International Journal of Advances in Applied Sciences (IJAAS)
Vol. 1, No. 2, June 2012, pp. 71~76
ISSN: 2252-8814

Feasibility of Transport Demand Management Policies through a Bottom-Up Planning Approach

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Article Info

Article history:

Received Feb 25, 2012
Revised May 21, 2012
Accepted June 4, 2012

Keyword:

Traffic Congestion
Transport Demand Management
Bottom-up Planning
Sustainability
Shiraz

ABSTRACT

In order to reduce traffic congestion and the associated problems, various policies have been put forward so far. In this way, it is believed that Transport Demand Management (TDM) offers an effective and economical solution. Since most TDM policies have both positive and negative impacts, public participation is, therefore, an efficient way to achieve better results. This paper attempts to evaluate a set of TDM policies and define their priorities through a Bottom-up Planning (BUP) approach for the metropolitan Shiraz, Iran. In this way, the possibility of developing common principles via the investigation of shared goals within an integrated framework for urban transport policies that are desired for sustainable transport is evaluated. The framework method was utilized through a BUP expert consultation process. A number of experts (n=21) were asked to prioritize the components of each policy package. A set of policy measures as solutions to traffic congestion was provided in three different categories: sustainable transport approach, engineering approach, and traffic restraint approach. Each category included 10 measures which were suggested after a primary survey on the metropolitan's traffic problems. These measures were weighted and rated using the Analytical Hierarchal Process (AHP) technique. Then the Weighted Scoring Method was applied to find performance priorities. Public bus and bicycle infrastructure development were found to be the two most favorite policies. In total, sustainable transport solutions were the most preferred policies in the bottom-up stages. The findings can contribute some insights to future transport planning in order to provide more opportunities for community involvement in planning processes.

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1. INTRODUCTION

The majority of developing countries have encountered increasing urban growth and physical expansion during the past few decades. The increase in car ownership and use is a result of this trend which has consequently led to car dependent cities. Such cities experience daily traffic congestion and, subsequently, environmental, economic and social problems. For managing these undesirable problems, Transport Demand Management (TDM) strategies have been suggested as an efficient solution in some countries. To overcome traffic congestion problems, numerous policies have been put forward so far. However, it is believed that TDM offers an effective and economical solution. In contrast with infrastructure development and long- term planning, which are associated with huge spending, TDM can improve the

situation through modifying the travel behavior of trip-makers. However, TDM implementation needs an attention to social and cultural contexts. The bottom-Up planning (BUP) approach offers a system which can encourage public participation in TDM implementation.

This research attempts to evaluate a set of TDM policies and define their priorities through a Bottom-up Planning Approach. The empirical materials for this research include interviews (using questionnaires) with individual experts involved in urban transport planning processes in Shiraz, south of Iran. Shiraz, the capital of Fars Province, with a population of 1.4 million is the sixth most populous city of the country. According to a recent survey, the shares of the different modes of travel in this city are as follows: personal cars and taxis: 60 percent, buses: 30 percent, and the other modes: 10 percent which is an unsustainable trend in a longer term.

A set of policy measures as solutions to traffic congestion was provided in three different categories: sustainable transport; engineering; and traffic restraint. Then the AHP and weighted scoring methods were applied in order to find the most preferred policies for the study area.

2. BACKGROUND

While the strategies of conventional transport planning have focused on the 'Predict and Provide' model, sustainable transport approach, on the other hand, offers strategies based on the 'Debate and Decide' approach. TDM is a new approach put forward to mitigate traffic problems in both short-term and long-term periods. The Transportation Research Board (TRB) meeting (1994) emphasized the significance of research and innovation in TDM for the first time (Saleh and Sammer, 2009). In general, TDM is a set of strategies and policies offered in hope of decreasing the travel demand (especially single occupant and personal vehicles) or redistributing such demands in alternate time or space. Sustainable transport objectives could hardly be achieved only through technological advances. To decrease car dependency and overcome the increasing concern about energy consumption in transport, it is important to take into account the TDM policies along with new technologies, and economic motivation. On the other hand, the success of TDM policies is tightly intertwined with public acceptance (Saleh and Sammer, 2009).

Although an integrated transport policy is essential to achieving more sustainable development, integrating the principles of sustainable development and the practice of decision-making on transport have raised significant challenges. The operationalization of these terms raises complex political decisions together with stable social values, on the one hand, and a varied set of socio-economic and environmental opportunity costs on the other (Hull, 2005).

The Bottom-Up Planning (BUP) Approach explains that hierarchical decision-making is of little efficiency for resolving urban concerns. BUP is the codification of the existing social experiences, sociological theoretical knowledge, and empirical findings into sets of procedures in organizing human activities in order to achieve a well-defined goal (Cernea, 1992). Generally, BUP prepares a basement upon which each group of citizens can get involved in the process of policy formulation. While top-down planning strategies and policies flow from the higher authority to the lower one, in BUP the planning strategies are undertaken by the authorities with the joint contribution of the public (Cernea, 1992). It is, therefore, believed that gathering together all stakeholders helps them achieve a common agenda in which they all find values for themselves.

In Brugmann's book titled *The Urban Revolution*, it is discussed that BUP is critical for the survival and sustainability of cities. This approach allows all stakeholders to participate so that they get involved in designing, building and governing their community (Brugmann, 2009). In fact, BUP makes all parties have equal opportunities in policy formulation and performance (El-asmar et al., 2012).

BUP application in urban planning history dates back to the late 1960s in the UK and USA (Wratten, 1994). In contrast, the results of application have not been fully documented and have been widely disseminated.

The Traditional Transport Planning Approach is identified by the top-down consultation process while the BUP approach creates new opportunities for public involvement. However, the fragmentary nature of transport planning associates with a set of difficulties for public involvement. The life expectancy of integrated transport depends, in part, on its answer to this challenge (Booth and Richarson, 2001). Public participation has been achieved as an essential component of the transport planning process in western societies over the past 30 years. However, this issue has not received enough attention and discussion in developing countries yet (Limapornwanitch et al., 2003).

Limapornwanitch et al. (2003) applied the BUP approach in examining the feasibility of the implementation of TDM measures in Bangkok. The study found that while local planners were cautious of introducing TDM for mitigating traffic congestion, most of stakeholders realized the effectiveness of TDM

policies. Furthermore, to carry traffic congestion mitigation out by TDM policies, a higher share of public participation in implementing TDM projects needs to be achieved.

Asri (2005) found that while stakeholder meeting acted as an appropriate tool to exchange different opinions, it is not so useful in examining sub-regional transport systems since sub-district representatives were only concerned with their own problems which are limited to their own area.

BUP could address stakeholders' needs in a right way, while the top-down approach is desirable in the plan formulation stage (Uttam et al., 2009). There is no exact process for BUP yet. Different Studies have applied their approaches in order to gain public opinion and achieve an operational method for analyzing it. One of influential ways in BUP is the identification and education of the representatives of beneficiary groups. However, it is clear that stakeholders' participation improves from awareness to participation and decision-making.

Through participatory planning, it is more likely that plans will be implemented willingly, so that activities and impacts will be sustainable. On the other hand, if the participants are unable to manage their own plans suitably in the long-term period, due to the lack of knowledge and experience, the entire decision making process becomes ineffectual (Uttama et al., 2009).

3. METHODOLOGY

This research examines the possibility of developing common principles via the investigation of shared goals as well as shared indicators within an integrated framework for urban transport policies that are aspired for sustainable transport. The framework method was utilized through a BUP expert consultation process. The research process is illustrated in Figure 1. Since transport is a multi-facet issue, its different dimensions including practical, social, economical and environmental are discussed firsthand. Then some criteria for each of these aspects are defined (Table 1). At the next step, the hierarchical tree of decision-making is identified. This is presented based on the judgment by experts later. An analysis of the hierarchical process (AHP) was used to denote a weight for each criterion. AHP is a flexible, powerful and simple technique for making controversial decisions between complicated alternatives. This multi-criteria approach was suggested by Thomas L. Saati at first and has had various applications in different fields. The first step in AHP is to create a hierarchical structure of the subject in which objectives, criteria, alternatives and the relationships between them are distinguished. The next steps in AHP involve calculating the weight of the criteria (and sub criteria if any), calculating the weight of the alternatives, calculating the final score of the alternatives and examining the logic compatibility of the judgments.

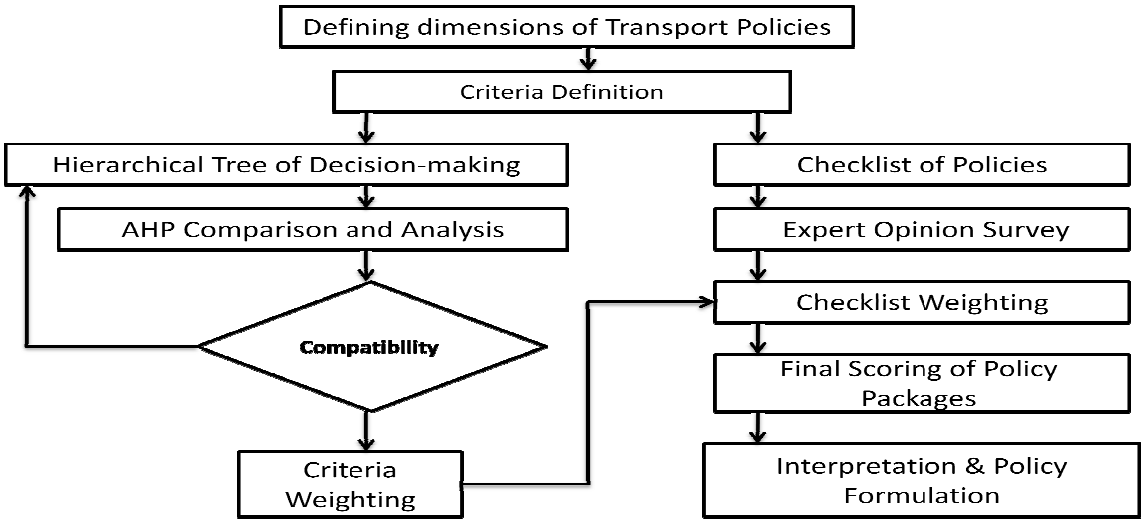

Fig. 1 Methodology

Table 1. Transport policy dimensions (criteria and sub-criteria)

Criteria	Sub criteria
Practical	Congestion reduction and traffic flow improvement
	Executive and technical feasibility
	Public acceptance and agreement
Social	Improving citizens' satisfaction and trust
	Increasing accessibility and comfort
	Improving safety
	Increasing physical activity, happiness and livability
	social education and encouraging public participation
Economical	Making more income for municipal
	Supporting low-income groups
	Travel cost saving
	Travel time saving
	Highway building cost saving
Environmental	Achieving a modern city
	Enriching historical identity
	Achieving more green/open space

Furthermore, three policy packages were considered as solutions to traffic congestion problems in Shiraz: Sustainable Transport Policies, Engineering Policies, and Traffic Constraint Policies. The first one involves policies that welcome more sustainable modes of travel such as public transport and non-motorized transport. The second package includes policies regarding highway construction and street network development. The third one consists of restriction policies which are designed to discourage travelers - especially drivers. Sample experts (n=21) were asked to prioritize the components of each policy package. The weight calculated for each criterion was applied here to have a weighted scoring for each policy option. The overall score of each policy package was calculated to make comparison easier.

The survey questionnaires consisting of two sections were distributed among municipal experts. At the first section, binary comparisons of policies were made in association with the relative importance of each indicator in relation with the other one. The second section asked the expert to compare different policy packages and the associated measures.

4. ANALYSIS AND FINDINGS

The priority examination of the criteria by the stakeholder groups showed that the environment-friendliness of the policies for the city was the first criterion, followed by the practicality and economic criteria (Table 2). The social aspect of transport policies was ranked forth. It seems that the experts mainly have concerns regarding the environmental impacts of transport throughout the metropolitan area; therefore, environmental improvement was their first priority. The result of sub-criteria priorities by experts are detailed in Table 3.

Table 2. The priority examination of criteria

Criteria	Practicality	Social	Economical	Environmental
Weight	0.210	0.044	0.185	0.569

Table 3. The priority examination of sub-criteria

Criteria	Sub-criteria	Weight
Practical	Technical feasibility	0.013
	Reduce congestion	0.040
	Public acceptability	0.148
Social	Increase citizen satisfaction	0.004
	Improve accessibility and comfort	0.015
	Increase safety	0.017
	Increase physical activity	0.001
	Improve public participation	0.006
Economical	increase the municipal income	0.022
	Help low income	0.008
	Reduce travel cost	0.058
	Reduce travel time	0.077
	Saving in the municipal cost	0.020
Environmental	Urban aesthetics	0.093
	Enriching cultural identity	0.169
	Preserving green/open spaces	0.307

It is evident that preserving green/open spaces (0.307) is the most important criterion from the viewpoint of the experts. This is followed by public acceptability (0.148), enriching cultural identity (0.169), urban aesthetics (0.093), and reduction in travel time (0.077). At the next stage, the weighted scoring method was used to calculate the overall score of each policy package. Scores were given by the experts who participated in the survey. The results of weighted scoring calculation for each policy package are shown in Tables 3-5.

Among sustainable transport policies, the highest score belonged to providing bus and taxi-specific lanes (1.605) followed by the provision of bicycle-specific lanes (1.367). In other words, the experts believed that a main barrier for sustainable modes of travel (public bus and bicycle) is the lack of specific lanes which do not share any space with other users of the road. The lowest score belonged to speed zoning/restriction by physical barriers (0.630). In fact, experts perceived that speed restriction is unacceptable by the public or it is an inefficient measure. In the engineering policy package, establishment of new bus and taxi terminals (1.377) was the first priority from the experts' viewpoint. This finding shows again the need for more attention to public transport requirements and facilities. The second priority in this package was the isolation of ring roads from local and arterial networks in hope of improving safety and increasing efficiency (1.241). Since the current ring road of the metropolitan shares spaces with local traffic in most segments, such a concern is expected. The lowest priority belonged to using part of Shiraz Seasonal River space for traffic flow (0.508) due to the environmental impacts arisen.

Among the eight measures suggested in traffic constraint policy package, the moving of regional bus and truck terminals out of the city center (1.171) and park-ride facilities (1.154) were the two most popular policies. Land use control (1.091) was the third import policy from the viewpoint of the experts showing the role of activities in trip attraction within the central zone. The lowest figure belonged to the restriction of unlicensed taxis in carrying passengers (0.417). The next stage is comparing the three policy packages in overall evaluations. The Sustainable Transport Policy Package (0.749) was ranked first, followed by the Engineering Policy Package (0.718), and then Traffic Constraint Policies (0.539). This finding confirms that sustainable transport policies are more likely to get experts and public acceptance, while traffic restrictions are less welcomed.

Table 4. The priority examination of sustainable transport policies

Sustainable transport policy	Average score	Priority
Defining speed zone	0.630	8
Paving Main streets with rock	0.787	7
Sidewalk repair	0.975	6
Developing car-free streets	1.163	4
Driving education	1.144	5
Establishing bicycle infrastructure (path, station, etc.)	1.3673	2
Establishing bus infrastructure (path, terminal, etc.)	1.605	1
Developing para-transit	1.310	3

Table 5. The priority examination of Engineering Policies

Engineering policy	Average score	Priority
Intelligent traffic control	1.228	3
Highway and intersection bridge building	1.094	5
Pedestrian bridge building	1.033	6
Parking space provision	0.925	7
Using space of Shiraz seasonal river for traffic	0.508	8
Ring road building	1.209	4
Separation of local traffic from belt road traffic	1.241	2
Establishing new bus and taxi terminals	1.377	1

Table 6. The priority examination of traffic constraint policies

Traffic constraint policy	Average score	Priority
Park-ride	1.154	2
Restricting car use in central area	0.527	7
Increasing parking cost	0.580	6
Traffic Toll for highly attractive land uses	0.690	5
Strict land use control	1.091	3
Logistics control	0.837	4
Limiting un-licensed taxis	0.417	8
Moving regional bus and truck terminals	1.171	1

5. CONCLUSION

This paper presented a report on the feasibility of TDM measures in Shiraz through a bottom-up planning process. A set of policy measures as solutions to traffic congestion was provided in three different categories: sustainable transport; engineering; and traffic restraint. Each category includes 10 measures which were suggested after a primary survey on the metropolitan's traffic problems. These measures were weighted and rated using the AHP technique. Then the Weighted Scoring Method was applied to find performance priorities. Public bus and bicycle infrastructure development were found to be the two most favorite policies. In total, sustainable transport solutions were the most preferred policies in the bottom-up stages.

The findings can contribute some insights to future transport planning in order to provide more opportunities for communities to be involved in the planning process. Since most TDM policies have both positive and negative impacts, public participation is an efficient way to achieve better results. This study can be improved by obtaining the preferences of community and transport agencies. Further information and explanation could give a clearer image of various policies and their likely outcomes.

REFERENCES

[1] Asri, Dail Umamil (2005). Participatory planning toward an integrated transportation masterplan for Jabodetabek, Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp. 2308 – 2319.
[2] Booth, Chris and Richardson, Tim (2001). Placing the public in integrated transport planning, Transport Policy, Vol. 8, No. 2, April, pp. 141–149
[3] Brugmann, Jeb. 2009, Welcome to the Urban Revolution: How Cities Are Changing the World, Bloomsbury Press.
[4] Cernea, Michael M. (1992). The Building Blocks of Participation: Testing Bottom-Up Planning, World Bank Publications.
[5] El-Asmar, Jean-Pierre and Ebohon, John Obas and Taki, Ahmad, 2012. Bottom-up approach to sustainable urban development in Lebanon: The case of Zouk Mosbeh, Sustainable Cities and Society. Volume 2, Issue 1, February 2012, Pages 37–44.
[6] Hull, Angela (2005). Integrated transport planning in the UK: From concept to reality, Journal of Transport Geography 13 318–328.
[7] Limapornwanitch, Karin, Hokao, Kazunori, Tanaboriboon, Yordphol, and Takahashi, Kiyoshi (2003). A Bottom-up Approach to Implement Transportation Demand Managment Measures in Developing Countries: Bangkok, Journal of the Eastern Asia Society for Transportation Studies, Vol.5.
[8] Roy, Uttamk and Ganguly, Madhubanti (2009). Integration of Top down & Bottom up approach in Urban and Regional Planning: West Bengal Experience of Draft Development Plans (DDP) and beyond National Town & Country Planners Congress, Goa: India.
[9] Saleh, Wafaa and Sammer, Gerd (Ed.) (2009). Travel demand management and road user pricing: success, failure and feasibility. Ashgate Publishing Co., England.
[10] Wratten, Ellen, 1994. Bottom-up planning for urban development: the development planning for real pilot project. RRA Notes. Issue 21, pp.83–90, IIED London.