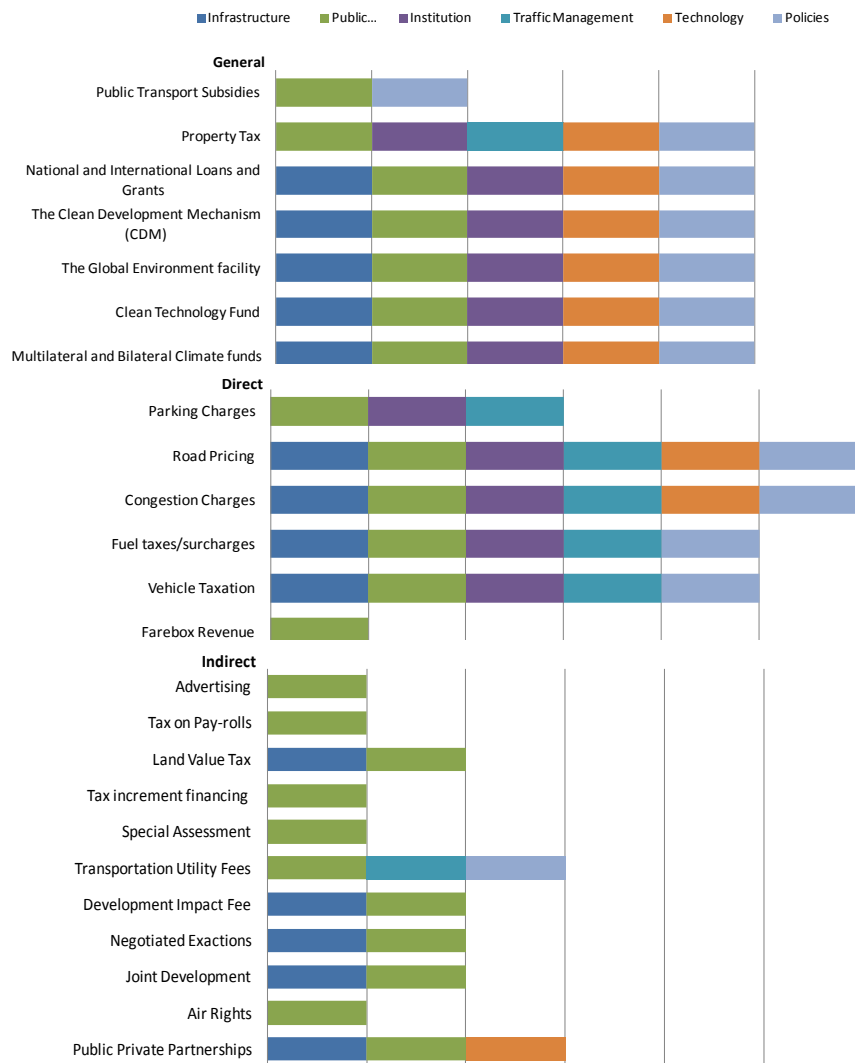
4. Using the financing mechanisms

We wrap up the analysis of the financing instruments by pairing up the results of the previous analysis to possible projects within the transport system. To simplify, we identify the following possible categories of projects: road infrastructure or capital investment in civil works, public transport including non-motorized modes, capacity building and institutional projects traffic management projects related to intelligent transport systems to improve the performance of traffic in the road networks, technology projects to improve the performance of other elements of the transport system, and policies which refer more to “soft” initiatives. The following figure shows the results divided by type of beneficiary, under

the benefit principle. A long bar alongside an instrument shows a broader range of projects which can be financed through the revenue from that instrument.

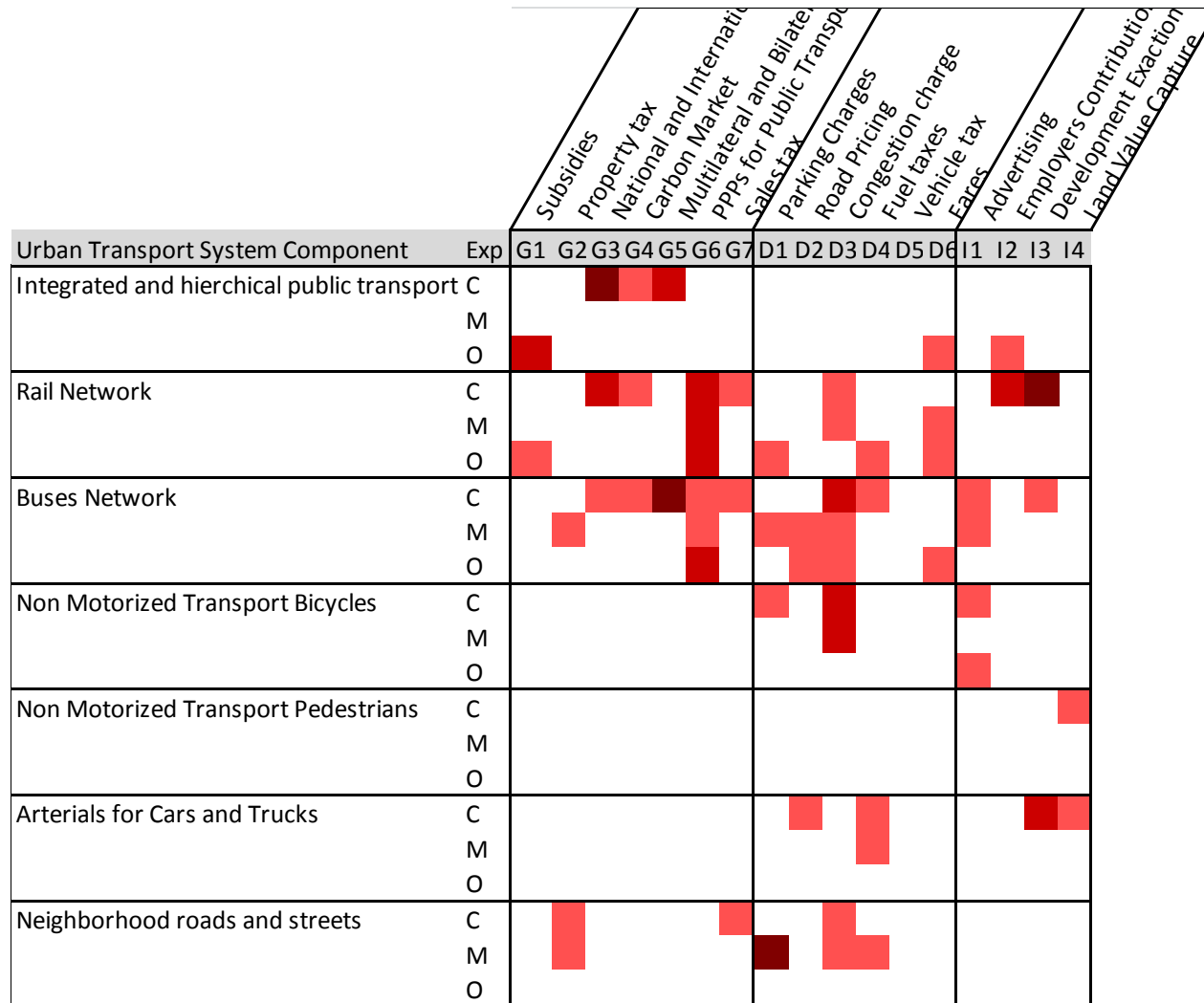
Under the direct beneficiary category, the key instruments that emerge are the property tax and the use of loans because they can finance the broader sets of issues. Yet other instruments in this category are also useful. The direct beneficiary category emerges as the best source of financing for the urban transport system's different projects. This result, not surprisingly, validates conclusions reached long ago in the literature: users (direct beneficiaries) should pay for their costs. Yet Table 6, above, reminds us that user charges are politically difficult to implement. This difficulty explains in part the financial gap that most transport systems face: direct users, in particular car users, are not paying enough. Finally, the indirect beneficiary category can certainly contribute to the financing of the urban transport system, especially for initial capital investments, but Table 7 reminds us that the administrative costs can be high. Therefore, using financing mechanisms linked to the indirect beneficiary should be done when expected revenue far exceeds the transaction costs.

Figure 1 Financial sources use by type of project



Source: Author

Finally, to further analyze the use of the diverse financial instruments, we reviewed examples of real world transport projects, of about 50 different cities, developed in cities around the world. For this analysis we categorized transport projects by mode and aggregate financing instruments by type. The figure shows how mostly integrated public transport systems and rail and bus networks are financed by an important variety of financing instruments. The colors represent the overall use intensity of that specific mode and TfL.



Source: Authors

5. Conclusions

The urban transport system is too large and complex and therefore a combination of financing instruments is needed to ensure financial sustainability. General benefit source have a This paper has assessed a series of financial instruments from several points of view to determine their suitability to be an effective financial instrument. Decision makers and planners can hopefully have a better understanding not only of the array of instruments but of the benefits, costs, and tradeoffs associated with each one. A key conclusion of the analysis is the importance of subsidizing investment in transport

projects that provide overall benefits for society and preventing implicit subsidies to the inefficiencies of private agents (users, operators, companies), which give the wrong economic signals²⁴. Although more subsidies from the public sector might be required it is also important that the direct and indirect users contribute with an amount proportionate to their benefit share. To accomplish these two objectives cities must have the autonomy and capacity to design their financial schemes accordingly to their investment responsibilities. A good example of an approach to achieve this objective is having a solid property tax. Many parts of the transport system benefit the population in general. Think of the neighborhood roads. It will be economically infeasible to charge for their use²⁵ as their benefits are general. Likewise for sidewalks and other non-motorized transport infrastructure. The property tax is therefore critical to cover these capital, maintenance and operational costs. Updating the cadastre of properties and collecting the associated revenues is fairly simple and therefore the property tax is quite cost effective.

Yet an instrument such as the property tax might not be sufficient to cover much needed capital investments in mass transit service, for instance. Cities can access loans from several sources to contribute to cover these costs. And the analysis clearly shows, thanks to the benefit principle, that national governments play a role here also. If the benefits of having a good urban transport system go beyond the city itself, then the national government has a duty financing public transport. That is why countries such as the UK, US, Germany, France, Mexico, Brazil, and Colombia have programs to finance urban transport infrastructure, specifically mass transit improvements. Evenmore, international funding, also may play a strong role in light of climate change and the need to invest in projects that contribute to the global benefit of reducing emissions from the transport sector.

National programs, however, rarely support urban highways. The analysis above validates this policy. The benefits of urban highways are more concentrated and users should pay for a large share of the costs or even in full. Likewise for operations and maintenance: user charges should cover these costs. Table 6 suggest that the political acceptability of user charges is low. To break the stalemate, a gradual introduction has to be considered, as well as an appropriate combination with other instruments. Fuel taxes earmarked for use in the transport system are the way to begin. Fuel taxes reflect use and can be a stable source, with low administrative cost, and one that promotes efficiency, equity, and helps achieve environmental goals. The next step will probably be to introduce parking fees to then jump to congestion pricing, for instance.

In sum, public transport projects should be financed by blending all types of resources—from the property tax to national and international sources to private sector participation. The benefits are general and hence the financing should be broad. Urban highways, on the other hand, should be financed ultimately from user charges because the benefits do not spread out as broadly. This short statement also reflects the entry point to this research: improving the financial sustainability of urban transport systems can be achieved through innovative financing and wiser investment. Innovative financing can increase revenue if different financial instruments are combined and managed effectively. Wiser investment, associated with the expenditure side, refers to making expenses more cost-effective through planning and transport demand policies that will lead to sustainable transport.

²⁴ Most important are subsidies for gasolina and diesel. (World Bank, 2012)

²⁵ The Singapore Land Transport Authority is beginning to assess the possibility of charging for car use as of the moment a car enters a neighbourhood road. The system will expand Singapore's famous Electronic Road Pricing system, which currently charges only in the most congested area of the city. This experiment needs to be followed carefully, particularly on the amount of revenue raised and what Singaporean authorities use it for.

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