

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****PUBLIC PERCEIVENESS AND POTENTIAL IMPLEMENTATION OF ROAD PRICING IN
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ABSTRACT

The growth rate in motor vehicle in Amman, the capital of Jordan, has been and is projected to vastly exceed the growth in new roads, causing traffic congestion, which is expected to rise even further over the next several decades. As a result, urban residents and commuters are confronting increasingly unbearable traffic conditions, a situation that will only get worse without radical reform. Among the many strategies that have been implemented to combat traffic congestion, road pricing and driver charging strategy is the one which has demonstrated a serious ability to make a lasting impression. This paper investigates public perceiveness of the road pricing strategy in an attempt to evaluate the acceptability and consequently the potential implementation of such a strategy on Amman's urban road network. Predesigned questionnaires were used to assess the level of acceptability of individual road users and public firms for introducing a road charging scheme on the use of congested roads. The results were encouraging and showed that almost half of the respondents support the implementation of such a scheme in order to combat traffic congestion.

KEYWORDS: Acceptability, Road Pricing, Traffic Congestion, Public Perceiveness, Traffic Demand, Jordan.**INTRODUCTION**

Traffic congestion is a problem not just for individual commuters as well as businesses. However, commuters' top concern is peak hour traffic while businesses are also concerned with the off-peak hour delivery of goods and hence their views on traffic congestion differ from those of commuters.

The impact of traffic congestion is significant. Using the earlier survey of Charlotte, North Carolina employers as a guide in designing the survey and the sampling process (Hartgen, 2007), a recent study identifies congestion as an issue of significant concern to many employers and quantifies the magnitude of this impact. The amount is significant, estimated to cost about \$5.3 B annually in shipping delays and \$76 B annually in employee day-to-day business travel delays. In addition, the study revealed that traffic congestion can be an important factor leading to a consideration to relocate where 38% of this consideration was "very influence" by traffic congestion. But, although employers do not view dealing with traffic congestion as one of their responsibilities, they do have some suggestions for its improvement and road pricing falls in this category (Hartgen, et al. 2012, Hartgen, et al. 2014).

The growth rate in motor vehicles in Amman, the capital of Jordan, has been and is projected to vastly exceed the growth in new roads. Among the many strategies that have been implemented to combat traffic congestion, road pricing and driver charging strategy is the one which has demonstrated a serious ability to make a lasting impression (Jadaan, et al., 2013).

The public's response to road pricing strategy in general has almost always been negative at the pre-implementation stage. However, this response tends to differ across time and was found to increase after experiencing the schemes in practice to the extent that a current scheme may gain support for further extension (Tretvik, 2003). Studies have also shown that the trucking industry and automobile associations have generally opposed road pricing, although this may change as urban congestion increases (Regan, 2000) (Walker, n.d.).

In Jordan, RP system was suggested to be implemented in “Al-Matar highway”. However no any details for the used methodology, and the price per kilometer were revealed (Addustour newspaper, 2013).

Acceptability of a road charging system is the first step for it to be implemented. Two surveys were carried out to investigate the acceptability of road pricing in Jordan; one referring to the general public and the other referring to firms.

METHODS

The acceptability of road pricing was studied in order to evaluate its potential application in Jordan. Data were collected through conducting two surveys using a predesigned questionnaire for each survey.

The first part of the questionnaire contained background questions about respondents concerning gender, age, level of education, occupation, income, holding of driving license, and owning a private car.

The second part deals with some general questions about the respondent’s opinion of the current traffic situation in Amman. Within the third part, questions related to the problem awareness were presented. The last part of the questionnaire focused on the reactions and opinions of the respondents towards road pricing and its implementation on Jordanian congested roads.

The first survey involved distributing questionnaires to a random sample of 500 from the general public. The sample size was selected by consulting the literature of similar studies and adopting the Hensher & Pucket approach(2008) using $\sigma= 11$ and 95% confidence level, resulting in a sample size of $n=464.83$. Accordingly, 500 questionnaires were distributed through various means including interviews, emails, and social media producing a 60% response rate with 300 responses.

The questionnaire prepared for the second survey was distributed among firms in Amman in order to investigate their acceptability of implementing road charges on congested roads. The first part of the questionnaire contained questions about the size and the activities of the fleet owned by the firm including the number of trucks and buses, number of trips, and the location of the delivery destination. The second part contained some details of the traffic congestion. The last part focused on the acceptability of implementing road pricing system among 35 firms in Amman.

The survey obtained the following information:

1. The level of awareness of the traffic congestion problem.
2. Perceived effectiveness of road pricing.
3. Acceptability of road pricing.

Problem awareness was measured using six questions regarding congestion .Responses were coded from 1-3 (no problem, minor problem, and serious problem). Perceived effectiveness was measured using 4 questions regarding, noise, air pollution and traffic safety, while acceptability was measured with a single question asking respondents to evaluate from 1-3 the decision to go ahead with implementing road pricing on congested roads in Amman.

3. Acceptability among the General Public

The general public sample characteristics are as follows: 75% male and 33% are between 18 and 23 years of age. The educational level of the respondents was 14% secondary school, 70% holding Bachelor degree and 16% are holders of a postgraduate degree. About 65% are drivers who own a private vehicle and 42% of those have had their driving license for more than 6 years. The income of 80% of the respondents is less than JD 600 (\$ 900). Only 3% of the respondents are unemployed.

The satisfaction level of traffic congestion as perceived by the respondents is shown in Table (1). It can be seen that 85% of respondents are not satisfied with the level of traffic congestion. This reflects the impression that the level of traffic congestion in Amman is worse than expected which highlights the need for a strategy to be implemented to combat traffic congestion.

Table 1 Responses to Traffic Congestion

Congestion problem	Measure	Satisfied	Moderate	Not satisfied
Range of satisfaction with the level of congestion	Frequency	10	36	254
	Percentage	3%	12%	85%

The traffic congestion encountered by drivers distributed according to the class of the road is shown in table (2). It can be seen that more than half of the respondents consider congestion a problem only on major roads, while 41% of them perceive traffic congestion as a problem on both major and minor roads.

Table 2 Perceivness of Traffic Congestion According to Class of Road

Type of Roads	Number of Respondents	Percentage
Major Roads	158	53%
Minor Roads	19	6%
Both (Major and Minor)	123	41%

Table 3 shows the level of traffic congestion as perceived by the respondents. The majority (62%) consider traffic congestion a serious problem while only 17% consider it a simple problem.

Table 3 Perceivness of the level of traffic congestion

Level of Traffic Congestion	Simple Problem	Medium Problem	Serious Problem
Frequency	52	63	185
Percentage	17%	21%	62%

The impact of traffic congestion was investigated considering its effect on travel time, delays and economic losses. The results shown in table (4) reveal that 47% of respondents consider traffic congestion has a great effect on delay and travel time. Regarding the effect on economic losses, 22% of respondents consider traffic congestion to have great effect and 31% consider it to have no effect. This may be due to the lack of awareness of the economic value of time among respondents.

Table 4 Effect of Traffic Congestion

	Measure	Great effect	Neutral	No effect
Delay and travel time	Frequency	142	135	23
	Percentage	47%	45%	8%
Economic Losses	Frequency	66	141	93
	Percentage	22%	47%	31%

Respondents were asked to select the most appropriate measure to alleviate traffic congestion. Table (5) shows the results where 62% of respondents consider improving public transport as the most appropriate while only 21% support road pricing as a most appropriate measure.

Table 5 Options to alleviate traffic congestion

Options to alleviate traffic congestion	No. of Respondents	%
Improving Public Transport	186	62%
Car Pooling	51	17%
Road Pricing	63	21%

This gives an indication that implementing road pricing in a small-scale will increase the acceptability of road pricing especially if the revenues were used to improve the public transportation. At a certain point of time this road pricing scheme could be stopped if the desired objectives were achieved.

The road user's perceivensess of the effect of road pricing on traffic and environmental issues was investigated including the effect on the level of traffic congestion, traffic safety, and air and noise pollution. The results are shown in table (6). It can be seen that those who consider that road pricing has a great or medium effect on traffic congestion constitutes 75% of the total. The same group constitutes 75% of the total regarding the effect on the level traffic safety and 78% regarding the effect on the level of air and noise pollution.

Table 6 Effect of RP on Congestion, Safety, Noise, and Air Pollution as Perceived by Respondents

	Measure	Great effect	Medium	No effect
Effect of RP on the Level of Traffic Congestion	Frequency	80	120	100
	Percentage	30%	40%	33%
Effect of RP on the Level of Traffic Safety	Frequency	97	129	74
	Percentage	32%	43%	25%
Effect of RP on the Level of Air and Noise Pollution	Frequency	109	126	65
	Percentage	36%	42%	22%

Regarding the acceptability of a road pricing scheme, table (7) shows that 42% of respondents consider road pricing an acceptable strategy to be alleviate traffic congestion on Jordanian road network while 45% do not accept implementing any form of scheme, and consider it as an additional form of tax.

Table 7 The Acceptability of Implementing Road Pricing

Level of Acceptability	Acceptable	Neutral	Not Acceptable
Frequency	126	39	135
%	42%	13%	45%

4. Acceptability among Firms

The characteristics of the studied firms shows that the majority (66%) have a fleet of less than 20 vehicles, and only 3% of them have more than 50 vehicles. The travel characteristics of the studied companies show that 69% of them have delivery stations that require driving on congested roads, 34% of these companies make less than 10 trips per day, 29% make less than 20 trips, whereas 17% make over 50 trips per day.

The analysis shows that 51% of trucks encounter traffic congestion on major roads, 17% on minor roads, and 31% encounter traffic congestion everywhere. This indicates that traffic congestion is mainly concentrated on major roads which support the potential strategy of road pricing on major roads.

Investigation into the satisfaction of firms from the level of traffic congestion reveals that 91% of respondents are not satisfied with this level while only 9% are satisfied as shown in Table (8).

Table 8 Satisfaction of the Level of Traffic Congestion

Level of satisfaction	Very Satisfied	Satisfied	Not Satisfied
Frequency	1	2	32
Percentage	3%	6%	91%

Regarding the firms' acceptability of implementing road pricing on Jordanian road network, table (9) shows that 54% of the responding firms refuse applying any form of road pricing scheme while only 29% accept implementing such a strategy.

Table9 Firms' Level of Acceptability of Road Pricing

The Level of Acceptability	Acceptable	Neutral	Not Acceptable
Frequency	10	6	19
Percentage	29%	17%	54%

It is interesting to note that while the majority of the responding firms admit that there is a high level of traffic congestion that causes delay to the extent that it affects the punctuality of their delivery, more than half of these firms do not accept imposing road charges to relief this congestion and would change their schedules of delivery in order to avoid paying charges.

CONCLUSION

This paper investigates the perceivness of road users of the magnitude and impact of traffic congestion on Jordanian urban road network and acceptability of implementing road pricing strategy to alleviate this problem. The study included the general public and selected firms.

The results of data analysis revealed that the majority of respondents from the general public (83%) and the responding firms (91%) admit the seriousness of traffic congestion on major roads. However, only 45% of respondents from general public and 54% of the firms consider implementation of road pricing strategy not acceptable as they all consider it an additional tax and a travel constraint. As an alternative to paying road charges, the majority of respondents support the provision of a high quality efficient public transportation system.

It is realized that road pricing alone will not solve all the urban problem and should viewed as a part of a broad suit of measures designed to achieve a sustainable transportation system.

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