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## Oil Rich Countries and Sustainable Mobility: Challenges in Tabriz

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### Abstract

Tabriz is a typical example of the medium sized and developing cities in oil rich countries. The city is a growing economic centre and urban agglomeration of Iran where a number of transport improvements and policy challenges are ahead. The very low level of fuel prices coupled with the insufficient public transport has brought about road based transportation patterns particularly encouraging the private vehicle trips. Obviously, any timely attempt to re-arrange the fuel and car taxes in line with the public transport improvements will achieve better sustainable mobility aims. Therefore, this paper investigates the current transportation problems and further discusses the future policy challenges within a framework of sustainable mobility through utilizing the results of a preliminary survey conducted to evaluate the citizens' perceptions and responses to the current policy making and planning issues in Tabriz.

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### 1. Introduction

Since the Brundtland Report, sustainability has been one of the central policy issues in urban transportation studies to an extent that the sustainable development aims and indicators are wide in scope and straightforward today (see Wheeler and Beatley, 2004 for an extensive review of the historical development of the sustainability concept). Sustainable mobility objectives lie at the heart of the sustainability discussions both in developed and developing countries (Banister, 2008). However, the design and implementation of policies is complex in practice, particularly for the developing countries as there is no one solution or optimum combination of policies that assures sustainable development (Hall and Pfeiffer, 2000). Every city is specific with its own stage of economic development and infrastructure provision, national poverty and income disparity, level of motorization and urbanization, and urban and economic policies of the governments. There is obviously a need for exploring each city with its specific features in a broader scope of sustainable mobility policies which may also provide guidelines for those policy makers who have gone and will go through a similar stage of sustainable mobility challenges.

With this aim in mind, we have chosen Tabriz as our case study area. The city is located in north western Iran and is the fourth largest city and is characterized by being the industrial center of the country. The city is very

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special with its distinct urban transport structure and applied policies which are recently going through a substantial change such as the recent seven-fold increase in fuel prices.

We conducted a survey in 2010 which enabled us to make a preliminary policy evaluation based on a modest sample of 300 respondents. The purpose of our survey is to investigate the possible policy outcomes of improving public transportation systems and policies of increases in fuel prices in Tabriz. Such surveys have been conducted with many policy aims in different countries (i.e. Kumar and Krishna Rao, 2006 for car ownership in India) but are still inadequate compared to those of similar survey based researches carried out for developed cities. Therefore, while additionally contributing to the surveys which assess the special characteristics of the developing countries, our paper provides an important discussion regarding the sustainable mobility challenges in oil rich countries with special reference to Tabriz, which we believe, will provide guidelines for the other similar cities of the region.

### **The case city: Tabriz**

The population is around 1.5 million and is expected to be the fastest growing population in the country. According to one of the United Nations projections, Tabriz is expected to consistently grow at an annual rate of 1.8 % which is higher than that for Tehran, the capital of Iran (United Nations, 2002). It is a well-developed city and a major Iranian heavy industrial and manufacturing centre (the average GDP per capita in Iran is 4600 USD). Some of these industries include automobiles, machine tools, oil and petrochemical products which have further encouraged the car ownership which is around 100 per 1000 persons today. The economic development over the past two decades has produced an urban travel pattern by which most of the trips are carried out by privately owned cars and taxis (Figure 1). The dominating private trips have increased dramatically as one consequence of the low cost of fuel.

Between 2005 and 2009, the unit price per 10 liters of fuel was less than 1 USD and there were no government restrictions on the monthly consumption of fuels for transport purposes. But with the universal economic crisis, United Nations' sanctions on Iran and technical weakness forced the government to increase the fuel prices.

Therefore, fuel cost remained the same for quantities up to 60 litres per month; however for the quantities in excess of this limitation, the fuel cost increased four times. These fuel price increases whereby public transportation has recently gained more popularity will definitely have impacts on transportation choices. The government intends to further remove subsidies on fuel in such a way that every car owner will be allowed to consume only 120 litres monthly and more importantly at a price of seven times more than that of before (10 litres of fuel=7 USD).

Tabriz is also served by taxis and a public bus network. The total number of taxis has reached approximately 15,000 registered vehicles. There are two types of taxis operating in the city. The first type is operated as more like a para-transit system in the way that one taxi is shared by more than one passenger but without any specific route (12,000 vehicles). The second type is the ordinary taxi (3,000) known as the 'phone taxi', which is nearly five times more expensive than the first type of taxi. Fare prices for both types are not based on distance. Instead it is a negotiated zonal price depending upon the start and destination points.

In Iran, Tabriz is the second city after Tehran that the Bus Rapid Transit (BRT) has been established. The line has a distance of approximately 18 km from east to west with 50 bus stops. (Approximately 700 buses are operating today on the entire bus network). The planned Tabriz subway network (metro network) has 4 major lines (Figure 2). The initial 6km of Line 1 which was planned for completion in 2006 has been delayed as a result of the technical and financial problems.



Figure 1 Peak hour traffic congestion in Tabriz



Figure 2 Subway system in Tabriz

## 2. The survey and the results

Realistic urban planning needs to be directly linked to individual perceptions and needs. This calls for a significantly deeper and multidimensional attitude toward social design (Rietveld, 2001 and Preston and Rajé, 2007). Therefore, surveys investigating citizens’ needs concerning urban policies better grasp the social perceptions and will make an effective input for policy design and evaluation. In this context we designed a stated preference type of survey and conducted in Tabriz (300 respondents). In Tabriz neither this type of survey nor the surveying has been a familiar issue among the citizens; therefore a team of five surveyors were trained on how to administer the questionnaire and initially a pilot survey was conducted through 30 citizens. Accordingly, the survey was slightly amended and in August 2010, the survey was conducted at business and industrial centers spread out across

the city with randomly selected respondents in order to minimize the sampling bias. Although the surveying time was long (varied from 7 to 15 minutes), the response rate and the interest in the survey was higher than expected.

The questionnaire was designed to establish the respondents' stated choices among the three main means of transportation: the currently used mode, private car, or the new metro system which is under construction. In the choice options, basically to provide a simple ranking, each of the three means of transportation was included with two options of 'definitely choose' and 'probably choose' where the seven choice options were: definitely will choose what I am currently using; probably will choose what I am currently using; definitely choose metro; probably choose metro; definitely use / buy car; probably use / buy car; and no idea.

The three means of transportation was mainly specified by the different levels of total time, total cost and comfort level as included in each set of choices. The main policy instruments, i.e. variables, in question with regard to car use were fuel cost and parking charges. For the considered public transportation systems, in addition to the different fare levels, in vehicle time, access/egress times and waiting time were separately included in the survey in order to better reflect the system as a whole. The in-vehicle comfort attributable to public transportation systems (air conditioned or not air conditioned / sitting or standing) and three levels of traffic congestion were also other variables associated with the aim of the survey.

The required information regarding the Metro system was obtained from the Tabriz Urban Railway Organization (TURO) and the respondents were informed over a map about the layout and operational aspects of the Metro system at the beginning of the questionnaire. All these variables in each choice set were designed for future trip estimations but more than this for policy analysis to discuss about how sustainable transportation aims of controlling the car use and promoting the public transportation use could be achieved in oil rich countries.

In our judgment, in such countries, the most difficult aspect is to grasp the different income levels to associate with the trip choices because most of the respondents were reluctant to respond to the income questions, or the answers did not appear to be reliable when checked against some other socio economic variables such as car ownership.

To sum up, our main focus was to discuss, in a sustainable mobility framework, the possible consequences of operating a new metro system, further increase in fuel prices and introduction of a parking charge scheme on the trip patterns. Below is a summary of preliminary results obtained so far to assist the discussions in a broader scope regarding future policy-making issues.

- More than half of the respondents who mostly use taxis have stated that they would definitely or possibly choose the new metro system. The remaining more than two fifths of the respondents tended to either shift to private car or continue with their current choice of transportation mode.
- The choice of metro tended to be highly sensitive to travel time and traffic congestion. There was an obvious shift to metro for trip times longer than 20 min per direction and the longer the travel times, the more evident shift from taxis to the metro system.
- An increase in travel cost was considered to be a combination of fuel increase and application of parking charge scheme at this stage of our analysis. In the case of no change in travel costs, more than half of the taxi users continued to travel by taxi although metro fare is cheaper.
- For longer trips metro system was more favoured than the private cars and taxis.

### **3. Sustainable mobility policy challenges**

Adverse impacts of car ownership and car use on sustainable city policies have long been acknowledged (Newman and Kenworthy, 1999). The stage of economic development, public transportation level of service and even urban design have played major roles on individual's choice of owning a car and using it on a daily basis. Obviously, government policies of fuel and car prices in terms of tax policies have also had the important impacts on the level of car trips in any country. This is particularly more evident in oil rich countries where the fuel price has been very low and inadequacies in timely public transportation investments and failures to improve the service levels of public transportation have resulted in a modal shift to other road-based transportation in many cases. However, with fluctuations in the economy over the past decade has resulted in higher fuel prices. Tabriz is one of the typical cities going through such an economic and urbanization process.

In the light of what we have discussed about planning issues in the city and discovered about the citizens' reactions to future planning and policy changes through our survey, we summarize the critical planning issues in Tabriz from our understanding of sustainable mobility aims.

- Although, Tabriz is not ranked among the large metropolitan areas of many similar developing cities, economic development, population growth and urbanization are leading to rapid progress in motorization.
- The low fuel prices only specific to similar oil rich countries coupled with qualitatively and quantitatively insufficient public transportation network further triggered private car trips and the road based transportation such as para-transit types of taxis. Most of today's para-transit users and a portion of bus users are likely to shift to automobiles unless the current status of transportation is improved.
- The proposed four line metro systems which are currently under construction provide adequate coverage for a city of this size. The first phase of 6km has a planned capacity of 20,000 passengers per hour. When all four lines are operational, it will be well placed to satisfy the travel requirements of the bulk of the population. Utilization may be further encouraged by a combination of affordable ticket prices & selective transportation initiatives that will overcome the habit of using low price fuel. The new metro will augment the existing BRT.
- A link to the existing mainline train station & industrial area to the west has already been provided for by the Metro. However, localised feeders will need to be organised to enhance access to the two stations from the industrial areas. Extension of the initial metro system to the airport buildings will be useful. Further expansion of the metro system is limited because the city has space limitations to expand outwards as it is surrounded by mountains. Therefore future expansion in capacity may be achieved by adjustments in train frequencies as travel patterns become established.
- At the moment the major housing areas are located in the east. Sustainable mobility will be further enhanced when the land use in the vicinity of the metro stations are developed for housing and businesses. Previous experiences in other cities have demonstrated substantial commercial advantages by integrating station access with a well designed mixed land use of shopping malls, housing and offices (Cervero and Kockelman, 1997; Cervero, 2009). All four lines may be interchanged in central Tabriz thereby making it easier to access all points of the city & encourage trade.
- The survey highlighted that the current planned metro layout does not satisfy the link between some major nodes such as the two stations in the east (the end points of routes serving the east in Figure 2). A revised and efficient bus service is required to meet such demand corridors which are not served by the metro system in order to displace the established taxis of both types dominating this route.
- Integration of the metro system with the para-transit and normal bus system is essential to further enhance a good mobility model by making the metro more accessible to passengers. Ease, comfort and safety of the metro system will encourage a larger number of car users to adopt the metro as a primary means of transportation.
- There is a peak time road traffic gridlock. It is well known that the shift from private cars to public transportation is best encouraged by increases in fuel, car tax and parking charges which is a highly possible policy option included in the near future plans.
- From the social sustainability point of view, equity requires the most careful attention in developing countries and the equity issue is even more challenging in oil rich countries. In a general context of urban planning, equity may be defined as to provide minimum standard of urban facilities and systems regardless of socio economic and spatial variations. However, the ease of car use as a consequence of very cheap fuel price and in many cases the lack of parking charges coupled with the very low level of public transportation services further add to the equity gap among the car owners and non car owners. This is also referred to as mobility divide in the literature which necessarily has to be considered for oil rich countries to achieve global initiatives and aims for sustainable mobility (WBCSD, 2007).

#### **4. Conclusions**

There are a number of growing cities in oil rich countries facing urban mobility problems similar to many other cities, such as motorization and public transportation which has not developed in pace with urban expansion and population growth or which has not been well organized. In these cities the previous very low fuel prices has brought about an understanding that the difference in the daily operating costs of cars and that of public transportation cost is negligible, once a car is available. One basic pattern of trips is, besides private cars, the

considerable use of taxis both in the form of an ordinary taxi or a sort of para-transit system with no specified route. However, the recent economic crisis resulting in significant fuel cost increases has forced a review of public transportation and better management of urban transportation. The optimal use of public transportation combined with government taxation and urban transportation management policies will achieve better sustainable mobility.

Our case city, Tabriz is a very good example of such cities with specific characteristics which will provide useful discussions about the sustainable mobility aims. In this sense, the present stated preference survey and sustainable mobility discussions in this paper come as a well-timed attempt which allow important insights into individual perceptions, policy attempts and additionally contribute to the international literature where there continues to be a research gap in this area.

We will continue to collect more information about the current urban land use and transportation problems in Tabriz and aim to establish a choice model based on the results of the conducted survey for a more elaborate discussion of the current transportation problems and the consequences of planned transportation developments and urban policies. In such a policy sense, any sustainable mobility framework in oil rich countries must definitely address firstly the financial instruments of fuel prices and other charges such as parking policies to overcome the ever increasing and dominating habit use of private vehicles coupled with the inadequate road network. Secondly it is very important to note the lack of well served public transport systems which are far from competing with the advantages of the private vehicle trips despite the severe traffic conditions.

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