

THE TRANSPORTATION/LAND USE CONNECTION: A DILEMMA FOR THE 21ST CENTURY CITY?

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INTRODUCTION

The transportation/land use connection remains a dilemma for the 21st Century City largely due to the poor understanding of the complex relationship that exists between the transportation system as a service function and all the other land use activities in the city.

Throughout history, predominant forms of transportation have had distinct impacts on the form, density and the character of the city. The most serious transportation problems are to be found in the rapidly growing cities. Conditions in these cities symbolize the failure to understand transportation as a complex system that interacts with the city and therefore requires comprehensive planning.

The conflict between cities and the car is believed and understood to be a problem of physical congestion. However, due to changes in policy direction, congestion is being acknowledged as a product of inappropriate urban policies and inadequate planning. It appears that through growth management and the management of travel demands in general, we are learning to control the land use side of the transport/land use relationship. Whether this will be successful in the 21st Century City remains debatable because the 21st Century City is a city in a state of revolution with a new set of challenges which is largely being influenced by the effects and shifts in population growth, economic development and globalization.

In this paper, transportation/land use strategies to alleviate congestion and urban problems have been reviewed. The emerging trends and challenges that will confront the 21st Century City have been outlined. Furthermore, the need to define and understand the relationship between transportation and other land use activities in cities as a key solution to congestion and urban problems has been emphasized.

HISTORICAL DEVELOPMENT OF CITIES

In relation to the historical development of cities, the connection between transport and land use is reflected in the distinction between the following cities, namely, walking, tracked and rubber cities.

The "*Walking City*" which is depicted by early cities which were founded around sites that had some form or potential for transportation. Most of the cities were located around rivers; natural harbours; railroad terminals, or stations. The cities were compact and pre-industrial, with activities in close proximity and easily accessible on foot and horse drawn coaches.

The “Tracked City” as illustrated by 19th Century City in Europe and North America was largely associated with “*tracked transport*”. Railways and trams provided a wider range of transport. Cities expanded spatially, suburbanization gathered pace and commuting became a norm.

The “*Rubber-tyre*” motor vehicle brought in a third phase in the evolving relationship between land use and transport in cities. The car led to the decline in the attraction of the traditional urban cores; widened the choice of residential locations and freed people from tracked transport. According to Vuchic (2000), while the early pedestrian and horse cart transportation led to more dense cities with intensive activities, the car opened up suburbs and formed major arterials out of cities. As a system, the car has allowed dispersion of land use activity that in turn has resulted in increased need for travel over greater distances.

The Predict and Provide Concept

The “Predict and Provide Concept” which originated in the United States of America (USA) in the 1950s promoted the relationship between land use and transportation. The concept was largely driven by systems analysis. During this period transport planning proceeded with pride and excitement, especially the newfound analytical relation between transport and urban development. Infrastructure planning was understood by policy makers as a rational mechanism for ensuring the greatest welfare for a large number of people (Richardson 2000).

Until recently, most politicians, planners and developers believed that moving people out of cities would help cities (Power 2001). The conflict between the car and the city was understood to be the problem of physical congestion which can be resolved by building more roads and parking facilities; by better traffic engineering and other measures of increasing capacity to accommodate movement of the car. However, it has taken years of experience, successes and failures to learn that capacity increase is desirable only when it causes no excessive negative impacts (Vuchic 2000).

The provision of transportation infrastructure based on the “Predict and Provide Concept” has had tremendous impacts on the pattern of urban development and the need for mobility in cities today. It is now recognized that provision of more capacity is not the only solution. Congestion is increasingly being acknowledged as a product of inappropriate urban policies and inadequate planning. It is not the fundamental problem of transportation. The fundamental problem lies in the poor understanding of the nature of the complex relationship between the transportation system and all the other land use activities in the city (Vuchic 2000).

As car ownership in cities has increased, more freeways and parking facilities have been provided at great expense. The cost is not only in the building of the facilities but also in the resultant dispersion of land use activities within the city. The practices associated with excessive car use, continuous expansion of roads and parking facilities in core cities, as well as extensive subsidies for car travel are major contributors to the urban crisis. According to Hall & Pfeiffer (2000), in most cities the size of the metropolitan area is now measured by its length or status of traffic congestion.

The Emergence of New Urbanism and Realism

A new realism in the transport policy arena emerged when it became apparent that land use development could not be controlled and that demand travel could not be served by expansion of road network system. Social and environmental concerns that were promoted by environmental movements in the USA in the early 1960s triggered further awareness and resistance from communities and civil society.

New policy concepts, namely, *Integration and Sustainability* which describe the shift in policy by emphasizing integration between modes, between transport decisions and decisions made in other policy sectors including land use planning. The key strategies in the new thinking are to reduce the need for travel by road by increasing the use of alternative modes, using existing road space more efficiently and through land use planning. The Predict and Provide Concept has now shifted to Predict and Prevent Concept.

However, according to Richardson (2000), this new policy rhetoric is failing to become institutionalized because it is embedded in various institutions and practices that require a lot of actors. Furthermore, technological improvements may only give a temporary breathing space from congestion. Primary measures that seem to hold promise in achieving traffic reduction are through land use planning. Yet the contribution that development planning could make is frequently marginalised because of the slow rate of land use change, and any impacts are likely to be long term and incremental in nature (Patterson 2000).

In the land use arena, there has been an explosion of interest in a variety of related planning and urban design approaches that place emphasis on public transport oriented development. Fierce critics of sprawl call for the return to traditional models of development by seeking to promote a mix of commercial and residential uses rather than segregating uses, with smaller plots, more parks and open space and public transport oriented neighbourhoods and network of streets. The new solution to urban congestion is to move people out of cars into public transport modes of transportation (Pollard 2001).

WHY IS THE TRANSPORT/LAND USE CONNECTION STILL A DILEMMA?

Since inception of the Predict and Provide Concept and the various studies that have been undertaken on the behaviour of land under increased accessibility, no clear picture of the impact and response has documented. According to Gakeheimer (1993), though the abstract logic of land use/transportation relations may be attractive, institutionally it is very difficult to integrate because of their conflicting orientations.

RESPONSE BY CITIES

Most of the cities in the world today are experiencing similar urban transportation problems and dilemmas, however their responses and actions differ considerably. Cities are pursuing more than one technique. The combination of techniques that are implemented is a product of financial, environmental, public support and other related concerns. Some of the measures include adding more road space; lowering the number of cars; changing the time that the cars use the roads or get more vehicles pass through a spot on the road.

Table 1. Conflicting Orientations of Land Use / Transportation

	Land Use	Transportation
Scale of Concern	Small- compatibility among micro land uses	Large scale – functioning of the network
Objectives	Complex often internally contradictory	Simple more straight forward
Planning Horizons	Short term – difficult to plan for land development alone as it depends on social and economic issues	Longer term – has been possible to plan for long term horizon assuming travel demand will achieve the assumption.
Techniques for analysis	Ad hoc	Standardized
Levels of Government involved	Local government is responsible for land use	Involves local, provincial and National levels
Prospects for Implementation	Low	High and more direct
Units of Implementation	Small single parcels of land and incremental	Large units, often each decision focuses on fixing the transportation network
Levels of Budget	Small – as implementation is mostly controlled by private actions	Large – a stronger government function and entails large public expenditure

According to Vuchic (2000), there are currently two groups of cities in the world today, namely:

Car – Based or Unimodal City – These cities are characterized by the convenient travel by the car to any part of the city in predominantly low-density areas. Traffic congestion is a frequent phenomenon. Groups of people who cannot drive are further marginalised. Expansion of the city involves low costs but consumes considerable land areas. The central business districts (CBD) of these cities become lifeless out of office hours and it is realistic to see transport as the initial maker and breaker of the city.

Balanced Intermodal System City – There is adequate provision for transportation. Extensive use of the car is discouraged through various measures. There is a greater diversity of land use activities and concentration of activities that offer economies of agglomeration. Pedestrian and the human oriented public places generate social and public activities. Furthermore, there is a higher degree of coordination of financing of modes of transport, as well as land use planning that integrates transportation not only in the plans but their effective implementation (e.g. Toronto, Stockholm).

However, Barter (2000) comments that different types of cities can be linked to a particular type of mobility. The dilemma for the 21st Century City will revolve around making the choice between two contrasting approaches, namely, restraint of the private car with the promotion of alternative modes or the unrestrained growth in private car numbers and neglected public transport system.

Case Studies

Toronto

Toronto serves as a model for transport and land use planning policies. It has achieved high rates of public transport usage through a combination of policies.

The success is attributed to results of the clear division of responsibilities between national government and provinces. Provinces and municipalities have all the responsibilities for all urban transportation, planning and financing assistance for both capital and operation.

However, Mees (2001) argues that Toronto's public transport success is not only through land use policies, though they help, it is its centralized and closely integrated network of trains, and especially the bus service. More frequent services, better coordination; more legible routing which makes public transport efficient and attractive.

In the recent years, however, unplanned developments have begun to take place outside the Greater Toronto Area which is believed to be stimulated by low business taxes and low housing costs. Transportation conditions have also contributed to this trend because the cost of car use is dropping. Subsidies for car use are more limited, but there is better coordination for planning for freeways, public transport and pedestrian facilities.

United States of America

Oregon, Portland

The City of Oregon adopted the concept of Smart Growth as an alternative to mindless sprawl. In the 1970s, Metropolitan Portland, Oregon, drew a line around its core, limiting development around the 93,000 ha area. This coupled with an expanded rail and bus system enabled the metropolitan area to accommodate a 50 percent increase in population with 2 percent increase in developed land and a moderate increase in trips by car. The outside boundaries, farmlands and forests were protected by zoning.

The Netherlands

During the 1950s, the Dutch cities also followed the similar trends in the USA, Paris and UK and tried to accommodate the use of the car. One of the measures taken at the time was to get rid of old-fashioned tramways. In many of the cities, tramways were later upgraded into Light Rail Transit systems and transportation in general favoured rail and bus services.

The bus service, LRT and Metro rail have now been integrated with the national railways, which provides regular services on an extensive network, which resembles a "National Rapid Transit Network." The Netherlands is also a world leader in developing urban design and transportation concepts. The best known concept is the Woonerf, a residential area that includes streets for pedestrian, areas for children, delivery facilities, limited parking and slow car driving. The car is not excluded but integrated into an environment predominantly oriented to residence and related activities. The Woonerf provides excellent diversity of coexisting functions and modes of transport. However, with the rising affluence, there has been an increase in car ownership and there is now growing pressure to accommodate increasing traffic. The freeways have been modernized but the government has resisted the pressure for immediate action to stimulate only one mode of transport. A comprehensive strategy known as Sustainable Society, which aims at striking a balance between individual freedom, accessibility and environmental amenity, has been initiated.

England

London

As the largest city in Britain, London has been the subject of numerous planning analyses and studies on methods of balancing public transport and car travel. The main constraint on car use has been by strict control of parking supply. Each new building is given a specified maximum number of parking spaces, which consequently increased the cost of parking and has been effective in restricting car use. This approach has also been successful in the cities of Boston, Portland - Oregon and Hamburg.

Switzerland

Switzerland presents an excellent example of the benefits of an integrated intermodal transport system. Most cities have integrated transport system, often with "Park and Ride" facilities for cars and bicycles. Railways and airlines are also integrated so that passengers are able to check in their luggage at railway stations and avoid congestion at airport terminals.

Australia

Australia has unlimited space for urban growth. However, its planning philosophies are based on the British system. Large cities developed strong core centres while suburbs grow around the stations of the railway networks. Low-income groups are located in the suburbs while the middle class and the rich live in the city centres.

Sydney: The City of Sydney is experiencing rapid population growth especially in the suburbs some of which are not adequately planned for. This has led to a growing dependency on the car, which in turn overloads the freeway system and has resulted in the decline of the role of public transport. An Integrated transport Strategy for Greater Sydney has been formulated to ensure urban containment. Emphasis is on ensuring balance between public and private transport, increasing parking rates and concentrating employment and residential developments around city centres.

Sweden

Sweden has along tradition of integrated land use and transport planning. Instead of allowing unplanned sprawl which requires extensive and expensive public transport infrastructure, generating car dependency and isolation of population groups, a number of suburban towns are built around public transport interchanges or stations. Land use activities includes offices, shopping centers and residential developments with medium to low densities surrounding the core. Large traffic generating land uses are located within easy walking distance from public transport. Parking is provided on the periphery of the city, while the city centre is the core for extensive pedestrian areas with many attractions, modern version of old but lively human oriented towns.

Asia

Asian cities have different urban conditions from those found in Europe and North America. Transportation is affected by limited space and this has led to the application of some innovative methods to solve urban transportation problems.

Singapore: a world leader in urban transport policy. People are encouraged to use public transport. The city has introduced a toll system known as the Area Licensing System (ALS) which when combined with strict parking regulations, improvement in the bus service and the rapid transit system, regulates modal split and controls street congestion. The ALS is used a permanent management tool that ensures efficient operation. As the number of cars and congestion increases, the cost of parking and tolls is also increased.

Hong Kong: Due to limited space, the scope for adding more surface facilities for roads is constrained. The City adopted the Electronic Road Pricing (ERP) where vehicles are charged according to the time of the day and corresponding level of demand. Technically the program was successful but was politically unpopular due to the concern about invasion of privacy.

Africa

Cities in the Sub-Saharan Africa are living with the dilemma of a phenomenon known as ‘Informalized urbanization’ which allows cities to grow without a formal economic base with a rise in population of the urban poor and an unemployed. These cities lack the ability to shift resources to areas of priority. Redistribution of resources is not happening in a coherent and sustainable basis. As a result the vision of integrated metropolitan development is failing, and polarization and segregation is being perpetuated (Hall & Pfeiffer 2000).

In most of these cities rapid changes in transportation developments over the last decade have left a traumatic imbalance between new levels of mobility especially private mobility and many aspects of the existing urban fabric and transportation infrastructure. This imbalance has emerged even though levels of private mobility are still relatively low (Barter 2000).

Rapid and sometimes massive urban growth due to immigration from rural areas is common, with newly arriving inhabitants forced to live on the periphery of the city. This is of fundamental importance from the point of transport provision with the poorest having the longest distances to travel to the city center. The lack of mobility of low income people is not due to poor public transportation service or lack of provision but stems from an absence of rational planning which coordinates land uses with transportation networks rather than some inherent weakness of transportation.

Transport problems in cities of the developing world are derived from their history and in particular the rapid leap from “Walking cities to the Rubber-tyre cities”, without the tracked transport that was associated with expansion of cities in the developed world. In terms of geography and history, each city is unique. Therefore, it is unhelpful to generalize the range and form of problems in the different socio-economic and historical context. The transfer of solutions from one city to another may as well cause more problems.

SOUTH AFRICAN CONTEXT

From the 1950’s South African cities followed the international trends in adopting the “predict and provide concept”. This period also marked the advent of apartheid. The apartheid policies capitalized on this trend by using transport network, freeways and rail as tools to separate land uses, enforce social exclusion and fragmentation of population groups.

The repealing of the statutes of apartheid has not removed the effects of its economic policies as the manifestation of inefficiency through the physical separation of land uses and the disparity of standards of services in the cities is still persisting.

In attempting to pursue the dilemma on the transport/land use connection, South African cities have adopted the concepts of corridor development, integrated development plans and frameworks in addition to some of the actions adopted by other cities. The fragmentation in the transportation system is heavily impacted upon by the lack of institutional framework between and within the levels of government as stated in Table. 1.

THE 21st CENTURY CITY

TRENDS

The 21st Century City is a city in a revolutionary state. According to Gruen & Gruen (2001), there are three shifts that are contributing to this state and will greatly impact urban development patterns. These include changes in economic development, globalization and population growth. These shifts will in turn cause urban land use to rearrange themselves into new patterns, which will manifest in the following trends and conflicts:

More Mixed Use Development less Single Use development: Single use developments are likely to become obsolete, with an emerging trend toward mixed – use projects. This is evidenced by the growing numbers of mega projects, casino and leisure developments, and the upgrading major transport infrastructure, such as ports and airports.

Fewer shopping Centres: There will be fewer but bigger regional shopping centres with more diverse uses. There will be no need to drive to shops, shopping can be done over the Internet. Driving or even walking will be over short distances for convenient items. Long distance travel will be to a center that combines business value with entertainment.

More Urban Growth: Due to increased opportunities in technological developments. The city will continue to grow beyond its boundaries.

Polarization and Social Challenges: The widening gap between the haves and have nots presents us with two great social challenges, namely, to create new educational opportunities and a feeling of common purpose in an era of increasing class conflicts.

CHALLENGES

1. Metropolitanization of cities:

City governments will need to reorganize to incorporate new urban growth outside the approved demarcated boundaries.

2. **Continuation and practice of the Predict and Provide concept:** local transport policy making is continuing to be understood and being promoted as a technical process, i.e. adoption of an objectives-led approach and relies on understanding present and future conditions to analyze problems and develop a model which may be used to compare solutions.

3. Lack of Regionalism

If new urbanism is to help cities, it must extend beyond a relatively small number of isolated projects and be incorporated into visions and plans for the entire region. Its concepts must be a part of a broader regional effort that includes public transport, community and open space revitalization.

4. Powers of Local Government

Local governments can't unilaterally shift from car dependency to a more balanced transportation system. Without regional or national government cooperation and investment, train and bus service is not always an option. However, cities have the power to create towns that will make alternatives possible. They can control and channel growth to appropriate directions.

5. Lack of the Big Picture

The causes of transportation problems in cities are more complex than is commonly believed. Many popular short-term solutions to problems when used indiscriminately are counterproductive in the long run. There is no clear picture of what type of metropolitan areas, not only with respect to transportation, but also in terms of quality of life and social relations that the city should work toward.

Assessment of the Relationship of Transportation and Other Activities

The interrelationship should be examined at three different levels, namely, within transportation sector itself, with land use planning and with other urban functions in order to achieve broader development aims.

Transport, as an important part of the overall city planning needs to be considered in the closest possible relationship to land use planning and other activities in the cities. Transport is the maker and breaker of cities because it exists in symbiotic relationship with urban form. The development of the city affects the transportation choices but in turn the transportation systems also affect the city's future development (Hall & Pfeiffer 2000, pg. 262).

IMPACT AND CONTEXTUAL ASSESSMENT

Therefore, it is critical that a contextual and an impact analysis is undertaken in order to determine the relationship of transportation and the other activities in the city. To alleviate urban problems arising from congestion, the impact of transport policies on land use, economic, environmental and social activities and vice versa must be thoroughly assessed and planned for see, Figure 1.

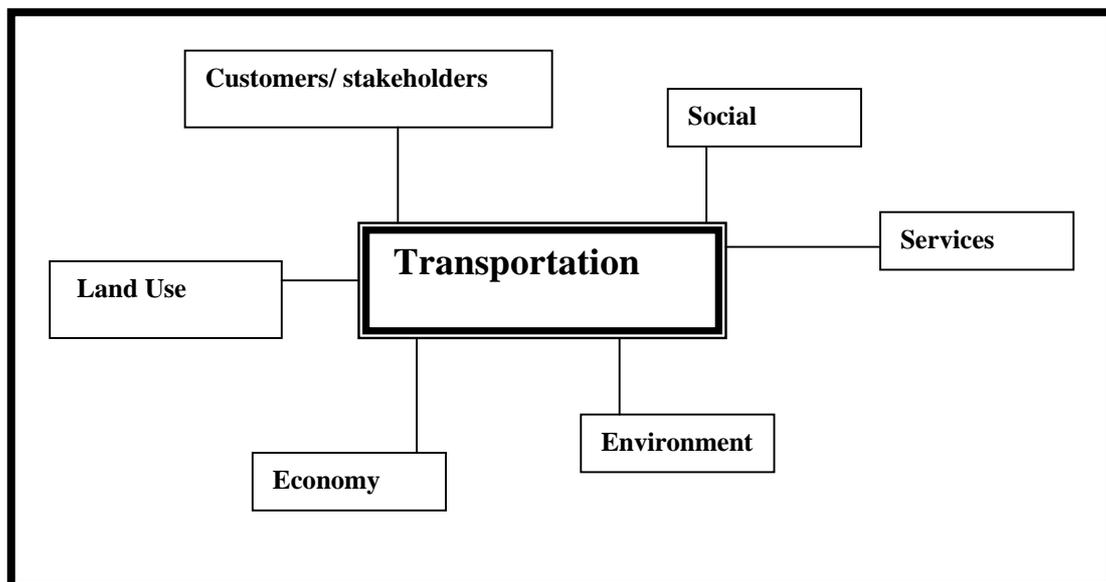


Figure.1. Relationship with Other urban policies

Scenario Planning

One of the methodologies and new paradigms that can be used to assess the impact of the relationship is Scenario Planning. Use of scenario planning at strategic level is new and helps to illustrate the implications of the potential outcomes of aspirations and what this means on the ground. This technique provides a means to explore "What if?" scenarios as alternative options. Without scenario planning, it is impossible to explore some of the trends, particularly the qualitative trends that might influence the direction of growth and development of the city.

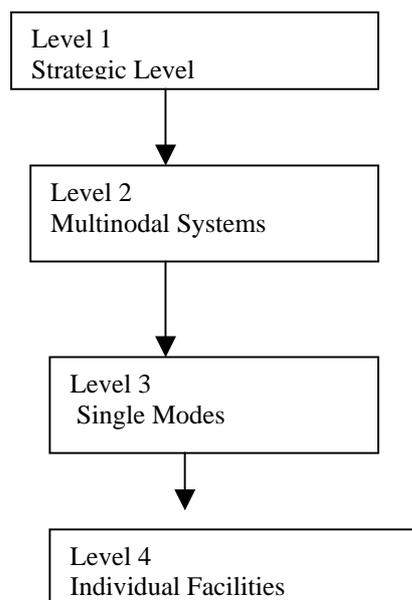
Four Levels of Planning

One of the ways of ensuring that the transport/land use dilemma is addressed at strategic level, is illustrated by a procedure for planning transportation and infrastructure in cities see Figure 2. The procedure can be applied in the assessment of major projects such as ports, airports, transport plans, tourism plans etc.

Level 1: deals with the relationship of transportation with the whole city and the region. This level is where the understanding of the interrelationship and complex relationship that exists between transportation as service function with the other land uses activities is determined. The big picture will also assist in identifying activities that contribute to congestion in cities. To begin to understand the complexity at this level, two key questions need to be addressed, namely, What kind of a City do we want? and what kind of transportation will support the type of City we want? This calls for a better understanding of the vision of the City.

This level of strategic planning requires that relevant actors are brought together and these include government, corporate, economy and civil society. No single actor has the true knowledge, wisdom or ability to shape the city on their own.

Figure 2.: Four Levels of Planning



Source: Vuchic 2002

Level 1: Emphasizes the multimodal systems, the transportation system needs to be integrated with other systems.

Level 2: Emphasizes the planning for single modes

Level 3: Emphasizes the implementation of individual facilities.

In this procedure, it is emphasized that the planning process should focus on Level 1 to ensure that the relationship with the City and the region is analyzed and understood. The subsequent levels should be guided by clear policy guidelines. Current efforts and with the continued application of the Concept of Predict and Provide, are concentrating in levels 3 and 4.

Conclusion

The transportation/Land use connection remains a dilemma for the 21st Century City because of the dynamic challenges that the cities are facing. The conventional wisdom of the 1990s is that the traditional, dense centralized model of cities like Paris and most European models are considered sustainable while the dispersed car oriented patterns of cities such as Los Angeles is not. It should be noted that people in compact cities are still leaving for the suburbs while places like Los Angeles are also moving toward environmentally- sensitive cities.

To find solutions to current problems, it is necessary to treat transportation as a functional system that consists of different modes, interacts with different activities and influences the character of cities.

There is also a need for institutions to proactively avoid focusing on the transportation system itself to the exclusion of its concerns and its role in land development and other related systems.

The diversity among cities and countries in terms of their historic, geographic, social and other conditions points to the need for a variety of actions and solutions to urban problems. Policies and solutions should not be transferred from one city to another without a thorough assessment of its impact in the local context especially the relation of the particular concept at strategic level.

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