COMPARATIVE ANALYSIS OF THE FARE SYSTEMS OF SOME CITIES IN THE WORLD

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ABSTRACT

The transportation fare system influences the mobility of a region and the life quality of its inhabitants. It has the ability to ensure the viability of activities and access / inclusion of the poorest people. Due to the relevance of the subject and its direct link with the quality of life and mobility, this paper aims to analyze the influence of some existing features in cities around the world and its possible influence in determining the use of public transportation system.

Keywords: Transport Planning, Pricing Strategies, Fare Structure.

INTRODUCTION

The market and social needs associated with collective transport are undergoing great transformation. On the market side, competition has increased with the presence of informal and alternative transport. Private car use has also increased, attracting riders formerly served by public transit systems. Even with the predominance of users from the middle and lower income segments, the tendencies on the demand side are for greater segmentation. From a standpoint of social needs, the contingent of poor people in developing countries is increasing due to the influx of rural migrants. These people often cannot afford the fares charged and are forced to commute on foot (Associação Nacional das Empresas de Transportes Urbanos, 2005).

Against this backdrop, the role of fare policies is fundamental to structure and improve urban mobility. Transit fares are a major factor in attracting passengers. They are also a basic element of transit system operations, affecting the financial condition of the transit agency. The fare amount, its relationship to the service quality and the convenience of fare payment greatly influence ridership. Types of fares and their collection also affect the efficiency of operations. The revenue collected from fares influences the method of financing transit operations in an urban area. Finally, in the long run, fares often have a significant impact on the form and development of central cities, their surrounding areas and suburbs. Therefore, planning fares for a given transit system requires careful consideration of numerous interrelated aspects of fares (Vuchic, 2005).
This study aims to analyze the influence of some existing features in cities around the world and its possible influence in encourage the use of public transportation.

LITERATURE REVIEW

According to TRCP/TRB[1], a transit agency's fare policy establishes the principles and objectives that guide the fare decisions. This policy can be affirmed through a declaration. If a formal declaration is made regarding the fare policy, it should present long-term goals and identify more specific short-term objectives, as well as specify the orientations or procedures to determine and implement changes in the fare structure or system.

Decision-making scenarios

A range of approaches are used to make specific planning decisions. Some agencies use a top-down approach, starting with the establishment (or reconsideration) of the policy objectives and then identify and assess potential technological and structural options referring to these objectives. Other agencies decide first on changes in technologies or equipment and then consider the fare structure that can be established to use the new equipment. In other cases, an entity reaches decisions on strategy, structure and technology, guided by a change in the system (e.g., introduction of a new mode of service or significant expansion of existing service).

A recent analysis of fare planning indicates that agencies' decisions reflect three factors:

1. Policy: The agency has established a set of goals and objectives and seeks a new fare structure, new fare technology, or both to address specific goals. These goals can be short term, such as surviving an immediate budgetary crisis, or long term, such as improving public mobility. The goals and the resulting strategies are usually agency-specific, but a growing number of regions are developing new technological and revenue-sharing approaches to facilitate regional coordination.

2. Technology: The agency has selected a new technology and develops a new fare structure to take advantage of the capabilities of this technology.

[1] TRCP Report 10 – Cooperative Research Program / TRB – Transportation Research Board.

3. Service: The agency is introducing a new mode of service (e.g., light rail) and needs new technology, a new fare structure, or both for the new mode, and possibly for the overall system.

The decisions reached and the questions involved can differ considerably in function of these factors.

The decision-making process differs considerably from agency to agency. The specific process is affected by the size and complexity of the system (e.g., number of different modes), the existence of a fare structure and system and institutional configuration (e.g., number and nature of entities and sources of financing and legal requirements), the governmental situation (including the size and type of policy, as well as the organization of the agency and its staff) and the nature of "external influences" (e.g., local interest groups, businesses and news reported in the media). The themes considered most important in reaching fare decisions also vary.

The process described in Figure 1 is an idealized decision-making process. Not all decisions will be reached by following every step of this process. The steps shown in Figure 1 generally follow a policy planning and service approach.

Depending on the scenario and decision reached, the agency can proceed with only some of these steps, and not necessarily in the order suggested in Figure 1. However, this process includes all the steps a transit agency probably will carry out.

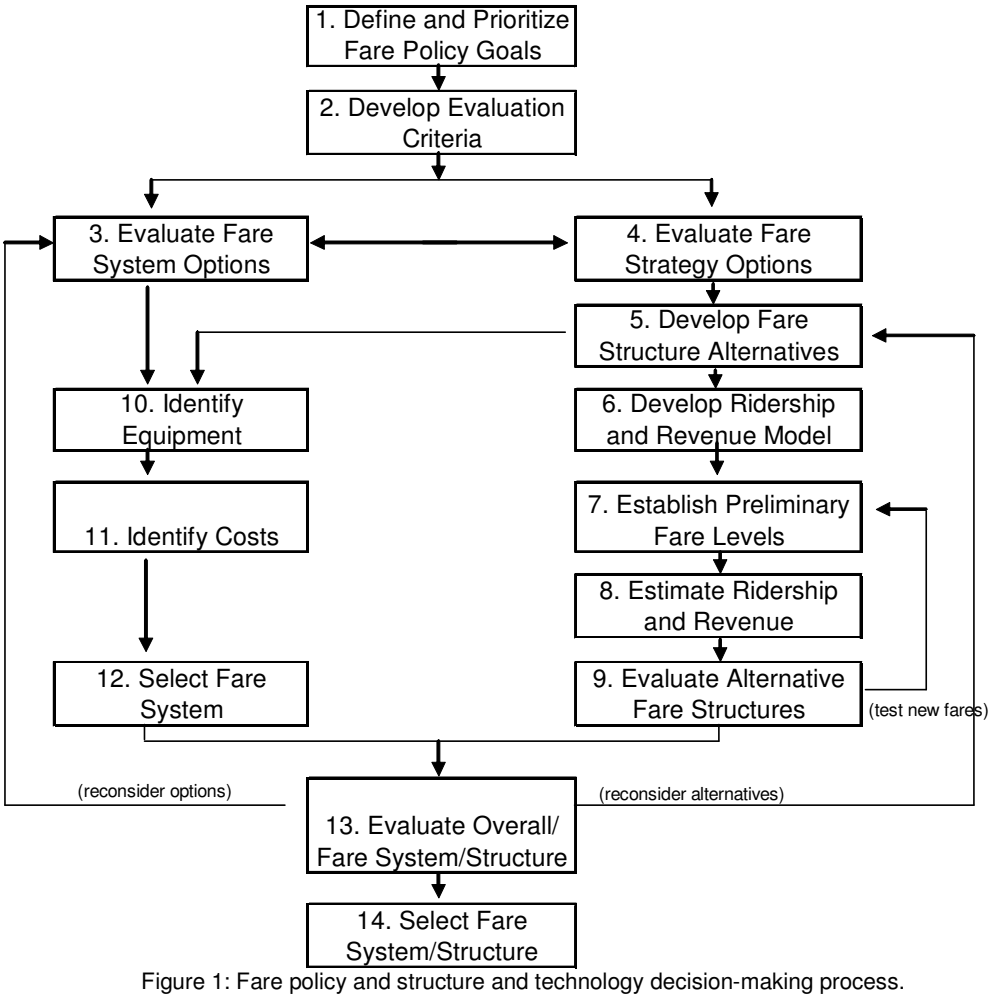

Figure 1: Fare policy and structure and technology decision-making process.

This study does not consist or develop the decision-making process presented in Figure 1. The reason is the need to determine the real objectives, targets and other definitions, which cannot always be assumed. It is up to the government, through its transport planning entities, to follow the flow chart presented in Figure 1 after carrying out a study like the one proposed here.

FARE POLICY

According to a study by the National Association of Urban Transport Companies of Brazil entitled “New Fare Policy Trends” (NTU, 2005), the fare structure is an important part of urban planning policies because it has direct effects on the socioeconomic condition of users, land use patters and the financial sustainability of transportation systems.

In formulating fare policies, three aspects must be considered (Figure 2):

4. Objectives: the results expected from applying the policy;

5. Fare structure: ways of charging for the services, involving the price level, fare collection strategies and payment options;

6. Payment technologies: tools (equipment, procedures and programs) used for sale of tickets and control of fare payment.

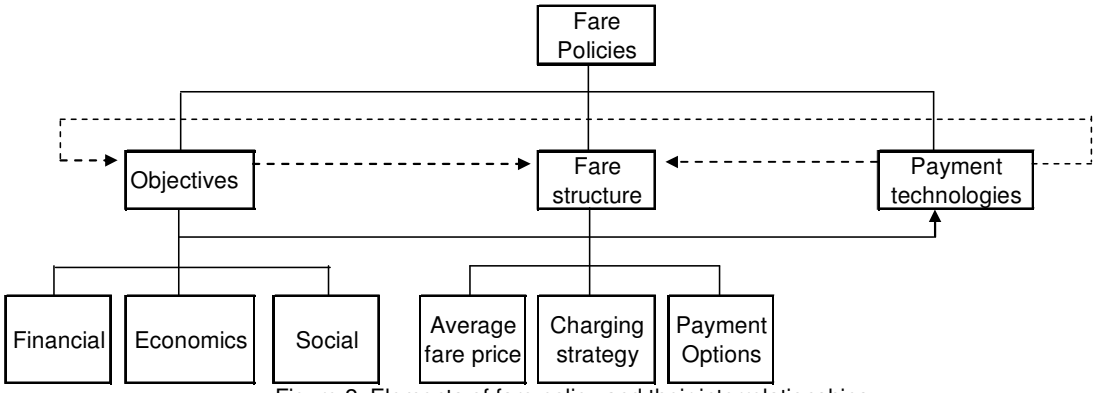

Figure 2: Elements of fare policy and their interrelationships

Objectives of Fare Policies

There are three basic objectives of fare policies:

1. Financial: to cover the cost of services;

2. Economic: to induce economically optimal user choices;

3. Social: to redistribute income and foster inclusion of less favored classes.

The existence of a mass transit system adequate to the characteristics of the population (in general and riders in particular) and the existing infrastructure is fundamental for the sustainable development of a local economy.

Fare Structure

According to the policy guidebook on fare structures from the Institute for Transport Studies, University of Leeds, available from the Knowledgebase on Sustainable Urban Land Use and Transport (KonSULT), fare structures are important policy instruments because of their potential impact on:

a) Efficiency: If a fare structure encourages transfers from cars, then it will affect traffic congestion and increase efficiency of labor markets due to increased access to jobs and possible reduction in unproductive travel time.

b) Livable streets: Reduced traffic levels make streets more livable.

c) Protection of the environment: Reduced levels of local traffic cut air and noise pollution, put less pressure on natural resources such as oil and green space and reduce greenhouse gas emissions.

d) Equity and social inclusion: Fare structures can impact the affordability of public transport and improve access to key goods and services by socially excluded and less well-off citizens.

e) Safety: Traveling by public transport is much safer than by car for passengers and also reduces the number of accidents suffered by pedestrians and cyclists.

f) Economic growth: If a fare structure encourages transfers from cars, then reduced traffic congestion can stimulate economic growth and improve access to jobs.

g) Finance: Fare structures can have a significant impact on revenues and also on costs because they can influence the level of capacity required.

The fare structure is composed of three elements, which together define the bases for charging for transportation services. They are:

- Average fare price: the method to determine fares and the procedures for their adjustments over time (in this work we do not consider this aspect).

- Charging strategy: falling basically into two categories – unified and diversified, in the latter case considering questions of integration, discounts and free passes.

- Payment options: conditions offered to users to pay fares (single ticket, prepaid electronic card, postpaid billing, etc.).

Charging strategies

The charging strategies are basically divided into two fare structure categories: unified and diversified.

A unified fare is a single price for any trip in a transportation network. A diversified fare structure means there are different prices depending on the type of user, quality of service, trip length and/or travel timing (peak/non-peak, etc.).

According to the American Transportation Research Board (TRB) and the National Association of Urban Transport Companies of Brazil, the different types of strategies can be summarized as follows:

- Flat fare: a single fare is charged for any trip within the transport network.

- Distance or zone: different fares are charged according to the distance traveled or number of zones covered.

- Market: the use of unlimited, weekly, monthly or annual passes, establishing a frequency of use.
- Time: the fare is different depending on the time of day (peak versus off-peak hours) or on weekends and holidays.
- Service: the fare is different depending on the type of transport utilized (such as bus or train) or according to the speed (normal versus express).

Table 1 shows the main advantages and disadvantages of each fare system, as pointed out by Pitcher (2003).

Table 1: Advantages and disadvantages of fare strategies

Fare Strategy Options		Advantages	Disadvantages
Flat Fare	**Flat Fare**	Esiest to understand	Places inquitable burden on those making short trips.
		Simpliest and least expensive to implement and administer	Increase will cause greatest loss of riders
		Lowest level of fare abuse	
Differentiated Fare	**Distance/ Zone-Based**	Should produce greatest revenue	Difficult to use
			Difficult to implement and administer;may require special equipment.
		Considered equitable; longer trip has higher cost.	Potentially high level of fare abuse.
			May be unpopular with users with long trips.
	Market-Based	Generally considered equitable;offers ability to pay less.	Generally produces least revenue.
		Can minimize ridership loss with fare increase.	Potentially high level of fare abuse
		Maximizes prepayment.	Requires extensive marketing to maximize ridership.
		Most convenient option.	Highest media production and distribution cost.
	Time-Based	Should increase ridership	Potential for conflicts with drivers
		Allows management of fleet usage through shift to off-peak.	Potential for fraud (agents on rail)
		Considered equitable; commuters pay more.	May require equipment modifications (or new equipment)
	Service-Based	Relatively easy to understand.	May be unpopular among users of higher cost service.
		Considered equitable; higher quality or higher priced service has higher cost	
		High revenue potential; low fare abuse	Complicates transfers (e.g, may require payment pf "upgrade" fare in transferring).
		Allows managment of fleet usage through shift between services.	

The fare structure also depends on the government policy concerning to discounts and free passes. According to Vuchic (2005) there are a number of variations on the basic types of fare structure are possible and are used frequently in conjunction with the conventional basic

fare systems already described. Such fares are used to achieve one or more of the following objectives:

- Attract additional passengers to increase mobility of population;
- Stimulate use of transportation facilities and increase revenue, particularly during hours of low transit system utilization;
- Favor a particular group of present or potential transit users, such as tourists or shoppers;
- Achieve specified social or economic goals; for example, provide a minimum level of mobility to some population segments, such as students, families, or the elderly;
- Change intermodal distribution of trips in favor of transit.

According to Vuchic (2005) the most common special fares and their characteristics are:

1) Fares for High-Quality Services

Transit services that offer higher-quality travel than regular lines, such as express trains or buses, lines with seated passengers only, vehicles with special amenities, etc., are usually operated with higher fares. Their fares reflect the higher value passengers get from using these services, as well as the higher cost of operations (more expensive vehicles, lower utilization when seats are guaranteed, etc.).

Two types of service and fare levels are sometimes used to meet different needs and preferences fo passengers. In intercity travel, it is common to have at least two classes: first and second on railways; first, business, and economy on airlines. Although far less common, two classes with different fares are also used on some transit systems. Regional rail systems in many cities have first and second class. Buses and minibuses often offer different levels of service. In many developing countries, buses may offer higher level-of-service than minibuses, which are overcrowded and often with low level of safety.

2) Child, Family and Student Fares

The reduced fares for children are provided on the basis of the following rationales:

- Raising the young is the responsibility not only of parents, but of the entire society (for the same reason public schools are supported by tax money rather than by tuition paid by the parents).
- The only travel alternatives for children are walking and bicycling (or being chauffeured), so that they are true transit-dependents.
- Attracting the young to transit creates a permanent habit for this mode of travel, securing long-term transit users.

Reduced family fares, usually made available for round trips made by several family members, are given for the same social reasons, as well as because travel by three to five family members paying full fares is so high that other modes, such as taxi, become

cheaper. Family fare thus attracts trips that would otherwise go to other modes. Given during off-peak periods, family fares are economically attractive to transit agency because they bring fare revenue without involving any measurable marginal operating cost. Another consideration is that the family fares are socially positive because they encourage family travel.

Student fares in the form of discounted tokens, fares, or passes are also commonly provided in many cities for students attending elementary and high schools, as well as colleges in the area. The rationale for these discounted fares is:

- Like raising children, education is a responsibility that is shared by society, rather than by parents only.
- Students, by and large, have no personal earnings.
- Students, making many trips, are even more transit-dependent than children, and attracting them to transit is likely to create future transit riders.

3) Fares for Senior Citizens and Disabled and Low-Income Persons

Senior Citizens usually enjoy drastically reduced and sometimes free fares on transit services, usually at all times except during peak-hour periods. The funding for this program, i.e., compensation of the expenses to the transit agency, is provided by the city or state governments from general or some special funds, such as sales, employer, tourist or other taxes, lottery revenues, etc.

Discounted or free fares for disabled persons has been one of the numerous measures introduced in many countries in recent years to provide this population group with basic mobility. The basis for these policies is well known and easy to understand: to assist their inclusion into mainstream society. The extensive measures that are legally required in most countries, such as to stations and transit vehicles are supplemented by lowered or eliminated fares as components of the same policy.

Low-income persons in some countries and cities get transit fares at reduced rate from their employers as part of their benefits or, if unemployed, from the city or the governments through programs similar to the ones for food stamps and other financial assistance. Sometimes various other public or private organizations provide assistance to get transit fares.

4) Night, Group, Family, and Other Special Fares.

Night (popularly know as “owl”) fares are charged for travel on owl services, i.e., those during the night hours, such as 11:00 P.M. to 6:00 A.M.They may be regular fares or higher, often double.

Group fares are necessary to attract travel by schoolchildren, excursion and tourist groups, sports teams or fans, etc. If reduced fares are not given to theses groups, they may charter a van or bus at lower price.

Shopper fares apply during off-peak hours for trips in the directions of shopper travel. This type of discount is given in order to give people a grater choice of shopping locations and to attract drivers from their automobiles.

As mentioned, most of these discounted fares are designed to shift discretionary travel from the peaks to off-peaks, when considerable capacity in transit vehicles can be used with negligible marginal operating cost, so that they usually bring revenues higher than marginal cost of providing the service.

It is important to mention that in some locations the city government or the country government establish laws that aims to help the employee bear the cost of transportation between home-work. Part of the cost of transportation is paid by the employer or government.

Payment options

A variety of payment options are available, the number of which has increased with advances in information technology. The most common options are:

1. Single ticket: This scheme entitles users to one trip or access to an integrated transport system. Generally the unit price is more expensive.

2. Multiple ticket: This scheme entitles users to several trips or accesses to an integrated system. The initial outlay is higher but the unit price is generally lower because of the number of rides acquired.

3. Time pass: This entails magnetic tickets or smart cards (with chips) allowing an unlimited number of trips within a defined period (month, week, day or number of hours). It can also consider complementary payment in case of transfer between transport modes (e.g., bus to subway) or trips between different areas of a greater metropolitan region.

4. Prepaid credit: In this case the smart card is loaded with a determined fare value and the fare is deducted from the balance each time it is used. The option is most suitable for system with differentiated fares.

5. Postpaid service: The use is monitored by a smart card and billed afterward through an account sent to the user's residence or office.

FARE SYSTEM OF SOME METROPOLITAN REGIONS OF NORTH AMERICA, SOUTH AMERICA, ASIA AND OCEANIA

The data for this study were obtained from a review of the literature, research of socioeconomic data and information on the mass transit systems in various locations.

In choosing the locations included in this study, we considered criteria related to the cultural, political and economic importance of each one in its wider region as well as the experience of the authors in some of the cities selected.

Characteristics of the metropolitan areas selected

For each location (metropolitan region) selected, we gathered the following data:

1. Population.
2. Area.
3. Demographic density.
4. Transportation system, including extension and number of passengers carried.
5. Fare integration (total, partial or none).
6. Predominant fare system.
7. Subsidy: Percentage that the government determines by law that the employer must shoulder the costs of the employee transportation home-work. We should stress the difficulty in finding this very specific data.
8. Free / Reduction: just present the direct reduction of the fare or if it is free.
9. Reduced Fare - 7-Day Pass: It is the percentage of the difference of the available pass (unlimited) and the pass calculated by multiplied the single fare to 14 (considering two trips per day). In table 3 it is indicated the percentage of the total fare reduction when using the available pass, instead of using single ticket.
10. Reduced Fare - 30-Day Pass: It is the percentage of the difference of the available pass (unlimited) and the pass calculated by multiplied the single fare to 44 (considering a month has 22 work days and most users commute to and from work each day, making two trips). In table 3 it is indicated the percentage of the total fare reduction when using the available pass, instead of using single ticket.

We chose metropolitan regions in developed and developing countries of North America, South America, Europe, Asia and Australia, namely: Federal District of Mexico (Mexico), New York-New Jersey Metropolitan Region (United States), Recife Metropolitan Region (Brazil), City of Santiago (Chile), São Paulo Metropolitan Region (Brazil), Brussels Capital

Region (Belgium), Greater London (England), City of Madrid (Spain), City of Moscow (Russia), Ile-de-France or Greater Paris (France), Porto Metropolitan Area (Portugal), Melbourne Metropolitan Area (Australia), Seoul Metropolitan Area (South Korea) and the City of Tokyo (Japan).

Obtaining Data

The data for this study were obtained from the operators annual reports and government reports.

The data related to the subsidy were obtained from the requests sent to the respective operators and urban public transport authority.

In relation to Recife and São Paulo cities, in Brazil there is a national law (Nº 7418, from December 16th, 1985) that says: *The employer will subsidize the employee transportation monthly expenses from home to work and vice-versa with a stipend equivalent to the portion that exceeds 6% (six percent) of his basic salary.*
So, to obtain the percentage showed in table 2 and 3, we calculated as follow:

Recife Metropolitan Area
Average income: R$ 1.361,17
R$ 1.361,17 * 0,06 = R$ 81,67

Basic fare = R$ 2,24
R$ 2,24 * 44 = R$ 98,56

R$ 98,56 - R$ 81,67 = R$ 16,89 --> 17%

São Paulo Metropolitan Area
Average income: R$ 1.789,02
R$ 1.789,02 * 0,06 = R$ 107,34

Basic fare = R$ 3,6
R$ 3,60 * 44 = R$ 158,40
R$ 158,40 - R$ 107,34 = R$ 51,06 --> 32%

Table 2 presents the characteristics of the metropolitan areas selected. We should mention the difficulty of standardizing the areas chosen for comparison and of harmonizing the political and urban divisions with the transport system.

Table 3 presents the reduced fare for each location and user when using the pass instead of single ticket.

Table 2: Characteristics of the metropolitan areas selected

Location	Area (km^2)	Pop. (mi) 2011	Demog. Density. (inhab/km^2)	Transp. System	Existing transport system		Fare integration ?	Predominant fare system	Subsidy (home-work)
					Ext. (km)	Nº. of passengers carried (year - million)			
Mexico City (DF)	1,479.0	8.8	5,950	Bus	3,519.7	419,3	None	Service	N.a.
				Subway	201.4	1,487.5			
				Trolleybus	453.1				
				LRT	n.d.	62,9			
New York - New Jersey Metropolitan Area	10,101.0	8.2	812	Bus	8,998.4	915,4	Partial	Flat Fare	0%
				Subway	368,0	1,640.4			
				Train	2,688.9	276.1			
				LRT	123.6	17.9			
Recife Metropolitan Area	2,768.0	3.6	1,300	Bus	n.d.	488.7	Total	Zona	17%
				Subway	39.5	76.0			
				Train	31.5	n.d.			
Santiago	876.8	4.6	5,246	Bus	n.d.	n.d.	Total	Flat Fare	0%
				Subway	103.6	639.9			
				Train	65.0	n.d.			
São Paulo Metropolitan Area	8,051.0	19.7	2,447	Bus	n.d.	3,384.0	Partial	Flat Fare	32%
				Subway [s]	65.3	811.7			
				Train	258.6	846.8			
Brussels Capital Region	161.4	1.1	6,815	Bus	360.9	91.9	Total	Flat Fare	0%
				Subway	39.9	125.8			
				Tram	255.7	112.1			
				Train	72.5	n.d.			
Greater London	1,579.0	8.2	5,193	Bus	n.d.	2,289.0	Total	Zone	0%
				Subway	402	1,107.0			
				Tram	28.0	27.9			
				DLR	34	78.0			
				Train	788.0	232.0			
Madrid	604.3	3.2	5,295	Bus	3,833.4	423.4	Total	Zone	0%
				Subway/VLT	220.0	1,500.0			
				Train	101,0	n.d.			
Moscow	1,081.0	11.5	10,638	Bus	15,044.1	2,348.3	Partial	Flat Fare	N.a.
				Subway	308.7	2,348.3			
				Trolleybus	940.6	465.5			
				Tram	415.1	275.0			
				Train	782.1	605.6			
Ile-de-France	12,012.0	11.7*	974	Train	1,525.0	1,138.0	Total	Zone	50%
				Subway	217.0	1,506.0			
				Tramway	42.0	108.0			
				Bus	24,661.0	956.0			
Porto Metropolitan Area	2,089.0	2.3	1,101	Bus	522.0	108.4	Total	Zone	0%
				Subway	67.0	55.7			
				Train	35.5	21.1			
Melbourne metropolitan Area	8,806.0	4.2	477	Bus	n.d.	106.1	Total	Zone	0%
				Tram	250.0	191.6			
				Train[s]	830.0	230.0			
Seoul Metropolitan Area	605.0	10.6	17,520	Bus	n.d.	1,699.0	Total	Distance	N.a.
				Subway	316.0	2,314.0			
				Train	246.0	704.5			
Tokyo City	621.5	9.0	14,481	Bus	781.5	201.2	Partial	Distance	N.a.
				Subway	301.3	3,146.6			
				Train	310.6	2,701.5			

*2009

Table 3: Percentage of reduced fare for each location and user.

Location	User	Free / Redution	Reduced Fare		Predominant fare system
			7-Day Pass	30-Day Pass	
Mexico City (DF)	Child	-	-	-	Service
	Teenager	-	-	-	
	Student	-	-	-	
	Adult	-	-	-	
	Elderly (+ 60 years old)	Free	-	-	
	People with disabilities	Free	-	-	
New York - New Jersey Metropolitan Area	Child	-	-	-	Flat Fare
	Teenager	-	-	-	
	Student	-	-	-	
	Adult	-	***	***	
	Elderly (+ 65 years old)	50.0%	-	-	
	People with disabilities	50.0%	-	-	
Recife Metropolitan Area	Child (até 6)	Free	-	-	Zone
	Teenager	-	-	-	
	Student	50.0%	-	-	
	Adult	17.0%	-	-	
	Elderly (+ 65 years old)	Free	-	-	
	People with disabilities	Free	-	-	
Santiago	Child	-	-	-	Flat Fare
	Teenager	-	-	-	
	Student	72.0%	-	-	
	Adult	-	-	-	
	Elderly	68.0%	-	-	
	People with disabilities	-	-	-	
São Paulo Metropolitan Area	Child	-	-	-	Flat Fare
	Teenager	-	-	-	
	Student	50.0%	-	-	
	Adult	32.0%	-	-	
	Elderly	Free	-	-	
	People with disabilities	Free	-	-	
Brussels Capital Region	Child (6-11)	-	-	-	Flat Fare
	Teenager (Students)*	-	-	71.4%	
	Student (12-24)	-	-	71.4%	
	Adult (18-64)	-	-	41.3%	
	Elderly (+ 65 years old)	Free	-	-	
	People with disabilities	-	-	-	
Greater London	Child (5-11)	-	75.7%	39.3%	Zone
	Teenager (16-18)	-	50.0%	50.0%	
	Student	-	30.0%	30.0%	
	Adult	-	51.5%	40.7%	
	Elderly (+ 60 years old)	Free	-	-	
	People with disabilities	Free	-	-	
Madrid	Child (menores que 4)	Free	-	-	Zone
	Teenager (4 - 23)	-	-	49.2%	
	Student	-	-	-	
	Adult	-	-	20.4%	
	Elderly	-	-	82.1%	
	People with disabilities	-	-	36.7% / 59.4% / 85.8% #	
Moscow	Child (under 7)	-	-	-	Flat Fare
	Teenager	-	-	-	
	Student	-	-	79.5%	
	Adult	-	-	27.9%	
	Elderly	Free	-	-	
	People with disabilities	-	-	-	
Ile-de-France	Child (4-10)**	50.0%	-	-	Zone
	Teenager	-	19.5%	15.9%	
	Student*	-	-	46.0%	
	Adult	50.0%	19.5%	15.9%	
	Elderly (+ 60 or 65 years old)	Free	-	-	
	People with disabilities	Free	-	-	

Table 3: Percentage of reduced fare for each location and user (Cont.)

Location	User	Free / Redution	Reduced Fare		Predominant fare system
			7-Day Pass	30-Day Pass	
Porto Metropolitan Area	Child (até 12)	-	-	55.5%	Zone
	Teenager (18-23)	-	-	55.5%	
	Student	-	-	55.5%	
	Adult	-	-	40.7%	
	Elderly (+ 65 years old)	-	-	55.5%	
	People with disabilities	-	-	-	
Melbourne Metropolitan Area	Child (0-3)	Free	-	-	Zone
	Teenager (4-16)	-	54.9%	50.8%	
	Student	-	54.9%	50.8%	
	Adult	-	41.4%	36.0%	
	Elderly (+60 years old)	Free	-	-	
	People with disabilities	Free	-	-	
Seoul Metropolitan Area	Child (6-12)	50.0%	-	-	Distance
	Teenager (13-18)	20.0%	-	-	
	Student	50.0%	-	-	
	Adult	-	****	****	
	Elderly (+65 years old)	Free	-	-	
	People with disabilities	-	-	-	
Tokyo city	Child (6-11)	50.0%	-	-	Distance
	Teenager	-	-	-	
	Student	-	-	-	
	Adult	-	***	***	
	Elderly (+65 years old)	Free	-	-	
	People with disabilities	-	-	-	

*Annual pass - Converted value per month (9 months).
** Just to 10 journeys pass and single trip origin - destination
*** The pass avaiable is more expensive than the respectivetly single ticket.
**** For tickets to trips within 10km in the subway (Seoul Metropolitan Rapid Transit Corporation)
# Three types of fare, for normal, joven and tercera edad users.

ANALYSIS

Some observations are possible from analysis of the data on each region chosen.

Comparison of the area covered and tracked transport systems shows that in 55,6% of the regions with area greater than 1,000 km^2 a tracked system (commuter train/trolley, subway and light rail transit – LRT) carries the most passengers. The only regions where tracked systems do not carry more passengers than other systems are in South America: the São Paulo and Recife Metropolitan Regions and in Europe: Greater London. In both, buses are responsible for carrying most of the passengers. For regions greater than 5,000 km^2, 75% have a tracked system that accounts for most passengers carried, except São Paulo.

Analysis of the regions by population shows that 87,5% of those with more than 5 million people have a subway covering more than 100 km. Only the São Paulo Metropolitan Region does not meet this criterion, while the Mexico Federal District, also in a developing country in Latin America, does have a subway extending more than 100 km.

Comparison of the population density and tracked network extension shows that the regions with more than 5,000 people/km^2 have a system covering more than 100 km and places with densities greater than 9,000 people/km^2 have a system extending more than 500 km.

With respect to fare integration and the fare system, the Federal District of Mexico is the only region that does not have fare integration, instead using a service-based system. All the regions in Europe (where a zone-based system predominates) have total fare integration. The places that have partial fare integration have a distance-based system (Tokyo) or a flat fare (São Paulo and New York-New Jersey).

In table 3 we can notice that in all locations selected there is a reduction of the fare for elderly people. In 71,4% of the locations the reduction is 100%, in the others there is just reductions that varies from 50% and 80%.

Looking at table 3 and 4 we can notice that the cities that doesn't have the subsidy presents indirect discount to the passenger by providing different payment options.

Comparing the subsidy with the variety of passes we can observe that the only location that presents a subsidy and the existence of passes is Ile-de-France. The other locations that have subsidy are located in developing countries, don't present variety of passes and a transportation network that involves all the existence systems.

As we compare the predominant fare system with the existence of reduced fare we can notice that 40% of the locations that present flat fare have reduced fare. Zone fare system usually present a lot of passes for different types of users, except for one location, the only one in a developing country.

In the distance fare system the existence pass is more expensive than how is calculated as already set in this study or the pass is the same price; however we can notice that the distance affects the journey.

Comparing the 30-day pass: 57.1% locations present more than 50% reduced fare for student and for adults there aren't reduced fare superior than 50%. The average reduced fare for adult is 31,8%.

Comparing the 7-day pass: 33.3% locations present more than 50% reduced fare for student and for adults occurs the same. The average reduced fare for adult is 37,5%.

In general, Latin American regions do not follow the concept of a transportation network encompassing all systems. Instead, the systems are independent, with occasional initiatives to integrate certain bus routes with subways or commuter trains, and there is not a single entity responsible for planning and operating the network and determining minimum service criteria. And so the aren't different types of payment options.

CONCLUSIONS

Among several findings the analysis of the fare systems of the regions shows that in developing countries there isn't a predominant fare system. Among developed countries, 67% of the metropolitan regions in Europe have a zone-based system. All the systems in

Asia charge fares based on distance. Of the 14 cities examined, 21% of them have direct subsidy, determined by law, to help with transportation costs home-work. The other 35% doesn't have reduced fare (7-day/30-day pass) and 43% of the cities have reduced fares and the discounts ranges from 20% to 80% on the purchase of transportation passes. Children, seniors and people with disability have discounts ranging from 50% to free in 93% of the selected cities.

The principal conclusion of this paper was to observe that in locations that don't present a connected transport network and fare system there isn't a variety of payment options and so, in some locations the government tries to "help" the users by creating a direct subsidy to the cost of the home-work transportation.

Only 14,3% of the locations that presents 30-day pass doesn't have tracked system as the system that carries more passengers per year. It is clear that the passes existence encourages the use of public transport network.

The payment options facilitate the use of the transport system and improve the clean use of the energy consumption. The different types of payment options encourage the use of the public transport by different type of users and for different purposes.

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