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INVESTIGATING WILLINGNESS TO PAY FOR CONGESTION PRICING IN PESHAWAR UNIVERSITY CAMPUS

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Abstract: *Congested road is a perfect example of tragedy of the commons as there is no restriction for drivers not to exploit it. Car users are independent in their traveling decisions but their decisions have negative consequences for others for which they do not pay rather the non-users pay for them in the form of hard cash, inconvenience and lack of safety. This unwanted but widely practiced phenomena has over-shadowed the livable environment even in universities all across Pakistan particularly in Peshawar university campus (case study) where the environment is exacerbated by minimum personalized vehicle holders for the maximum non-car commuters resulting from the free vehicular entrance and biased provision of infrastructure. This leads to huge social divide, inequality and gender disparity. In addition to finding appropriate rent for provision of new equitable, environment and gender friendly modes of transport like rental bikes and golf carts, Willingness to pay for congestion pricing as proposed solution is investigated through online web-based questionnaire survey from 580 respondents and statistical analysis is used for selecting most feasible mode(s) of alternate in-campus transportation. Results showed that 67.6% respondents were WTP for congestion charging and 55.3% selected golf carts as their preferred mode in campus followed by rental bike with 27.6%. Appropriate rent chosen for golf cart was PKR 20 and less than PKR 20 for rental bikes by more than half of the respondents. Congestion pricing was perceived as effective solution and proposed modes were opted as the preferred modes for traveling in campus.*

Keywords*: willingness to pay, congestion pricing, stated preference surveys, discrete choice experiment, and road infrastructure*

I. INTRODUCTION AND BACKGROUND

Transportation system and road network acts like skeleton of the city. That is why efficient and sustainable transportation supplemented by well-conditioned and well-connected road network should be among the foremost priorities of the governments. This is also because, problems related to transportation including road condition, related infrastructure, traffic safety, vehicular speed and congestion continued to persist in most of the countries. This alarming situation holds several reasons. Rapid population growth, increased car ownership rate, distant residences and jobs, poor governance and lack of efficient and sustainable public transportation in most of cities are among few of the reasons. [1, 2]

Basic elements of transportation system like road needs to be specially designed, maintained and monitored in terms of its capacity and potential. Otherwise, it can result into a number of problems including the most visible and noticeable, traffic congestion and poor road condition. Additionally, congestion leads to external costs like environmental consequences in the form of air and noise pollution, material damages and injuries in the form of accidents, excess in travel time and reduction in property values [3-5] especially in peak hours in urban areas where there is high population density and high personalized vehicle ownership rate [6, 7]. For instance overall in European cities, the negative consequences of these externalities result in economic loss of 100 billion € per year, corresponding to about 1% of the EU's GDP [8].

A. CONGESTION PRICING

Travelers make travel decisions according to their best choice and they are independent in their decisions but their decisions have consequences for others as well. When they drive cars, they contribute in road damage, infrastructure loses, create noise and vibration, cause delays and traffic congestion. The impacts of congestion do not result only in the form of delays causing time wastage and economic losses but also severe environmental degradation. For instance, in U.K contribution of road traffic in the overall level of CO, CO_2 and NO_X gas is 90%, 20% and 49% respectively [9]. In such scenario, their decisions impose costs on non-car users for which they are not responsible and have no input in creating damages to public goods and environment that is for all. In most cases and systems this external cost is not paid by the car users. Congestion pricing is one of the way to include such costs [10].

Therefore economists, in effort to get relief from the worsening congestion and to finance the road infrastructure give the second best option, congestion pricing, road tolling or congestion charging where road users have to pay some amount for using the roads with different mechanisms that serve a number of objectives like congestion relief, revenue growth that may finance road infrastructure, reduction in air pollution and greenhouse gases, equity and social inclusion [9, 11-14].

II. RESEARCH PROBLEM AND METHODOLOGY

In Peshawar University campus which acts as educational hub, can be called as knowledge mini-city, the environment is exacerbated by the minimum personalized vehicle holders for the maximum non-car commuters. All the infrastructure is supporting the car owners while there is majority of pedestrians. Everybody else is paying for car owners but car owners do not pay for them. Car owners not only become security risk but also putting the lives of vulnerable school kids and pedestrians in danger. It has also made the environment hostile for kids. In spite of supporting and facilitating the most environmental friendly mode users and pedestrians an incentive is provided in the form of free vehicular entrance to car owners that will resultantly encourage more and more people to take the car and aggravate the livable environment for residents.

Figure 1: Free vehicular entrance to university campus Peshawar causing difficulty in pedestrian movement

In this research willingness to pay for congestion pricing and appropriate rent for the introduction of new environment and gender friendly transportation modes like golf carts and rental bikes as proposed solutions is investigated through online web-based questionnaire as stated preference survey from 580 respondents and statistical analysis is used for selecting most feasible mode(s) of alternate in-campus transportation. The questionnaire consisted of socio-economic section, willingness to pay section and some questions regarding the travel pattern and transportation problems in campus. The discrete choice experiment was framed in most of scenarios.

III. LITERATURE REVIEW

Congestion charging in spite of facing too much opposition, is adopted by many cities and delivered fruitful results. The increment in acceptability of congestion pricing is rising day by day. Road pricing is now practiced worldwide. Many cities have adopted this as traffic demand management tool. The first road pricing scheme was adopted by Singapore in 1975, followed by Bergen in 1986, Oslo in 1990, Trondheim in 1991, London in 2003 and Stockholm in 2007 [15]. The importance of congestion charging schemes is rising day by day as because of its fruitful and durable results. For instance, for the last few years in U.S. 35 of 50 states are opting for congestion charging schemes. In some states they are in planning and in some states in implementing stages [16]. Road pricing is not only opted by European countries but it has been considered as effective tool elsewhere in the world as well. For example in Australia, New Zealand, proposal in South Africa, city of Caracus, venezeula, Santiago, Singapore, an attempt by Kuala Lampur in Malaysia and Bangkok in Thailand. Road pricing is progressive in countries like Thailand, Malaysia, China, Taiwan and Philiphines and implemented in Tokyo (Japan) [9].

There are several variables that affect acceptability of congestion charging for instance WTP is directly related to income. It increases with increase in income [1, 5, 17]. Significant changes in puplic attitude towards congestion pricing were observed in case of Oslo toll ring because of the increment in the level of trust and fairness as it became more obvious and public perception that the collected revenue is invested directly on road infrastructure [17]. In an effort to investigate determinants of private car users' acceptance for road pricing in Sweden, infringement on personal freedom particularly in low income car owners and perceived fairness in system were the major reasons behind the rejection of road pricing [12]. Similarly in an effort to investigate reactions of the Lyon (France) public to the introduction of

hypothetical road pricing there were varied responses towards road pricing but overall infringement on freedom while using private cars should be compensated with clear alternative modes and fairness in the use of the collected revenue and the effectiveness need to be well communicated to the public [18].

Specification of collected revenue use also plays a key role in acceptibility of congestion pricing for instance the mean acceptability was 35% in different 32 cases where no use of the revenue collection was shown but it was 55% in different 19 cases where the use of the collected revenue from congestion pricing was mentioned [19]. It is also concluded from a survey in Athen while modelling public acceptability that socioeconomic characteristics, use of the collected revenue from congestion charging schemes and expected consequences of congestion pricing scheme do influence public acceptability [19]. Acceptability of congestion pricing found to be higher if collected revenue is used in transport system rather than as public funds while investigating impacts of revenue use on acceptability of congestion pricing [20].

Acceptability got increased with the level of information and expected incentives of the proposed project if delivered and communicated respectively. The reasons behind comparatively high acceptability in Vienna include direct investment of collected revenue on transport infrastructure, distance based charging system and timely communication of forecasted benefits and effectiveness [21]. Road pricing need comprehensive set of enactment factors and most importantly political and public support while ignoring dissemination of information about the scheme and publicity strategies can act as hindrances in successful execution of the schemes [22, 23]. However acceptability of congestion pricing is related to expected advantages, existence of substitute transportation modes, amount of charges, allocation of collected revenue, dissemination of information regarding the scheme, compensation mechanism for the most affected people and equity effects [24].

IV. RESULTS

As this study was conducted in university campus therefore majority of respondents were students that is 82.8% and 12.9% were external visitors. The rest of respondents include faculty members and administration staff etc. 96.9% respondents were in the age of 20-40 years and 24.3% were females while 75.7% were males. 89.5% were single while 10% of respondents were married. 73.9% respondents' household size was 6-9 and less than it. Since this was a university level that is why 75.9% of the respondents were enrolled in bachelors. There were 44.3% respondents whose monthly income was in between PKR 18,000-50,000 and less than it and 30.5% with income in between PKR 50,000-100,000.

The research investigated WTP for congestion charges and 67.6% of the respondents were willing to pay for congestion charges while 29.7% were not WTP. So far the appropriate rent for introducing new transport services is concerned, 53.3% of the respondents felt the appropriate rent for golf cart should be less than PKR 20 while 35.3% and 10.7% felt it to be in between PKR 20-40 and PKR 40-60 respectively. Similarly for rental bikes 64.7% felt appropriate rent should be less than PKR 20 while 27.9% and 6.6% felt it to be in between PKR 20-40 and PKR 40-60 respectively. In response to the question for the preferred mode of transportation in campus in given options of bus/van, taxi/rickshaw, golf cart and rental bike 55.3% of respondents preferred golf carts for traveling in campus while 27.6% favored rental bikes. Bus/van was preferred by 12.1% while taxi/rickshaw was preferred by 5% of the total respondents.

V. CONCLUSION AND RECOMMENDATIONS

It is concluded from the survey results that congestion is a serious problem in campus and people want to get rid of this worsen condition that is why overall people are willing to pay for congestion pricing. This also proves that congestion pricing is perceived as effective solution for congestion reduction. Less than one third of the respondents were not willing to pay for congestion charges. Most of them were considering it to be unfair and infringement on their freedom. This was also financially unaffordable and difficult for them to change the mode. Income is also one of the reason for rejection of congestion pricing because more than half of the respondents who denied congestion pricing were having less than PKR one lac total monthly income. New transport services were accepted as preferred modes of transportation in campus. Majority of respondents accepted the rent of PKR 20 for golf carts and less than PKR 20 for rental bikes.

It is recommended for the greater acceptability that information regarding the scheme design, its positive consequences and use of revenue should properly be disseminated. Similarly involving the public and developing their trust by ensuring fairness in the system coupled with political support can maximize public acceptability of congestion pricing.

Further research about demand and supply of new transport services on the basis of collected revenue from congestion pricing can be conducted in addition to use of collected revenue as determinant factor for acceptability of congestion pricing and credit-based charging schemes.

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