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Lina Shbeeb

Al-Ahliyya Amman University, shbeeb3@gmail.com

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A Review of Public Transport Service in Jordan: Challenges and Opportunities

مراجعة لقطاع النقل العام في الأردن: التحديات والفرص

Lina Shbeeb

Al-Ahliyya Amman University
shbeeb3@gmail.com

Abstract

Jordan's public transport (PT) system is characterized by low quality. Jordanian Citizens are reluctant to use the PT unless they have no other option. This paper aims to examine legislative framework for transport system and its effect on the system. It also aims to analyze factors affecting the sector and make suggestion to develop it. All legislations governing the system since the founding of the Kingdom of Jordan were reviewed including points of weakness in those legislations. Data on PT were collected locally and globally for comparison and were analyzed statistically. Results showed that PT vehicles/1000people in Jordan is low compared to international indicators (0.88 compared with 2.66); PT share is 33%; fare in Jordan is the lowest compared to 12 European cities (\$0.47 compared to 2.57). Fares in Jordan cover operation cost compared to nearly half of the cost in 56 cities. User satisfaction index did not exceed 60 percent and it is related to low service spatial coverage. Investment in transport is low; there is a need for innovative funding; engaging private sector, and developing the public transport system and legislation.

Keywords: Public transport vehicles/1000 people; Public transport share; transport fare; operating cost; satisfaction index; investment; financing

المخلص

تعاني منظومة النقل العام في الأردن من تدهور في مستويات الخدمة، وعزوف المواطنين عن استخدامها إلا المضطرين منهم. وتهدف هذه الورقة بحث الإطار التشريعي لنظام النقل وأثر ذلك على المنظومة، وتحليل واقع القطاع والعوامل المؤثرة به؛ لاقتراح سبل تطويره. تم تناول التشريعات الناظمة، منذ تأسيس المملكة، وبيان تطورها على مر السنين، ومواقع الضعف بها، وجمع بيانات عن النقل العام محليا وعالمياً؛ لمقارنة الأردن بها، وتحليل ذلك إحصائياً. بينت نتائج الدراسة انخفاض ملكية وسائط النقل بالنسبة لعدد 1000 مواطن، مقارنة بالمؤشرات الدولية (0.88 مقارنة بـ2.66)، وحصص النقل العام من الحركة 33%، كما أن أجور النقل في الأردن هي الأقل مقارنة بـ12 مدينة أوروبية (0.47 \$ مقارنة بـ2.57). فأجور النقل في الأردن تغطي كلف التشغيل مقارنة بـ48% معدل 56 مدينة، مؤشر الرضا لمستخدمي النقل لم يزد عن 60%، وهو مرتبط بالتغطية المكانية للخدمة، والاستثمار في النقل دون المؤمل، ولا بد من التفكير بطرق تمويل إبداعية وإشراك القطاع الخاص وتطوير النظام والتشريعات.

الكلمات المفتاحية: ملكية وسائط النقل بالنسبة لعدد 1000 مواطن، وحصص النقل العام من الحركة، وأجور النقل، وكلف التشغيل، ومؤشر الرضا، والاستثمار، والتمويل.

Introduction

Jordan's citizens lack the existence of an integrated and efficient public transport (PT) system. There is no time schedule for the service with a well-defined time for departing from terminal or arriving at bus stop. If there is a time schedule for the service, the operator does not stick to it. Quality of service provision depends on the mood of the provider in the absence of a clear framework, criteria, and key performance indicators for service quality standards that would facilitate monitoring the service. PT terminals in many provincial centers and districts do not exist, which would not facilitate supervision and enforcement mechanism. Transport service is still provided in traditional style, modern techniques are not integrated in the service. The use of electronic payment mechanisms is in minimal. Necessary Information on transportation service using modern technologies (phone, Internet, etc.) are not provided for the customers. PT vehicles do not provide adequate level of comfort and convenience as they lack required amenities (proper seats, windows curtain, and air-conditioning system). Elderly and the disabled person needs are not always taking into account when planning and running the service; very few of PT vehicles cater for

their needs. The operational life of the transport vehicle is above international norms. It is up to 20 years for large-buses, 15 for medium-bus, and 12 years for passenger cars. The major contributing factor to the present condition of PT service is the lack of interest in investing in the sector from the private or public sector, who believes that it is not a rewarding investment since the government is not providing incentives, necessary exemptions or subsidizing the service. There is no clear policy regarding the pricing and subsidizing the service to provide minimum frequencies that would improve the level of service.

Rural and urban communities with a low population density experience limited mobility. Their members conduct few trips outside their communities. This may attribute to limited ability to possess their own vehicles on one hand, and the poor service quality of PT on the other hand. The temporal coverage of the PT service in these areas is low, and normally does not exceed two trips a day (morning and evening trips). Poor land-use planning has resulted in spreading the communities following a strip manner around major highway. PT is regulated by providing lines serving each community to and from the district center, which prevents creating sufficient demand for PT. This constitutes a barrier to invest in such service due to

the expected low rate of return that would justify delivering acceptable satisfactory service quality.

Road accident statistics show a high involvement of PT vehicles in accidents in both urban and rural areas. The percentage of vehicles involved in accidents out of all vehicles registered as PT is 34% and 26% for large and medium buses respectively, while the ratio for small passenger cars does not exceed 15% (Public Security Directorate, 2014). The contributing factors for these accidents include poor mechanical conditions of vehicles and in some cases they should not be authorized to be on roads. In addition, long driving hours, the fleet management style and the absence of strict enforcement of legislation governs driver working hour are contributory factors.

Amman and the similar large cities, needs PT service characterized by high temporal and spatial coverage to satisfy the desire of its population for mobility. In fact, the poor coverage and deteriorated quality of service increased the dependency on private vehicles, where the number of registered vehicles is continuously increasing with time at high rate. This had led to traffic increase on the road network and the associated traffic jams and accidents, air and noise pollution, not to overlook the drain of scarce energy sources in Jordan. In Amman, transport and mobility master plan that was ended in 2008, which included nearly 10,000 families, indicated that only 13% (8% for taxi and 5% for bus) of daily trips are made by PT. The average monthly income for majority of PT users is below 400 dinars. The study also indicated that 65% of PT users' within the Greater Amman Municipality (GAM) do not have a private car (GAM, 2009). At the national level, Public Transport Regulatory Commission (PTRC) studies in 2009 showed that 85% of the PT users are captive riders and they are forced to the use of the service because they don't have a car. This proportion fell down to 75% in 2011 due to the poor PT service quality. The vast majority of people want to own their own vehicles regardless of their monthly income. A survey showed that 30% of households earning no more than 300 dinars want to own a car Instead of using PT (Tarwaneh, 2009). However, the need for regulated PT service is a necessary even though the continuous increase in car ownership levels. PT is not only a substitute for private car,

it is a part of the integrated transportation system. For example, 39% of trips in Vienna are made via PT, compared with 28% of trips made by small cars. The car ownership in Vienna is 380 vehicles per 1000 people in 2014 (Lukacsy and Fendt, 2015). The estimated car-ownership is 350 vehicles per 1000 citizens in Amman, which has similar to Vienna's level but PT share is only one-third of Vienna's

A high quality PT system that is sustainable, efficient and effective is a priority to meet the needs of the community members seeking to move quickly with fewer trips, minimum delay and low door-to-door travel time. This requires high coverage PT network that provides long service hours. A study aimed at identifying the impact of PT services on youth job opportunity for age group (15-24) including 460 subjects (males and females) was completed in 2014. The main problems facing the Future Youth Program Graduates employed in four regions in Jordan (Mafraq, Sahab, Al, Rusiefah and Al Shounah) were highlighted. The study showed that about (46%) young workers are using more than one mode of transport to go back home from their working locations, and (39%) use more than two-means of transport to access to their workplace (International Organization for youth, 2014). The study also showed that 30% of parents in surveyed areas don't allow their children to use PT. Furthermore, 78% of the graduate see the unavailability of transportation as an obstacle to access to work. The study also showed that the average round trip time is 115 minutes, the time it takes to get to and from the departure station is between 12 and 22 minutes in each direction. Thus, the number of hours dedicated to work is approximately 12 hours a day. The results also indicated that the daily cost of transport in the study areas had reached 1.9 JD (2.85 US\$), which implies that transport cost composes 23% of the monthly salary [on average, 202 JD (285US\$)]. The proportion of transportation cost of the monthly salary in Jordan is considered high when compared to other countries even the developed ones. In the United Kingdom, the transportation cost constituted 12% in urban areas and 15% in rural areas of the monthly salary (the British Office of national statistics, 2013) and about 18% in the United States of America (American Transportation Association, 2010).

Transport has a social dimension, it is supposed to provide mobility for all segments of society. It serves those who have the financial ability to own a car, but they are sometimes unable to use them due to age or physical capabilities. It is the right of every citizen to move regardless of his or her financial or physical capacities. In addition, some families in Jordan relies on transport as a source of income because of the substantial part of the transport system is based on individual ownership, which are often inherited.

The ratio of energy consumption in the transport sector of the total energy consumed in Jordan 46% (Department of statistics, 2015). A well-regulated PT system contributes to energy savings through reducing the reliance on small cars, thus, reflects positively on the environment and help in reducing the number of accidents due to the reduction the number of vehicles on roads. Studies in the United States revealed that improving PT strategies including land-use policy leads to greenhouse gas emissions reduction by 24% (American Transportation Association, 2010). The existence of a well-regulated PT is a means of alleviating congestion and the resulting costs. For example, Bangkok loses approximately one-third of the total gross product of the city as a result of transportation delays. In the United States, the estimated cost of congestion is \$ US160 billion by 2005 that corresponds to 6.9 billion delay hours. The studies indicate that annual increase of PT mileages by 27% during the years (1982-2005) have reduced the delay time by 3.33%, and time delay in 2005 by 2.4 US\$ billion (A&M Texas Transportation Institute, 2005). There is a global trend to reduce the dependence on private cars. The ratio of daily trips made by private cars is 11% in Hong Kong and 12% in Tokyo (Singapore Land Transport Authority, 2011).

Unfortunately, locally, the priority in planning and the implementation of projects remains for private car traffic. For example, the successive administration of believes that demand for transport can be met by increasing the road network capacity (add lanes, construct new roads and grade-separated junctions). This has led to increase demand; thus increases the levels of congestion. The people did not perceive the effectiveness of these measures. Providing an effective PT system was not as an alternative to providing

transport service. Nevertheless, some attempts were considered but they were not providing the required quality and extent.

Study Objectives

This paper aims to examine the conditions of the PT system in Jordan from different perspectives including, the legislation, regulation, and service attributes. Review of worldwide best practice, compare local conditions to international practices to provide a benchmark for improving the service and defining the problems facing the sectors, and suggest possible means and measures to address them.

Study Methodology

The research methodology for the study is completed by conducting a comprehensive literature review for previous studies and reports issued by land transport regulatory authority and other international institutions. The evolution of the legislation framework that governs PT system since the founding of Jordan is scrutinized to define the points of weaknesses that should be handled to improve the sector. Data on PT in Jordan and in many other countries from a number of reliable resources (World Health Organization, national statistics, etc.) were collected to enable the author to develop mathematical models to study factors affecting the quality of PT service and its implication on the customer of PT satisfaction index. Appropriate statistical methods and tools are adopted that suits the data under evaluation, including t-test for comparing means of two samples, F-test and ANOVA test for comparing the means of three samples or more, Chi-square test for contingency tables testing. The following variables are selected for the purpose of this study: Transport lines (type and province), a number of transport vehicles related to the population, PT model share, fare rate, fare-box recovery ratio and overall satisfaction index. The tested factors are: PT line type (intra and inter province), PT vehicle types

(Small car, medium-bus and large-bus), geographic location (province, country, and continent), and country income class (low, medium and high)

Analysis

The first part of analysis section will cover the legislation governing public transports in Jordan and the remaining parts will deal with the analysis of collected data and conducting necessary comparisons between Jordan and other countries as appropriate.

The legislative framework for public transport:

The first specific legislation to regulate transport in East Jordan Emirate "then" is the law of "road transport" (Law No. 116/1926). The law assigned the Commander of the Arab Army to set instructions including the control and regulation of public vehicles, the behavior of the owners and drivers. The commander of the province (province) at that time had right to issue or renew acquisition license or driving license in the province, as deemed appropriate. Subjected to the Governor approval, the municipal mayor should develop instructions for setting passenger transport tariff for using public vehicles within municipality boarder and he should determine the stops along the service line. Subsequently, amended law (No. 6) for road transport was issued in 1936. It mandated the commander of Arab Army, subjected to the Cabinet approval, to issue the necessary decrees that regulates granting vehicle acquisition licenses, sets rules for vehicle testing and specify the permitted number of passengers or weight of goods (permissible payload weight), the maximum fare that can be charged for passengers or cargo transport, regulating, restricting and controlling vehicle licensing and use of public or commercial vehicles operating in any area and delineate the routes that should be followed with an emphasis on making the necessary actions to ensure the safety and comfort of passengers on vehicle board. It also provided the opportunity to the Ministers of

Interior and defense together to form committees from time to time to develop instructions for road transport regulation that are issued by Arab Army Commander. The competent for issuing or renewing licenses for the acquisition or driving remained for the district Commander. In 1958 under law No. 49/1958, the competence to regulate passenger transport became the responsibility of the Ministry of the Interior through the following committees:

- Central Traffic Committee (CTC) chaired by Minister of the Interior or the Secretary-General on his/her behalf of and a membership of the directors of traffic department and vehicle and drivers ' licensing department; engineers representing the Ministry of the Public Works and the Ministry of the Interior (municipal and Rural Affairs department); and representatives from the Ministry of industry and trade, Ministry of transport, capital municipality and the syndicate of owners of cars and truck drivers ' Association.
- Traffic Sub-Committee (TSC): it is headed by the Governor and membership of the provincial directors of police and public work departments and delegates of the public transport Corporation and the municipal engineer.

Articles concerning the composition and authority of central traffic committees were included within traffic law No. 14/1984 where the membership was limited to representatives of government agencies. The representatives from the private sector was appointed by the Minister of interior for one year instead of union representatives. These committees had the right to issue instructions to regulate traffic and parking in municipal areas, to set a tariff of fares for public vehicles transport and to give PT permits within municipal boundaries and beyond. The STC recommends a set of appropriate decision to be approved and endorsed by CTC. There was no planning in the proper sense and the adopted decisions were not based on clear criteria. Both committees lack databases on the operating PT lines and the needs. Many permits were given to individual to meet the pressures of social or

political aspects. PT was seen as a mean for generating income for the needy.

For the operational part of the service, Company of Buses Union of Amman Municipality Cooperation Limited (CBUAMCL) had the entire responsibility associated with transport operation within the capital municipality under its concession law No. 36/1964. The company was considered decadent in 1975 when the public transport corporation was established by law No. 21/1975 (public transport Corporation Act of 1975). The law authorized the corporation for transporting passengers by bus exclusively within the territory of the region of Amman or any other area within Jordan. The corporation inherited passenger PT facilities that were owned previously by CBUAMCL based on its concession. Enterprise law was issued in its final form under law no. 19/1985. The public transport corporation was working as operator and has a supervisory role on some lines that were let to operate by the private sector. The authority of regulating the PT sector remained the responsibility of CTC and STC until the PTRC was found by temporary law (No. 48/2001). It was later replaced by law No. 39 of 2006 after making some modifications to the authority of PTRC to organize the sector through establishing policies for developing the PT service and network including the routes, stops and terminals. PTRC authority covers issuing license for operators, setting service fare rate and preparing necessary studies. The private sector was given the entire role for operating the service. At that time, PTRC inherited fragmented service that is provided by large number of individuals who claimed that they have grandfather rights for providing the service and they own a lifetime permit; a reality, PTRC had to deal with.

In 2007, Royal Decree was released approving the provisional law no. 51 of 2007 for regulating public passenger transportation within GAM. Some authority related to PT within the capital that is used to be under PTRC mandate was granted to GAM. This law empowers GAM to regulate and plan PT service, set the standards of service quality, set tariff as well as receiving requests for licensing operators and vehicles; and managing and supervise PT facilities and activities except facilities fall under PTRC authority are under GAM responsibility.

Later on, the provisional law was cancelled under article 22 of the public passenger transport Act No. 33 of 2010 when the "Land Transport Regulatory Commission LTRC" replaced "Public Transport Regulatory Authority". LTRC, in addition to PTRC mandate, has the authority to organize the transport of goods and rail transport per law no. 4/2011. LTRC has been also entrusted regulating tourism transport, which used to be under the authority of Ministry of tourism, as well as transport of private university and school students to avoid multiplicity of organizing passenger transport sector. However, LTRC has not been supplied with the required competent staff to carry out proper supervision and control of the sector. It also lack an integrated and up-to-date PT database on served or unserved areas, number of lines and patronage. The absence of clear policy and strategy for the sector to increase dependency on PT is a challenge LTRC has to face. In addition, there is no hierarchy for passenger transport service (national, provincial, and municipal levels or within cities). Under article 4 of the above law, LTRC or competent authorities issued licenses in form of contracts or agreements between the relevant authority and the licensee and in accordance with the principles approved by LTRC. No person shall engage in acts of PT without obtaining a license or authorization from LTRC or the competent authority, as appropriate. LTRC holds the supervision and control of land transportation through the division of work by region (excluding GAM area).

The role of municipalities was very modest. In principle, municipalities' laws did not cover PT sufficiently and this might be one of reasons behind the deterioration of PT service. Municipal law No. 115/1925 was issued one year before issuing road transport Act. It limits role of municipalities in article 4 to determine service tariff depending on necessity, to set the permitted payload and speed for cars and other modes of transport. The amended text of the Municipal law No. 29/1955 stated the role of municipality in establishing, defining, regulating and supervising the stops of PT vehicles within municipalities'. This role is one of 29 other roles considered to be the functions of the municipal councils. The case remained the same when the municipal law No. 14 was issued in February 2007. It pointed out that the municipal has the right

to receive a portion of the collected revenues from the transportation process within its borders including vehicle acquisition license fees or traffic violation. In 2015 the Municipal law No. 41 was issued and in article "5-A" municipal roles were defined, including PT, as follows: "to contribute to the development of PT networks within municipal boundaries, define and establish stops for transport vehicles, set, organize and assign routes, and participate in determining the amount of its tariff when appropriate within the municipality, by taking into account the provisions of other laws". It must be pointed out that there is a lack of clear vision defining the role of municipalities as regards transport (operation or infrastructure provider). In fact, municipalities are currently playing no role either in supervision or management of transport services except for GAM. It should be also noted that PT is not an essential element when setting up organizational plans and schemes of urban agglomerations, therefore, the needs of PT stops, routes and facilities complementary (Pedestrian and parking facilities) are not considered when setting the right of way for roads. This may be associated with the percentage of land allowed for expropriate without compensation for constructing new roads or expanding existing roads purposes (Expropriation Law No. 12 of 1984), which is up to a quarter of the land area. Other reasons may include the lack of allocated financial resources and lack of holistic and creative thinking for securing sufficient resources to provide proper infrastructure for transport services.

GAM did not have a significant role with regard to PT until early 1980s when the first terminal was established when GAM construct the Hashemite square, which was one of three major terminals (in the South, middle and North. The organization of PT within its borders became under their authority exclusively in 2007 and beyond. GAM has now a vision for transport organization by focusing on the development and improvement of mobility by improving PT, the provision of new mode of transportation (light rail lines or bus rapid frequency) and facilities for pedestrians rather than looking at improving traffic operation conditions by increasing the road network capacity.

Operational Conditions of the public transport sector:

The statistics of drivers and vehicle licensing department indicated that number of registered vehicles is 1,263,414 in 2013 (JTI, 2014). Public transport vehicles compose 3.5% of all registered vehicles, which is equivalent to 6.4 vehicles for each 1,000 people compared to 132 registered small car for every 1,000 people. Registered vehicle numbers have significantly increased over the past ten years. The growth rate during this period is about 8.6 %. It is higher than the growth rate in number of Latin America (Hidalgo and Huizenga, 2013). Figure 1 indicated that the number of vehicles is steadily increasing with time but the growth rate levels tend to negatively decline.

A mathematical model relating growth rate (dependent variable) and time (independent variable) is developed as follows:

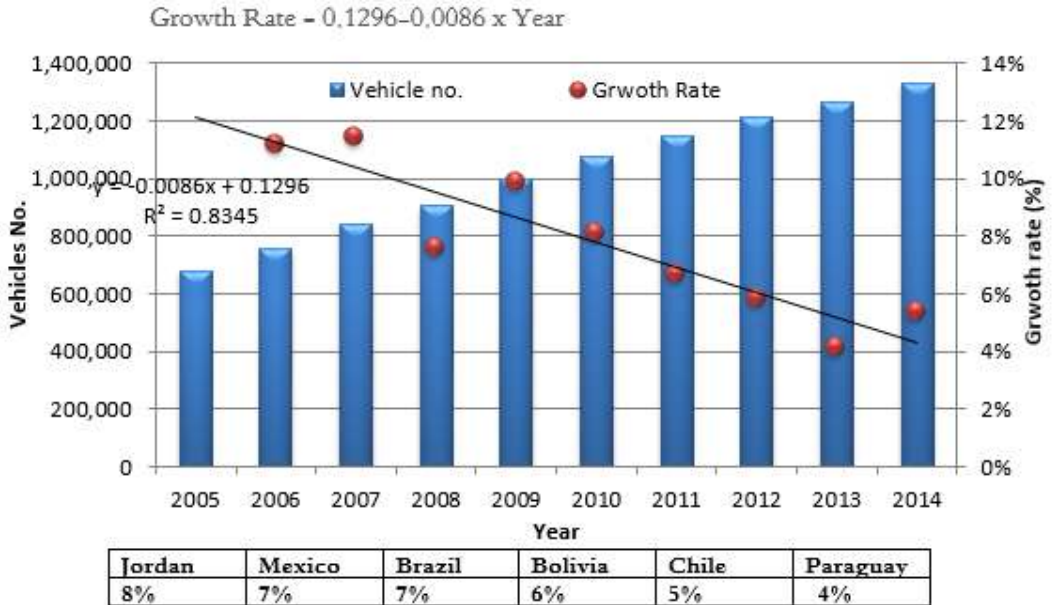


Figure 1 Registered Number of Vehicles in Jordan and the associated Growth Rates

The coefficient of determination = 0.834, which is statistically significant ($F = 35.3, p = 0.001$).

It is noted that the growth rate of PT vehicles during the period (2010-2013) reached 5.6%, whereas, it is 6.7% for registered private cars (Figure 2). The difference between the two rates is not statistically significant ($t = 1.82, p = 0.21$).

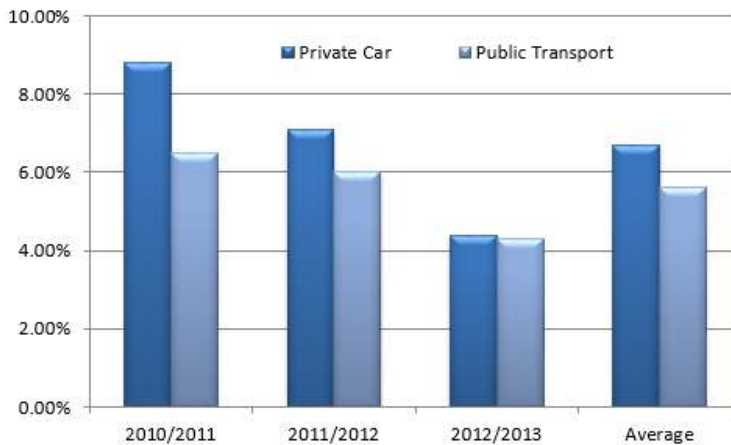


Figure 2 A comparison between the growth rates of the number of PT vehicles and small private passenger

Transport Routes (lines)

The registered PT vehicles (cars, medium-buses and large-buses) is 36,534 distributed as follows (LTRC, 2012):

- PT buses: 5,737 including (4,234) medium-bus and (1,503) large-bus
- Special service vehicles (leasing and tourism transport): 1,260 buses (402 medium-bus and 858 large-bus)
- Small class cars: 20,806 cars divided by taxi including limousine service (16,530) and shared taxi service (4,300) car and travelling across the border (1,100) car.
- Rent a Car service: 7492 car.

PT vehicles registered for the use on contract basis (Private schools, universities, etc.) are 10,386 buses. This number is twice the number of buses used for PT service with no contract. Almost half of them are used for transporting students in kindergartens and schools (5,492), and the buses used for transporting the employees of private companies are 4,162 buses.

PT consists of two main types: internal (intra provinces) and primary (inter provinces). There are 2,207 PT lines in the Kingdom (27% of them operates on primary lines while the rest operate on transport lines within provinces) distributed as follows (Table 1).

Number of buses that serve mass transportation divided by population does not exceed 0.88 vehicles per 1000 people. The author collects data on population, income level and number of buses (World Health Organization, 2013 and 2015). Bus ownership indicator (Registered buses in each country divided by its population). The indicators were grouped by income and geographic region (Figure 3). It shows that the ratio in Jordan amounts to only one-third of the global average (2.49 vehicles for every 1,000 people). It is also below average for low-income countries (0.99 vehicles per 1000 people). The analysis results showed that there is no statistical difference between the rates that can be attributed to income category ($F = 2.31, p = 0.103$) or the country location represented by its continent ($F = 0.25, p = 0.323$).

Table 1
PT Lines by Means of Transport and Province

Province	Lines No.	Vehicle Category		
		Small Car	Medium-Bus	Large-Bus
Amman	298	3257	340	524
Irbid	346	268	835	28
Balqa'	195	10	258	19
Karak	134	1	245	0
Ma'an	52	2	56	26
Zarqa'	221	91	558	23
Mafraq	126	16	203	9
Tafielah	66	0	82	0
Madaba	67	61	97	0
Jerash	46	14	85	0
Ajlun	36	0	58	1
Aqaba	15	0	41	11

Intra-Province	1602	3721	2858	639
Inter Province	605	572	1326	875
Total	2207	4293	4184	1514

Public transport share and mobility:

PT share is related to the availability of infrastructure facilities and means of transport, GAM study showed that the contribution of PT in the mobility is very limited. It is far below an overall rate, which is calculated on the basis of establishing database adopted from an independent information from previous studies (Singapore land Transport Authority, 2011 and 2014), (EPOMM, 2011).

As shown in Figure 4, the ratio was in Jordan is below overall average and constitute only 38% of the overall rate (34%). Nevertheless, there was no statistical difference between the PT share that might be attributable to income category ($F = 0.98, p = 0.3267$). Oppositely, there was a statistical significant difference in PT share due to geographic location "the continent" ($F= 4.01, p= 0.012$). The relationship between PT share and number of buses per 1,000 people suggests a positive relationship as follow:

PT share= $7.1326e^{0.5305 \times \text{No. of busses}/1,000 \text{ people}}$.

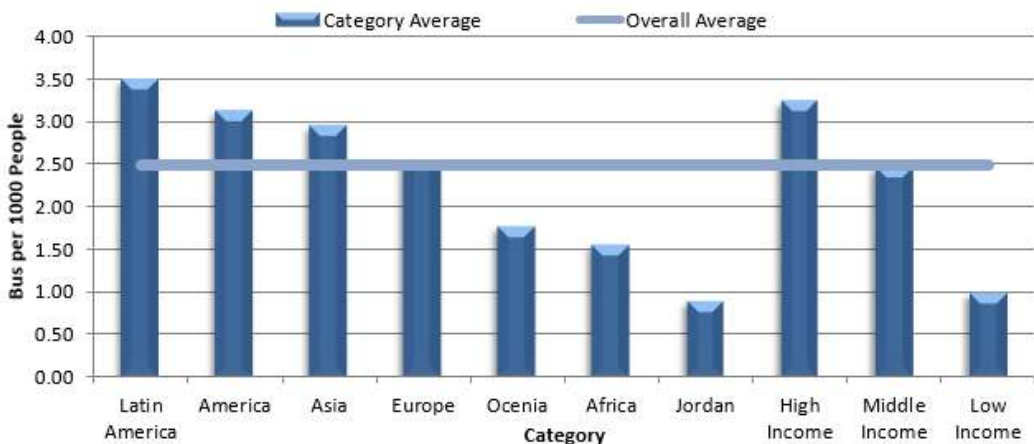


Figure 3 Number of Buses for every 1,000 People by the Country's Income and Geographic Location

(World Health Organization, 2013 and 2015)

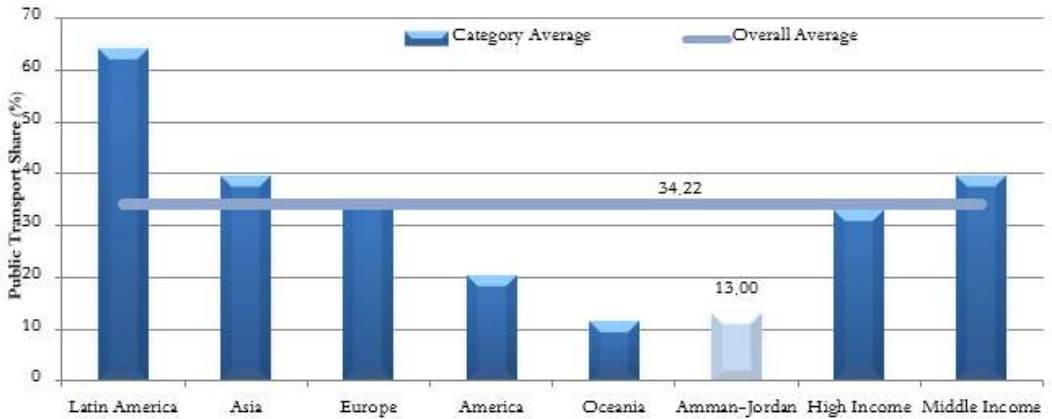


Figure 4 PT Share by the Country's Income and Geographic Location

This implies that the higher the number of registered buses for each 1,000 citizen is, the higher the share of PT is. Figure 5 shows that indicators of Jordan is located at the tail of such a relationship. The relationship is statistical significance (F = 8.63, P = 0.026).

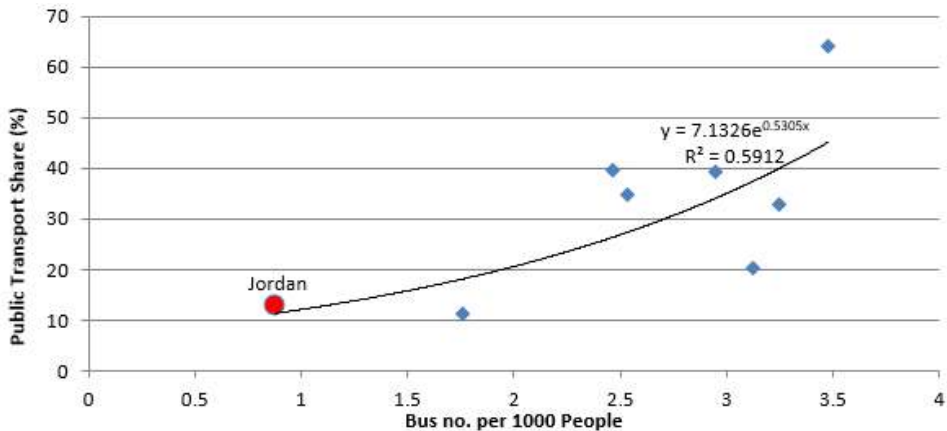


Figure 5 the Relationship between the PT Share and Buses per 1000 People

Public transport Fare Rate (Tariff):

Studies indicate that the PT fare rate per trip "single trip" in most urban areas in the world ranging from US \$ 2 to \$ 3 (Litman, 2014). A study in 12 European cities showed that the PT fare rate per trip is 2.36 euros (2.57 US\$), the highest fare was in Oslo/Norway 3.96 euros (4.3 US\$) and the lowest in Hamburg/Germany 1, 64 euros (1.8 US\$) (Danish Consumer Council

(2015). In Jordan, the national average fare rate per trip 0.33 dinars (0.47 US\$). PT fares by PT service type of PT and each type of PT vehicle types are presented in Table 2. The service pricing per LTRC is based on a formula that takes into consideration the operating costs and adding a marginal profit of 10%. Relationship between PT fare rates and type of service indicated that there is no statistical significant difference due to type of line (t = 0.38, P = 0.71) but there is a

significant difference in average fare attributed to the type of vehicle (means of transport) ($F = 5.81$, $p = 0.003$). Table 2 shows t-test results, which suggests that the fare rates of lines that form the entire network does not vary significantly by type of line or the type of PT means.

Figure 6 indicates a significant difference in fare rates from one province to another ($F = 10.42$, $p = 0.0001$). PT fare rate in Ma'an is the highest (512) files (724 ¢) and the lowest average rate is in Zarqa (251) files (354 ¢). The PT fare rate rates for the provinces that is higher than the national PT fare rate are reported for four provinces. In fact, the highest rates are in Ma'an and Mafraq, which may be attributed to their large area and low population. Study analysis indicates that the PT share in the provinces are not related to PT fare rate (correlation coefficient = 0.36 and statistical significance = 0.01).

Table 2 Transport Fare Rate by Transport line type and Means of Transport

Type of Line	Small Car			Medium-Bus			Large-Bus			Total		
	No. of Line	Fare Rate (fils)	STDEV (fils)	No. of Line	Fare Rate (fils)	STDEV (fils)	No. of Line	Fare Rate (fils)	STDEV (fils)	No. of Line	Fare Rate (fils)	STDEV (fils)
Intra-Provinces	70	311	139	1200	335	172	51	348	201	1321	334	172
Inter-Province	36	204	279	299	360	306	130	291	336	465	329	316
Total	106	205	203	1499	340	206	181	307	304	1786	333	219
Results of statistical tests	Intra-Provinces	Inter-Province	Small Car (shared Taxi)	Medium-Bus	Large-Bus	t-value	p-value					
X: variables that are tested for any difference in their rates	x	x	(x)			2.17	0.0356					
(x) category in question*	x	x		(x)		1.36	0.175					
	x	x			(x)	1.40	0.918					
		(x)		x	x	2.04	0.046					
	(x)			x	x	0.455	0.651					

STDEV: Standards Deviation * For example: for small car the difference between the fare rate due to line type (intra or inter province), t-vale is 2.17 and p-value= 0.0356

PT share =- 193.47 + 42.304ln (Fare rate)

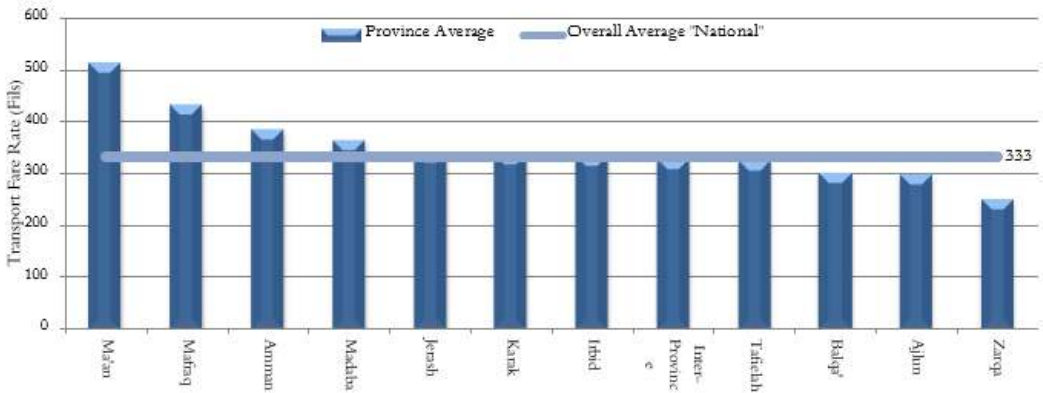


Figure 6 PT Fares Rate (fils) by Province

This might be due to the fact that most of the PT users in Jordan do not possess their own car and they are forced to use PT despite its cost (Figure 7).

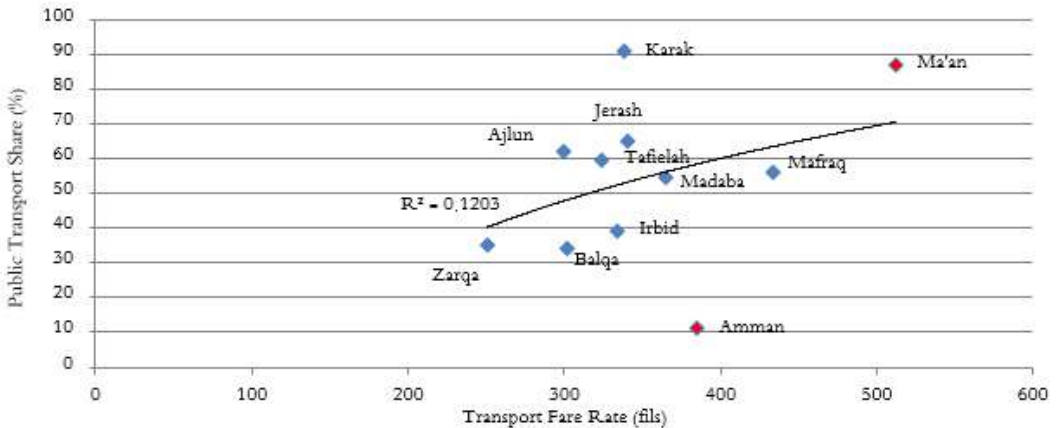


Figure 7 the Relationship between Transport Fares Rates of by Province (fils) - PT Share (%)

Fare Box Recovery Ratio (FBRR)

FBRR is one of the most important issues related to the economics of transport. It is computed by dividing the total collected fare revenues by its total operating expenses. Studies show that the collected revenues in Germany contribute to cover 77% of the operational costs. In medium-sized cities such as Vancouver, Canada it covers 42% while it is only 23% for Montpellier city, France (Wang, 2013).

The revenues in PT system of Jordan cover operational costs expenses and even more for some lines, where the operator is required to pay a concession fees as a return to LTRC. Data from 58 city from 14 countries in four continents, representing three variables [service pricing policy (travelled distance “mileage”, traffic zone or flat rate fare regardless of mileage or traverse zone), FBRR, and priced fares] were collected. For the purpose of this study, fare rates in the selected countries are divided into five categories and a relation-

ship between fare, FBRR and geographical locations represented at continental level is developed (Figure 8). The relationship seems positive (the higher the fare is, the higher the FBRR is). It varies from continent to another; such a trend is more pronounced for countries in Asia and to less extent in Oceania and America, where there is no clear trend that can be described. FBRR of PT systems Asian cities in Asia are highest (up to 131% on average), while cities in the Oceania is the lowest (32%). The statistical analysis re-

sults for the entire dataset failed to prove that there is significant difference in FBRR due to fare price ($F = 0.868$, $p = 0.489$). Similarly, the analysis by considering the location of selected cities in each continent separately, which indicate there is no significant difference in FBRR due to fare price ($[F = 2.49$, $p = 0.2413$ (Asia), $F = 0.0091$, $p = 0.992$ (Europe), $F = 1.94$, $p = 0.124$ (America) and $F = 0.76$, $p = 0.48$ (Oceania)] whereas, the FBRR differs significantly by continent where the selected city is located ($F = 39.40$, $p = 0.001$)

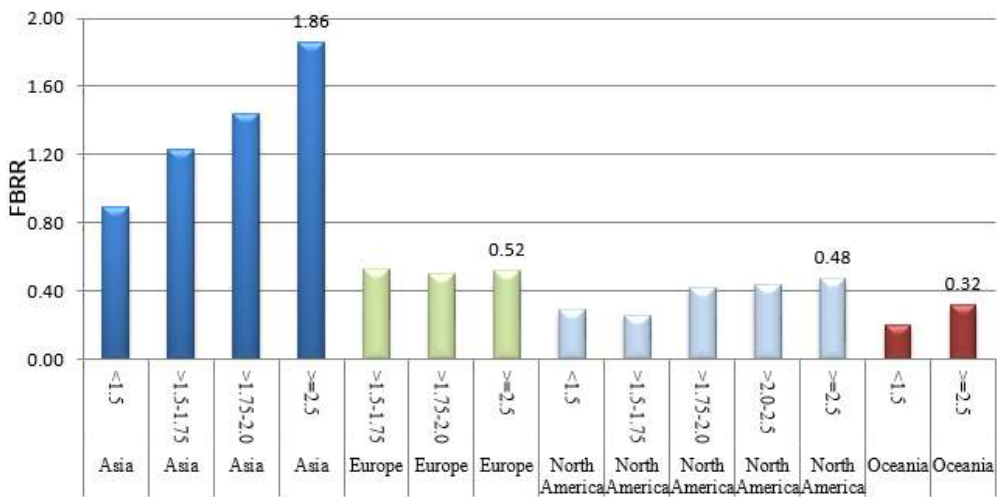


Figure 8 the Relationship between Transport Fare Rate Categories and Fare-Box Recovery Ratio for some Cities' in some Continent (Wikipedia, 2013)

Figure 9 shows that the collected revenues in Jordan cover the operating costs (FBRR of 1 including a marginal profit of 10%), which is higher than the ratios recorded in the selected cities in four continents except Asia that has an average FBRR of 1.31, despite the fact that average national fare rate in Jordan is low (0.47 dollars). It does not exceed a quarter of Asian cities PT fare rates, which have lowest fare rate among other continents. The cities included in this study follow three different policies for pricing PT fare: distance based; zone based or flat rate, which is the most common (32 out of 58 of the selected cities adopted this policy).

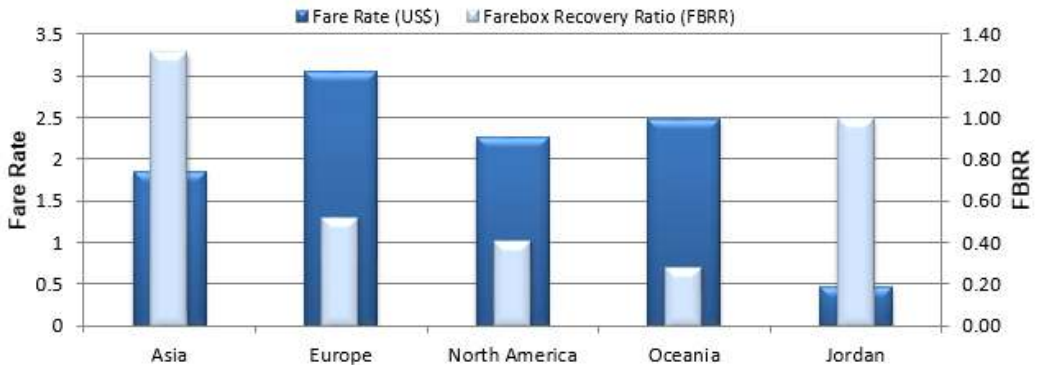


Figure 9 PT -FBRR for some the Cities Represented by their Continent Compared to Jordan

Figure 10 showed that the distance-based fare policy is associated with the lowest price of the service and it is the most effective policy to recover the operating cost expenses, whereas, the adoption of zone-based fare policy could generate what it is only equivalent to 45% of operational costs. The flat-fare policy is the worse in recovering the operating expense costs. Statistical analysis indicated that there is a significant difference between FBRR due to the selected pricing

to pay the fare for the entire length regardless of the actual distance they travelled along the line. The fare price in Jordan is quite low, yet, it is sufficient to cover operating expense with a profit, but at the expense of the quality of service as will be explained later.

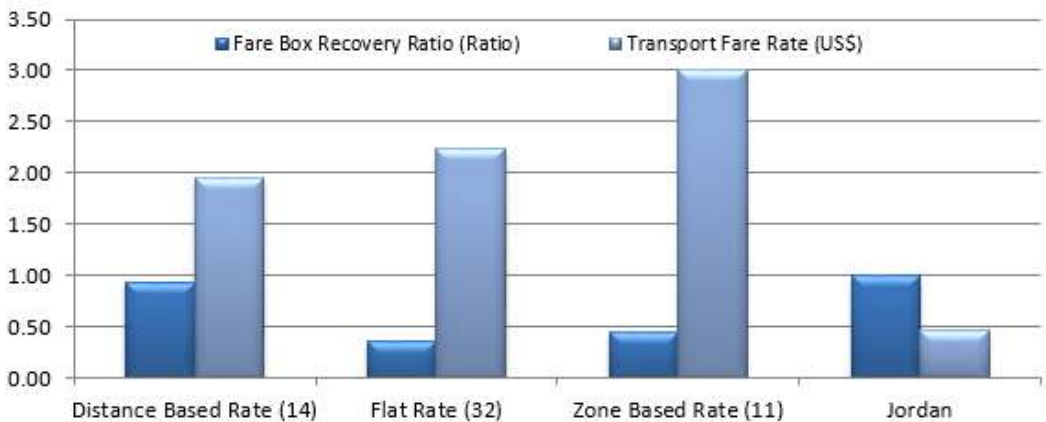


Figure 10 PT Fare Rate and the FBRR for some Cities by the Policy used for Setting Fare Rates.

policy ($F = 13.75, p = 0.001$).

In Jordan, service pricing adopts a modified version of distance-based fare policy. The fare is calculated for the entire length of service line; and the users' have

Public Transport's Customers satisfaction Index:

Jordan PT service attributes are reflected negatively

on the citizens' satisfaction of PT service. Periodic studies are undertaken by LTRC to assess the customer satisfaction about the provided service. Survey results of 2009 and 2011 showed that national satisfaction index rate in 2009 was 59% (A scale of 100 point), then it declined by nine points in 2011 to reach 50% (LTRC, 2009 and 2011). At province-level, a study show that there are decline in satisfaction indices for all provinces between 2009 and 2011, except Balqa province. The highest satisfaction indices were in Jerash and Amman in 2009, which were dropped significantly in 2011 by 18 and 17 points respectively (Figure 11).

The decline in the satisfaction was minimal in the provinces of Ma'an (1.7 point), Tafielah (2.4 point),

ceed 53%. However, the satisfaction index in London for the same share of PT is up to 80%. Transport services' satisfaction index is not related to PT's share of the societal mobility.

Regression analysis showed that satisfaction indices in different provinces are not related by PT share or by the fare because most users are captive riders (Table 3). The analysis results demonstrate that variables that are statistical significant related to customer satisfaction index are the number of service lines, number medium buses for every 1000 population, number of transport lines proportion of province area and the percentage of the lines in the province out of the national network while other variables were not significantly related to satisfaction index (transport

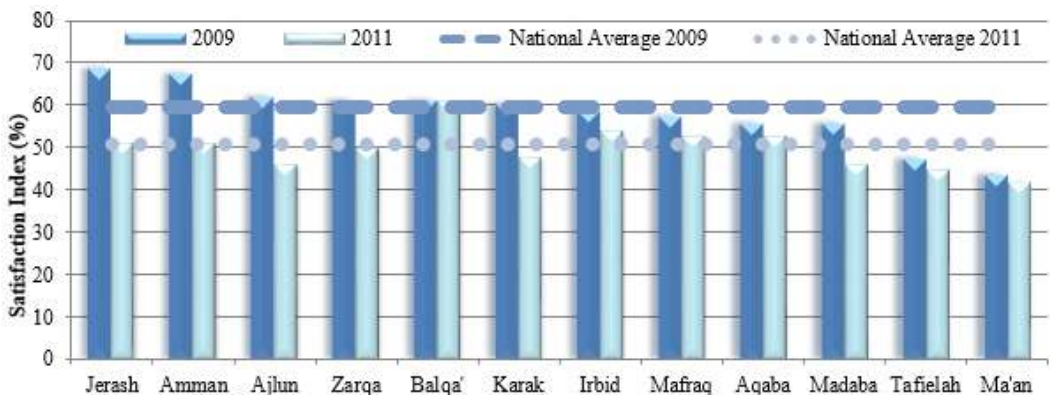


Figure 11 Satisfaction Index for Provinces in Jordan during the years 2009 and 2011 (LTRC, 2009 and 2011)

both provinces registered the lowest levels of satisfaction in 2009 (under 50%), both indices remained at the same level in the subsequent study. Similar satisfaction rates were stated by a study not issued or directed by LTRC included 376 people (191 male and 186 female) have showed that the overall satisfaction rate is 56% (Imam, 2014). The PT users' satisfaction in Jordan was compared to a number of countries in the world that performs periodic studies on PT. The level of satisfaction at the national level or in Amman are lowest and both are less than the average satisfaction in six European countries (Augustin, 2011) and (Vrenne, 2011) by 23 points (Figure 12). PT trips constitutes 33% of all trips made in Jordan; but, the population weighted satisfaction index did not ex-

ceed 53%. However, the satisfaction index in London for the same share of PT is up to 80%. Transport services' satisfaction index is not related to PT's share of the societal mobility.

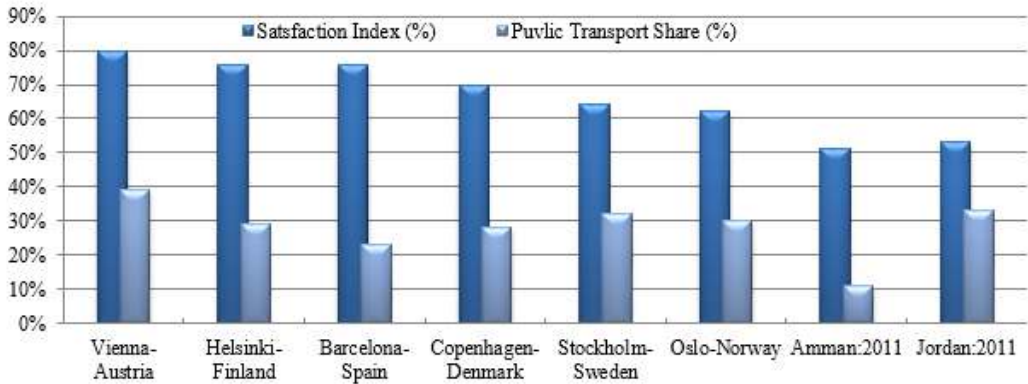


Figure 12 PT Share -Satisfaction Index in a number of European Cities compared to Jordan (2011)

Table 3 Regression Analysis Relating Satisfaction Index (Dependent Variable) and a set of Independent Variables Describing Province PT Attributes

Independent Variable (x)	Coefficient of Determination (R ²)	F-Value	Significant (p-value)	Formula
Fare Rate (fils)	0.138	1.44	0.261	59.84e ^{-0.0005x}
PT Share (%)	0.348	4.81	0.056	56.93e ^{-0.0026x}
Population Density people/km2)	0.293	3.73	0.086	46.53e ^{-0.0002x}
No. of transport lines/ Area (lines/km2)	0.448	7.29	0.024	45.58e ^{-0.0012x}
No. Medium-Bus	0.417	6.43	0.032	34.13x ^{0.072}
Province proportion of Transport lines (%)	0.415	6.38	0.032	61.92x ^{0.0837}
No. of Transport Lines	0.414	6.35	0.033	32.74x ^{0.0885}

Investment in public transport:

American Public transport Association states that every \$1 invested in PT generates \$4 in economic activity (American Public transport Association, 2010). The investment in PT sector in Jordan was limited. It did not exceed 80,000 JD (11,300 US\$) in 2008. Later, the investment was increased considerably following a Cabinet decision which gives incentives for individual operators to replace their vehicles after the end of their operational life (15 years for medium-bus and 20 large-buses). The investment in 2009 increased up to

27 million and then to rise to about 35 million in 2012. Nonetheless, the investment by companies enjoying financial and administrative capacity and expertise to ensure continuity in service delivery is extremely limited. Investors in the sector lacked experience, and many of them tumbled in their business; they face problems hindered them from providing proper service. According to the statistics, 82% of the operators are individual, who own medium size buses with low operating costs; hence, making it difficult to compete with what so-called investor operators who are required to operate the service and pay concession

fees to LTRC, which is reflected on the quality of the service Investors have to deal with low return of investment, because of limited revenues combine with inability to increase the fare due the limited income of the citizen and their dependency on PT. Apart from operating service on some lines, there is no real public-private-partnership in PT service including infrastructure projects (Transport terminal, major sub-stations and the associated investment (advertising services). Generated revenues of such projects may contribute in covering operation expenses to ensure better quality of service.

Government investment in infrastructure, which is financed mostly by the central budget, remains limited. The municipalities do not allocate resources within their budget for PT projects. The allocated capital expenditures did not exceed six million in 2012 compared only to 1.62 million in 2010. Around 120 million Jordanian Dinars (170 million US\$) were allocated during the period 2013-2016 from the Gulf Countries Council grant to cover the cost of improving transport facilities including terminal and bus stops, which are lacking in many provinces or in bad quality if available, and to finance the Bus Rapid Amman and Zarqa, which is the first to inter-urban exclusive bus lanes.. GAM, which is considered as a local government, borrowed a loan to finance the infrastructure of Amman Bus Rapid Transit. It tried to engage the private sector in constructing bus stops along on PT routes. These projects are not always going easy and facing many challenges. In fact, financing transport projects is a great challenge and there is a need to think about creative solutions. LTRC is managing PT service centrally to serve inter-urban mobility and urban mobility with a high level of coordination with municipalities in a model similar to transport administration in Colombia. But in Colombia, 30% of funding comes from the private sector and 10% of local governments and the rest from Central Government (Diaz and Bongardt, 2013).

Conclusions

Jordan PT system is facing many challenges such as

poor service quality and low dependency. In the capital Amman, 13% of the total trips are made by PT. The capital is the home of 40% of the country's population and 78 percent of registered vehicles in the Kingdom. At the level of the Kingdom, the dependency on PT is higher than Amman because of the low vehicle ownership outside the capital. The studies showed that 86% of PT users do not own private vehicle. PT vehicles are limited in number. There is only 0.88 vehicles per 1000 people, which is low when compared to the average ratio for middle-income countries (2.66 vehicles per 1000 people). PT system in Jordan composes of 2,207 service lines but they are not well structured with a low spatial and temporal coverage. This have lead in the emergence of the phenomenon of using unregulated private means for PT.

The number registered buses is 5,737 (74% medium-bus and 26% large-bus), which is half the number of registered transport vehicles for private use. PT vehicle standards are relatively satisfactory but vehicles have relatively high operating life (15 years for medium-bus and 20 years for large-bus). The standards do not provide a high level of comfort and convenience. The system lack standards with well-defined performance indicators, which is negatively reflected on service quality. Poor transport services impedes access to working place. New employees travel more than four hours at a cost constituted 23% of their modest income despite the fact that transport fare is relatively low transport (330 Jordan files per trip rate), which constitutes only 20% the PT fare rate in 12 European cities. The FBRR in 56 different world cities cover 48% of operational expenses' costs whereas the low fare rates in Jordan cover the full operating costs and even more because the operators of some lines are requested to pay annual concession fees.

PT satisfaction index is low and does not 60 on a scale of 100 points. One of the factors affecting customers' satisfaction is the number of lines per served area, which represents the spatial coverage of the service. Despite the low customer satisfaction, PT share at national level is relatively high when compared with a number of countries worldwide, which is due to the fact that users lack an alternative for mobility. Investment in the transport sector, whether from the public or private sector is limited, which is a major cause for

low service levels and associated satisfaction indicators.

Recommendations

The development of PT system is one objective within a set of societal objectives formulated for all sectors. It must be planned through far-reaching vision to achieve integrated transport system at state, region, province, and municipality levels. A set of goals and objectives must be formulated specifically to develop PT sector including: Provide transportation service as the main alternative of movement and mobility through increased use of PT in their mobility needs for all segment of society; Show the value through managing cost-effective transport process and creating public understanding of the benefits of PT; Achieving economic and financial viability through controlling the operating expenses, selecting the investments with greatest possible return, and distributing of revenues from the transport sector between regions and operators to cover operating cost and securing profit.

Improving PT services requires the translation of the goals and objectives into operational policies in several areas from planning and operation management, including developing legislations to regulate all aspects of transport sector, improving service standards and quality, providing well-regulated service with well-defined time tables including proper frequency and timing. In addition, improve the quality of infrastructure including, terminal, bus stops, providing exclusive bus lane service and consider mass transit project such as metro or light rail. Furthermore, secure sufficient support for PT either directly (cover the operation expense required to provide quality service including subsidizing the service if needed) or indirectly (reduction of customs and tax or limited-period exemption) is. It also includes encouraging partnership with the private sector to take over service provision through giving concessions or compromises gradually. The role of the municipalities shall be activated to improve PT within their territories.

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