Objective based transport planning: A model for emerging urban areas

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ABSTRACT: The Texas Governor's Business Council (GBC) recently recommended a long term mobility goal for major urban areas --- that by 2025 peak period road traffic should be no more than 15 percent slower than "free flow." Currently, traffic moves up to 40 percent slower. The goal has been adopted by the Governor and is in the early stages of implementation by the Texas Department of Transportation. A similar planning process could be useful in identifying long-term transportation output (performance) goals, and in selecting the strategies that best contribute to such goals in lower and middle-income urban areas, where financial resources are far more limited. The process could be applied to all urban transport, both roads and public transport. Such an objective-based approach would produce better results than the current project-based approach, which is skewed more toward serving political interests than the day-to-day mobility needs of people in the market.

ABSTRACT: Le Conseil de Développement Economique du Gouverneur du Texas (Governor's Business Council, GBC) a dernièrement émis un projet à long terme concernant la circulation dans les principales agglomérations de l'état: d'ici 2025, le trafic routier en heures de pointe ne devra plus ralentir que de 15% par rapport à la circulation dite « fluide ». Aujourd'hui, la circulation routière est 40 % plus lente en périodes d'affluence qu'à d'autres moments de la journée. La résolution a été adoptée par le Gouverneur, et le Ministère des Transports du Texas a amorcé son application. Un tel procédé de planification pourrait se révéler utile dans les zones urbaines à revenus modérés et faibles, là où les ressources financières sont beaucoup plus limitées: il contribuerait à fixer des objectifs à long terme de développement des transports, et à sélectionner les stratégies les plus efficaces à la mise en œuvre de ces objectifs. Ce procédé pourrait aussi bien être appliqué à tous les modes de transport, qu'ils soient individuels ou collectifs. Cette approche fondée sur une déclaration claire d'intentions produirait de bien meilleurs résultats que l'approche actuelle basée sur des projets au jour le jour – approche qui d'ailleurs a tendance à servir des intérêts politiques, et non les besoins en mobilité quotidiens du public.

1. INTRODUCTION

Urban areas in developing, emerging and transitional economies face daunting challenges in responding to significant population growth, more rapidly increasing motorization and comparatively low standards of living. Effective urban transport can be important in increasing the size of labor markets accessible to the citizenry, contributing to a higher standard of living. However, because financial resources are very limited, suboptimally efficient policies exert a significant price in forgone opportunities, which in these urban areas mean greater poverty and less opportunity. The individual transport project based planning approach, the basis of much urban transport planning is poorly matched to the special and intense challenges that face lower and middle-income urban areas.

In 2003, the Texas Governor's Business Council (GBC) commissioned a study by the Texas Transportation Institute, Alan Pisarski and Wendell Cox to establish an "objective" based transport planning process for the largest urban areas in the state (Dallas-Fort Worth, Houston, San Antonio, Austin, El Paso, McAllen and Brownsville). The TGBC report recommended adoption of specific long term mobility goals, most significantly an objective that by 2025, traffic flows during peak hour would be only 15 percent slower than during periods of "free flow"--- a significant improvement from the present in some of the areas.

While the GBC process related only to roadways, there is no reason that it could not be applied to the multi-modal environment of urban areas. Given the fiscal restraints faced by lower income urban areas, a GBC-type process could be useful in identifying long-term transportation output (performance) goals, and identifying the strategies, whether road, public transport or other, that best contribute to the objectives.

2. GOVERNOR'S BUSINESS COUNCIL REPORT

Dissatisfaction with this planning method led a new to a different approach in Texas. There is a growing consensus that urban traffic congestion is the most serious transport challenge faced in the state, and a principal threat to future economic growth. The Governor's Business Council, a "blue-ribbon" panel of business executives convened by Governor Rick Perry, commissioned a study to determine the cost of improving urban traffic congestion in the state's largest urban areas, Dallas-Fort Worth, Houston, San Antonio, Austin, El Paso, McAllen, Brownsville and Laredo (the latter four referred to as "border areas"). The study was to be different from conventional planning in at least the following respects:

- It would abandon the project focus of current planning and instead establish mechanisms to select projects based upon the effectiveness of their contribution to the established goal.

- It would be based upon a vision of improved mobility. This would require adopting a mobility improvement objective to be reached in each of the urban areas by 2025.

U.S. federal regulations require regional planning authorities to adopt long term transportation plans that are financially constrained --- plans that assume only the funding that is known to be available. The Governor's Business Council (GBC) recognized the wisdom of such planning, but felt that a "vision" plan was also needed. The new plan would not address the "what can we afford" question, but would focus the question of "what can be." The GBC report was unique, because it had long been the conventional wisdom in US urban planning that we "couldn't build our way out of congestion." The basic principle behind the GBC report was to ask the "unthinkable," --- just what would it cost to " build out of congestion." Once determining the cost, it might well be determined that it was too expensive, but the GBC was of the view that it would be irresponsible to not at least consider the question.

Texas is one of the fastest growing states in the United States, with a population now exceeding 21 million. During the 1990s, Texas passed New York to become the second largest state in population after California. Texas metropolitan areas are also among the fastest growing. From 1990 to 2000:

- Dallas-Fort Worth was the fastest growing metropolitan area in the nation out of the nine with more than 5,000,000 inhabitants between 1990 and 2000.

- Houston was third in population growth among the 11 metropolitan areas over 4,000,000, trailing Atlanta and Dallas-Fort Worth.

- Austin ranked second out of the 49 metropolitan areas with more than 1,000,000 residents (behind Las Vegas).

- McAllen ranked second out of the 81 metropolitan areas with more than 500,000 population (behind Las Vegas).

- Laredo ranked ninth out of the 260 metropolitan areas with more than 100,000.

- Brownsville grew at more than double the national rate (28 percent) of 13 percent, while El Paso grew slightly above the national rate (15 percent).

More than 80 percent of future Texas population growth is projected to be in these metropolitan areas. Dallas-Fort Worth and Houston together are projected to add nearly 5 million, 55 percent of the growth. The largest percentage increases are expected in Laredo (94 percent), McAllen (86 percent) and Brownsville (62 percent), all located in the lower Rio Grande River Valley, along the border with Mexico. McAllen is expected to exceed 1,000,000 population.

Despite their reputation to the contrary, Texas urban areas are only slightly less dense than the national average for areas with more than 1,000,000 population. For example, San Antonio has a density of 3,257 Houston is 2,951 and Dallas-Fort Worth is 2,946, all somewhat close to Portland, at 3,340 (Figure 2).

Like urban areas throughout the nation, Texas urban areas have experienced rapid traffic growth. However, there is one notable exception. In the early 1980s (Figure 2, Houston had become the second most congested major metropolitan area, behind Los Angeles. An aggressive road building program, however, reduced traffic congestion by the early

1990s. While little expansion has taken place since then, Houston's traffic congestion has fallen to 13th in the nation, behind much smaller urban areas, such as Portland. This experience was also instrumental in encouraging Texas officials to review the potential for reducing traffic congestion by expanding roads.

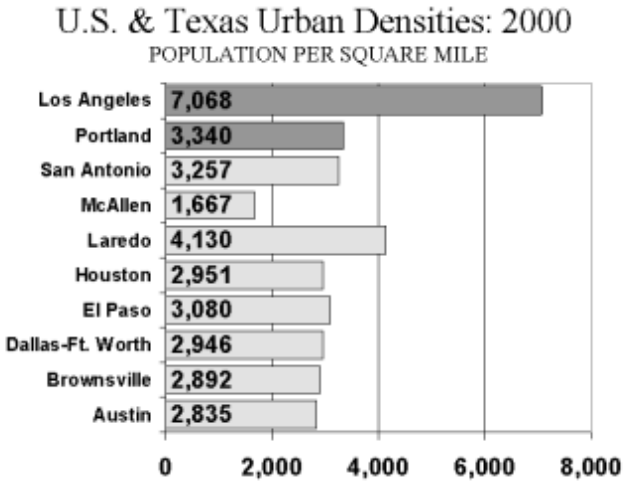


Figure 1

Continuing population growth will mean more automobile and truck traffic. The extraordinary growth rate of Texas metropolitan areas will translate into traffic growth rates ahead of the national average. Based upon current trends, three of the metropolitan areas above 1,000,000 population in 2000 are projected to have Travel Time Indexes above 2.00 by 2025. This is above the 2000 value of 1.90 in Los Angeles, the worst in the nation. The fourth metropolitan area, San Antonio, would achieve a TTI greater than that of San Francisco, which ranked second in 2000. Some of the border metropolitan areas are also expected to exceed Los Angeles.

Figure 2

Moreover, Texas is at the most important strategic position relative to the Mexican border. The United States, Canada and Mexico approved the North American Free Trade Agreement in 1994. This has brought a substantial increase in both truck and rail freight traffic and is likely to increase more as Mexico's continuing economic progress increases trade volumes. Nearly 80 percent of trucks crossing the border between Mexico and the United States travel through Texas ports of entry, and more than one-third of that volume crosses at Laredo.

At the same time, public transport serves only a limited market in Texas. The largest overall public transport market shares are approximately one percent, while work trip market shares are all three percent or lower. Each of the Texas metropolitan areas experienced major losses in public transport work trip market share from 1990 to 2000. This includes Dallas-Fort Worth, where a 41 percent loss and an actual loss in the number of public transport commuters occurred despite opening what many consider to be one of the nation's most successful new urban rail systems.

The regional planning agencies in Dallas-Fort Worth, Houston, San Antonio and Austin project that virtually all new travel will be by highway. Public transport's market share in these urban areas ranges from 0.5 percent to 1.5 percent. Public transport has even smaller market shares in the border metropolitan areas.

The Texas Transportation Institute has established performance indicators for traffic congestion that have become the national standard. Each year the Institute publishes a "mobility" report rating traffic congestion in the major urban areas of the nation. The principle index is the "Travel Time Index," (TTI) which compares average speeds of roadway travel during peak period with average speeds during periods of no traffic congestion. For example, a TTI of 1.50 would mean that a trip that would take 30 minutes in uncongested conditions would take 45 minutes during peak periods. The highest TTI in the nation is in Los Angeles, at 1.90. At the other end of the spectrum is Kansas City, with a density of 2,300 persons per square mile, a comprehensive freeway and arterial street system and a TTI of 1.10. The highest TTI in Texas is in Houston, at 1.38, followed by Dallas-Fort Worth at 1.33, Austin at 1.27 and San Antonio at 1.23. The overall average for the large metropolitan areas was 1.30. It was projected that, based upon present plans and resources, the TTI would rise, on average, to 2.09 by 2025 (Figure 3).

The first step in the GBC planning process was to set a mobility improvement objective. After much discussion, it was agreed that a travel time objective of 1.15 would be set for 2025 for each urban area. In all cases but the border metropolitan areas, this would represent an improvement. However, because of the especially fast growth in the border areas, cur-

rent trends would place the 2025 TTI for these areas at among the highest in the state.

Using Texas A&M University population projections, and traffic projections a broad roadway network was developed in each urban area to achieve the 1.15 TTI objective. The results through 2025 were as follows:

- Current resources of $140 billion would be available over the planning horizon from present sources. This would not be sufficient to maintain current traffic conditions, which would deteriorate.

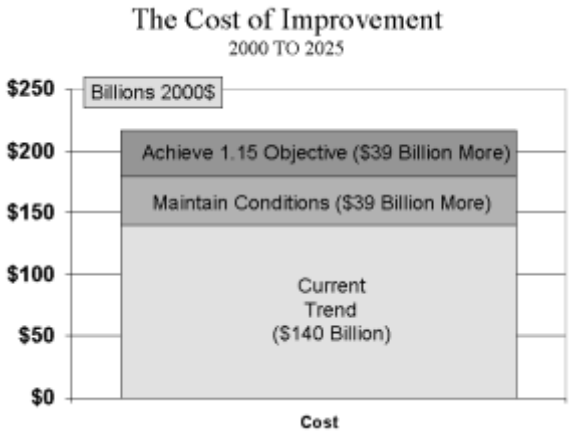
- To maintain current traffic conditions (as measured by the TTI) would require an additional $39 billion.

- To build the additional roadway capacity to reduce the TTI in each urban area to 1.15 would require an additional $39 billion (Figure 4).

While these amounts appear to be large, they are modest in the context of household expenditures. A recent US government report indicated that US urban households spend approximately $7,600 annually for transportation. On a per household basis, financing the $78 billion additional required to reduce the TTI to 1.15 in all of the studied Texas urban would cost $335 per year, an approximately five percent increase in household transportation expenditures. Approximately one-half of this amount would be needed simply to keep traffic congestion from getting worse. On this basis it was concluded that not only can enough roadway capacity be built to handle demand, but that the cost is affordable. Further, the economic benefits were estimated at $2,118, a more than 6:1 benefit:cost ratio.

Figure 3

The GBC report also proposed establishment of a more detailed long term planning process based upon the 1.15 TTI objective in each urban area, and that the Texas Department of Transportation and regional planning organizations be required to submit annual progress reports to the state legislature and governor. It was recommended that individual projects be evaluated based upon the efficiency (cost)



per hour of actual travel delay to be reduced.

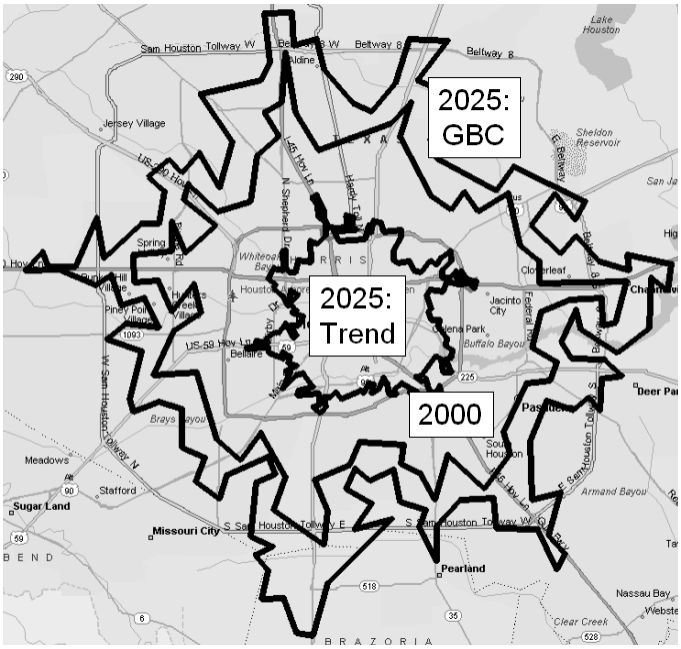


Figure 4

Figure 5

The impact of such the proposed objective is illustrated by the case of Houston. Currently, as noted above, the Travel Time Index is 1.38, indicating that a trip that would normally take 30 minutes in uncongested conditions takes, on average 41 minutes during peak period. At current trends, it is projected that the Travel Time Index would increase to 2.17 by 2025, meaning that the 20-minute uncongested trip would take 65 minutes (Figure 5).

3. IMPLEMENTATION IN TEXAS

As a result of the GBC report, the Texas Department of Transportation was directed by Governor Perry to establish formal urban traffic reduction objectives, and a new executive office was established to oversee the program. It was expected that a formal Travel Time Index objective would be adopted during September 2003. As a result of the Governor's Business Council report, planning officials in Houston are beginning to prepare a "100 Percent Plan," which would establish the detailed blueprint for achieving the travel time objective by 2025. There are indications that other states are interested in undertaking a similar planning process.

Planning processes similar to the Governor's Business Council approach could be useful in applications in other urban areas, in the United States and elsewhere. The principal elements are as follows:

- Adoption of a long-term travel time (mobility) objective. This might be expressed in terms of roadway traffic where public transport has little role, or it could be expressed in travel time per distance where public transport is a viable strategy. The travel time objective would be subject to preexisting environmental and community standards as appropriate.

- Establishment of a process that identifies potential projects that would achieve the travel time objective as quickly and inexpensively as possible.

- Evaluation of potential projects based upon their cost effective contribution toward achievement of the travel time objective.

- Adoption of a program of projects, based upon the evaluation above, to achieve the travel time objective.

- Projection of expected progress toward the travel time objective each year of the planning horizon (no less than 25 years).

- Comparison of annual travel time objective results in relation to projected values.

- Periodic reporting to appropriate parliamentary and executive bodies.

4. APPLICATION TO EMERGING ECONOMIES

The longer-term urban transport challenges will be much greater in low and middle-income economies than in the high-income world. Motorization still lingers well behind high-income world rates, yet can be expected to converge upward, all things being equal. The higher urban densities, and the larger size of many middle and lower income urban areas are particularly poorly suited for the motorization increase that can be expected. Already, metropolitan areas such as Mumbai, Delhi, Sao Paulo, Mexico City and Seoul have more than 15,000,000 people. Depending on the geographical definition, Beijing and Shanghai may also be that large.

By comparison, only four high-income world metropolitan areas, Tokyo-Yokohama, New York, Osaka-Kobe-Kyoto and Los Angeles are above 15,000,000, and each is considerably less densely populated than the urban areas in the low and middle-income world. Further, each of these urban areas has a transport system that meets its needs relatively well. Tokyo-Yokohama and Osaka-Kobe-Kyoto have effective urban rail systems that were constructed before and as the urban areas developed and today carry nearly 60 percent of all travel. Traffic congestion on the roadways is intense, but manageable. New York and Los Angeles rely much more on cars (more than 90 percent of travel) and have effective roadway systems that have comparatively little (New York) to moderate (Los Angeles) traffic congestion by world standards.

Some of the emerging urban areas already have traffic congestion worse than the high-income urban areas, such as Seoul and Taipei. None of the major emerging urban areas is likely to have the resources to duplicate the Japanese urban rail systems, not least because building them after the urbanization occurs puts such comprehensive improvements well beyond the financial capability of even high income world urban areas. Even where huge investments are made, they serve only a small part of the urban transport demand. For example, the extensive Mexico City Metro serves only the core of the urban area, which has accommodated less than one-quarter of that metropolitan area's explosive growth since the first line was opened.

More challengingly, it can be expected that at least some low and middle-income world metropolitan areas will grow at perhaps even greater rates in the future. For example, both India and China have urbanization rates of approximately 30 percent. There is good reason to believe that these rates will rise substantially, perhaps, ultimately to the high-income world rates of 70 percent or above. This could mean that, in the longer run, the Mumbai, Delhi, Shanghai and Beijing urban areas could become home to 30 million or even 50 million people.

Or, alternatively, there could be many more urban areas in the two countries (and elsewhere) that achieve the 5,000,000 to 15,000,000 population threshold.

Following the high-income world planning model, much planning in the low and middle-income world is project based. Planners ask where the next Metro should be built. Politicians advocate their particular favorite projects, such as double decking Mexico City's peripheral highway (not even yet a motorway along major segments). The problem is that project based planning is insufficient to address the overwhelming challenges ahead, and is likely to lead to greater car ownership as the lack of adequate public transport service induces people to provide their own mobility.

The Texas Governor's Business Council model provides a theoretical framework for shifting from a project based to an objective based planning system. Difficult as it is in a political environment, the future of low and middle income world urban areas depends upon adopting and pursuing a vision of what transport and the quality of life should be like in 20 or 25 years.

The principal step is to adopt one or more goals on which resources and policies should be focused. In Texas, because of the statistical irrelevance of public transport (approximately one percent of travel), an appropriate measure was roadway travel time. In low and middle income world urban areas, with public transport shares of 30 percent (example, Curitiba) to perhaps nearly 90 percent (example, Mumbai) a better indicator might be a maximum travel time over a particular travel distance for a specified share of travel. For example, an urban area might seek to develop a transport system in which:

> *for 90 percent of trips, distances of 10 kilometers are reached in less than 15 minutes, 20 kilometers in less than 30 minutes, etc.*

The planning and policy mechanisms need measures for evaluating potential strategies and projects as regards their contribution to the overall objective. The Governor's Business Council process will use cost of reduced delay hour, a factor that could be applied to either highway or public transport (or other) projects.

Without an objective based transport planning approach, it is very difficult, if not impossible to ensure that the resources available to improve or maintain the transport system are used efficiently. And, there will be consequences of transport resource misallocation. To the extent that the public transport system fails to meet the needs of a population growing more affluent (or seeking to grow more affluent), there will be a greater personal imperative for purchasing cars.

And, while it may appear to Western observers that time lost in traffic congestion will be a serious impediment to increased motorization, even the slowest traffic can produce door-to-door travel times competitive with, if not superior to that of public transport. This is especially true for trips not to or within the urban core that is often represents the only market with substantial public transport service.

5 Reference

The Governor's Business Council Report, "Texas' Roadways – Texas' Future: A Look at the Next 25 Years of Roadway Supply, Demand, Cost and Benefits," was overseen by Transportation Task Force Chairman Michael Stevens and was authored by Alan E. Pisarksi (independent consultant), Tim Lomax (Texas Transportation Institute), David Ellis (Texas Transportation Institute) and Wendell Cox (Wendell Cox Consultancy), www.texasgbc.org/reports.html.