Sustainable Urban Mobility

ABSTRACT

Congestion is currently a major problem in urban regions. Experts are predicting that future growth will be concentrated in rapidly expanding suburban cities, further increasing this problem. A sustainable transport plan is essential to ensuring people will continually have the mobility required to access the desired activities that define the North American culture. Introducing new road capacity and promoting low emission vehicles are short term solutions that will not solve the main problem. As the majority of commuters in these regions are car users, even a small transfer of riders to public transit will make a significant impact on reducing the effects of congestion and increasing the sustainability of a region. The term suburbia is quickly becoming an oxymoron, as spawned communities are becoming equals or even more populated than their parent cities. Typical transport patterns into and out of central business districts are being replaced by complex movements between growing suburban industrial parks. The bus, being the most common mode of public transit, has not historically been well adopted by affluent members of North American suburban society. The central question posed in this paper is: **what role (if any) should the bus play in growing North American suburban regions in attempts to develop an inter-urban sustainable transport system?**

Research into multiple urban transport theories has revealed a number of overlapping themes that are relevant to solving this inquiry. In general, people choose their mode of transport depending on cost, comfort, flexibility, and timeliness. The reason the bus is not being well adopted for suburban movement is because it does not create a package of these factors that is greater than what the personal automobile offers.

Recommendations for bus specific policies include public/private partnerships, a province-wide integrated bus payment system focusing on drivers' licences, segregation of bus type to better serve the culturally minded rider and using the growing digitalization trend to improve the timeliness and comfort of a bus trip. It should be noted that an increase in suburban bus ridership will not occur without a combination of supportive policies, such as road pricing, land-use planning, traffic calming, transit priority, parking reduction and taxation benefits. The bus and public transit have the ability to transform congested urban areas into sustainable, vibrant, liveable communities. Some of the challenges to transit oriented development are economic interests, political resistance and a culture of seclusion and greed. An urban area that fails to create a diversity of transport options will be inflexible and therefore dangerously susceptible to global trends that are threatening their only means of mobility.

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1 Introduction

1.1 Background

Transportation has become the major medium for the 21st century mobile lifestyle. Whether by sea, land or air, modes of transportation have historically been influential on the development of countries and their economies. As habitation patterns have grown in the form of dense settlements, policy has been required to efficiently allow for the movement of citizens throughout a city. The movement of people has evolved from one purely based on local movement within confined neighbourhoods, towards an inter-city voyage between suburbs and a metropolis' many districts. Most transit systems designed around a central business district have not evolved to reflect this new pattern of movement. Although it would be better if society's living patterns evolved to be more conducive to public transit, an uplift of current infrastructure or culture change is improbable. Decisions must be made acknowledging the faults of this lifestyle, limiting its 'crawl' and working with it.

A sustainable urban transportation system is complex, encompassing a myriad of interconnected variable factors. Some aspects are more important, and some are dependent on the success of others. The success of transport policy is also variable depending on location and environment. Many of the successful transit systems around the world can be attributed to vast amounts of resources and novel technology. As transportation is one of many resource intensive public services, it continually competes with other interest groups for funding to develop. Ensuring significant funding is crucial to develop a sustainable transit system. Although inexpensive modifications can be made to improve the service, any large-scale significant change will require the availability of public resources.

1.2   Modal Focus

Due to its large capacity and low per passenger fuel use, the conventional bus is the most energy efficient transit medium. Other than cycling or walking, "the bus is the most efficient public transit mode being some three times as efficient as rail" (Banister et al., 1992, p.167). Whether fuelled by supposedly environmentally-friendly sources such as bio-fuels, or through dirtier sources such as diesel or gasoline, a well used fleet of buses will remove an immense number of polluting, congestion causing cars from the road. As congested city routes slow the movement of trade and increase the amount of pollutants in the air that harm humans and the environment, increasing bus ridership is an essential step towards operating a sustainable urban transportation system. "Transit can enhance destinations, helping to create community places by supporting existing spaces, as well as providing a place for new activities and services" (TRB, 1997, p.22). System routing also has a strong impact on business profitability and property values. Depending on frequency and proximity to a stop, property values can appreciate while increased foot traffic around stores and shops can help generate sales: "By alleviating traffic pressure on streets, transit can help make an area more attractive and pedestrian friendly" (TRB, 1997, p.36).

Light rail transit has been argued to be the better option than rapid bus service in the long term; however, many small to moderate sized cities can not afford the larger capital, maintenance and operating costs. Rail also requires more in-depth planning because of its large investment and inflexible infrastructure requirements. The involvement of numerous stakeholders and the short-term nature of a politician's office tenure make rail development slow and difficult. Modern transit theory touts "the use of more flexible systems of public transport (principally the use of busways and Bus Rapid Transit), as they are much cheaper and more flexible in their operations" (Banister, 2005, p. 201). As increases in total travel have taken the form of more, but

shorter trips, the bus has the greatest potential for meeting these new needs (Hanson & Giuliano, 2004, p. 33).

1.3   Geographical Focus

In dense urban areas where multiple modes of transportation are not available, buses are usually adopted well. A problem often experienced in these areas is a lack of resources (both human, and financial) to increase capacity to meet demand. In the Western World, the typical city structure has changed drastically over the past fifty years. Cities in North America which had vast stretches of land and resources, developed their communities and transport systems around the automobile. Accompanying this has been the exodus of citizens from urban centers, producing a spread-out type of city living that is not conducive to efficient bus travel. "Over half the population of the world lives in urban areas (over 25,000 population), and this number is likely to increase to 70 per cent by 2020" (Banister, 2005, p.10). Focusing on congestion-free low density rural areas that exist at the fringe of cities will not make an impact on the sustainability of urban areas.

For a bus system to be effective, a dense population of frequent users is needed to financially support its operation. "The built form of the city dictates the overall demand for transport" (Breheny et al., 1992, p.142). "Journey trips to urban cores are now a small proportion of total work trips in most cities. Most commuting now takes place from suburb to suburb" (Breheny et al., 1992, p.146). The term suburbia is quickly becoming an oxymoron as these communities are becoming co-equals to their parent cities by attracting businesses and growth away from deteriorating downtown centers. Research has shown: "smaller cities have higher, not lower, car travel" (Breheny et. al., 1992, p. 173). This means that these smaller cities that are proliferating rapidly are less efficient and therefore have the potential for the greatest

improvements. For a present day public transit system to be effective it must include a focus on inter-suburban movements.

1.4   Target Market

North Americans are among the leaders in fuel consumption, as they have the highest percentage of single occupancy drivers and the lowest number of walkers, cyclists and public transit users in the developed world (Hanson & Giuliano, 2004, p.216-224). In order to make a significant impact on sustainable transport, it would be logical to focus then on the largest, least-efficient segment of society. A small increase of public transit usage in North America cities would generate noticeable benefits. The culture here has embraced the philosophy that: "free roads, free parking, cheap petrol and universal, cheap driver licensing are viewed as a natural right" (Banister, 2005, p. 153).

When focusing on policy that will be effective at increasing bus ridership and the sustainability of a city, it is important to focus on the largest segment of the public which are not taking the bus. There is currently a large divide of income between different segments of the population. Those in poorer income brackets must take the bus out of financial need. The very wealthy have their choice of travel medium, usually opting for car travel, and generally live in remote areas that would never support buses and are not transit supportive. Cycling and walking are the most efficient modes of travel but encompass only a small percentage of the suburban modal split. Those with special needs who require a much different degree of service should also be excluded from 'mass' transit improvements if the bus is to become efficient enough to compete with the automobile. Existing publicly run services that operate specifically for individuals with special needs rather than the public would be recommended to best serve this smaller market.

The majority of drivers on congested urban roads are assumed to be classified as the upper lower class to the lower upper class in North America. These would be the drivers who travel large distances on highways to work their '9-5' jobs while additionally requiring extensive recreational mobility after work and during weekends to spend their disposable incomes. It should be noted that "work and business-related activities account for under 20 per cent of all activities (but 29 per cent of travel distance – 2002), yet most analysis still concentrates on these two activities" (Banister, 2005, p. 211). By focusing on middle-class suburban automobile drivers, transport policy makers have the best chance at improving the sustainability of cities.

1.5   Central Question

There are a number of areas to examine when considering why the bus has not been well adopted in North America. Examination into factors such as the pre, present and post bus experience as well as possible cultural and financial factors should reveal information on its low usage. Transit use can also be segregated into ride-purpose, such as for recreational or business. Since congestion caused in major cities is attributed to the commuter traffic by typical blue or white collar workers before and after work, it is important to focus on why the bus is not adopted as a means of travel. The central question this paper will address is: **What role (if any) should the bus play in North American suburban cities in attempts to develop an intra-urban sustainable transport system?** To attempt to answer this inquiry, assumptions will need to be made on the following supplementary questions:

1. Why has the bus not been adopted well in suburban areas?
2. What are the critical factors that contribute to an effective bus system and how can they be transferred over to develop a sustainable transit system?
3. Where have there been cases of effective systems?
4. What are successful regions doing right and what are cities with similar characteristics doing wrong?

2   Anticipated Findings

This inquiry focuses on an intense meta-analysis into related literature and an examination of case studies to attempt to answer the central question. Solutions to the supplementary problems will be considered in an attempt to mitigate current issues and capitalize on potential opportunities, in order to create a sustainable suburban transit system. My original hypothesis is that the lack of 'comfort' during travel periods and the inconsistency, unreliability and length of time spent during travel are the key factors contributing to the underuse of transit systems in North America. The initial analysis would be that Bus Rapid Transit (BRT) services that provide for more reliable and quicker travel could solve the problem of unreliability. Since 'comfort' is part cultural and part systematic it is difficult to define and therefore very hard to address.   It should be noted, that although popular research emphasizes that city-suburbs should be more like large cities, they are not. One could hypothesize that radical changes will generate harsh public opposition. In some cases, what seem to be minute alterations that are acceptable in some locations may be rejected in others. "Great cities are not like towns only larger. They are not like suburbs only denser" (Jacobs, 1961, p.30). Suburban cities are unique in their own and requiring more focus and customized policies.

2.1   Assumptions

There exist many global trends that have and will continue to directly affect the success of buses.   Climate Change and Peak Oil can drive gasoline prices high, thereby heavily encouraging drivers to choose public transit.   Technological advances in bus technology may eventually eliminate problems of emissions, or evolve the bus into a more attractive product. Although many of these changes would be welcomed by bus advocates, their anticipated occurrence should not be cause for in-action. Global trends and their corresponding societal

reactions are unpredictable. Action needs to be taken now on strategies that can be implemented locally to encourage ridership. Waiting for change removes power from a decision makers hands.

Although increasing public transit is important to developing a sustainable transit system, there are multiple external factors that need to occur concurrently for policies to be effective. Cultural views of public programs, road pricing, traffic calming, tele-working, mixed-use zoning, financing, environmental considerations and population density are all examples of areas that require attention before any recommendations stated here can be effective.

3   Research Findings

The attempt to create an efficient transport system is not new. Although not initially referred to as sustainable transit, many studies have been conducted on methods to improve transport systems. Researchers have examined many types of travel, determining percentages of trips taken per medium, by whom, when from where and for what reason. Focus groups have been surveyed to determine riders' thoughts on travel. This section gives a brief overview of the scientific community's consensus regarding why people do not take the bus. The following are general findings into what affects a person's modal choice in no particular order.

3.1   Comfort

Comfort is a broad term used to encompass the general satisfaction experienced during a trip. Aspects can include a person's emotional state, their physical needs and their reaction to the surrounding environment. Comfort levels will differ depending on each person, and are relatively inflexible. Creating a universal policy to address comfort levels is very difficult, if not impossible.

3.1.1 Cultural Perceptions

Social perceptions, although often wrong, are very powerful motivators for human interaction. Regardless of truth, a person's perception on how their actions will be judged has influence on their comfort using a travel medium. This applies to buses and public transit with the negative connotation that some people have regarding those that ride the bus. A popular prejudice is that only the poor take the bus. This brings in many racial connotations, as in many inner cities, racial minorities encompass a large proportion of the lower class. A study in the United States found that African Americans and Hispanic Americans together accounted for 62% of all bus riders, while comprising only 20% of metropolitan house holds in 2001" (Hanson & Giuliano, 2004, p. 212). Popular thinking is that if a person has enough money, they would drive. Often overlooked are the increasing population that take the bus because of the environmental, safety or social benefits involved with bus travel. Regardless of the validity of negative perceptions, they are powerful deterrents to ridership and are not easily changed. Forms of public transit such as the high-speed train which charges a larger amount of money for 'first class' tickets, is an example of the exception to this rule. To attract the suburban traveller, it is essential to understand their cultural opinions and cater to these misguided but influential perceptions. The act of using transit must adapt so that society perceives it as being a comfortable option. By delving deeper into the problem, it is perhaps the concept of 'having' to take the bus, with no control or choice, which is perceived negatively. By generating a cultural belief that some 'choose' to take transit because they can afford it or are concerned with the environment, would produce positive intrinsic rewards for riders.

3.1.2 Physical Features

There are multiple features of a bus's physical structure that contribute to the success of a comfortably experienced journey. The ride portion of a traveller's bus experience begins when

someone first steps onto the bus until he or she exits. During this time there are a number of factors that can influence the enjoyment of that ride. The functional environment such as the comfort of the seats or the usefulness of hand rails are usually a standard factor for any trip on a bus. Improvements can be made with increases in funding, but it is important to note that what might be comfortable to some, will be uncomfortable to others. The affect of physical sensations felt by riders vary depending on each person, but will strongly affect the enjoyment of travel. These sensations include factors such as the smell of the air, the temperature of the interior, the sights witnessed or the sounds heard while riding a bus. It is unlikely that a very noisy, loud, smelly or uncomfortable bus will be adopted well in any area where there exists a choice for an alternative travel mode.

3.1.3 Human Interaction

Depending on a person, human interaction on a bus can be seen as a positive or a negative aspect of travel. For the friendly-minded, more social rider, the bus can be seen as an enjoyable experience to meet new people. However for anyone who has ridden a bus lately, the majority of people tend to keep to themselves with very little speech between passengers. Many automobile drivers enjoy the time they spend commuting as it may be the only time they have to themselves throughout the day. Although it would be difficult for the bus to replicate this, it can provide a comfortable atmosphere that might appeal to a large portion of the public.

It is important to remember that with any organization, a customer's opinion of a business will be most clearly defined by their interaction with the front line employees. In the bus's case, the driver is the 'face' of public transit. In Toronto, TTC advertising campaigns that appeared on TV and in transit terminals in 2005 included human interest stories of bus drivers that have gone 'above the call of duty' to help passengers in times of need. This interaction is

symbolic of the actual product that is being sold. A friendly driver who is educated in emergency health services, or who can be flexible depending on a riders needs is representative of a desirable bus system meant to make its passengers comfortable. It is therefore very important that transit companies attract and train their employees accordingly, to represent their company and its service. Un-satisfactory drivers can ruin a rider's impression of the service.

3.1.4 Emotional State

Perceived safety is a concept that is important when considering a customers mental capacity to make an informed decision. If users feel unsafe, this can cut ridership by 10 to 15%, even if objective levels of security remain constant (Mezghani, 2007). Whether it is while waiting for a bus or after getting off at a stop, many people are afraid of a long walk by themselves. Although this can be mediated by transit programs that encourage driver/passenger communication for drop offs closer to a person's destination point, it can never put a worried passenger's mind at ease. The automobile is usually perceived as safer due to its ability to deliver its user as close to their destination as possible. There are however often unperceived threats, such as dark parking garages, car-jackings and the fact that unlike public transit, drivers are usually alone in their vehicles. One may believe that these unperceived safeties in addition to the extreme dangers of frequent automobile accidents should be enough to convince riders that the bus is safer, but this is often not the case.

3.2   Control

As the automobile offers its users the ability to go anywhere (dependant on roadway capacity), drivers have a high level of control. The bus is more structured and usually follows specific routing patterns with little room for deviation. As many travellers desire the flexibility to make alteration to their daily schedule, the automobile provides them with the ability to make

quick changes. Although the structure of the bus offers other benefits (better communication so as to avoid traffic, priority over other vehicles, stability in bad weather conditions, etc.) the control and flexibility the automobile offers is influential in a commuter's mode selection.

3.3   Cost

In terms of cost (price) the economic concept of supply and demand can be applied to a consumer's decision (demand) to travel. Supply refers to the travel options that are available to a consumer. If transit is the only viable option and travel is deemed a necessary service, as long as a consumer has the ability to pay, they will travel on the bus. However, in suburbia where the supply of automobile mobility is high, willingness to pay for transit is low.   This economic principle breaks down when the total costs of driving are higher than public transit, and yet automobile travel dominates. In much of the United States, people pay more for transportation than for clothing, entertainment and health care combined (Hanson & Giuliano, 2004, p. 83).   If money has already been spent on fixed costs (auto purchase price, car insurance), a consumer is often tied down to the use of their automobile, and only with a strong increase in variable costs (gasoline and insurance) can a consumer be convinced to use another mode of travel.   In economic terms, the customer's elasticity of demand to bus cost is low; meaning a change in transit fares will not reflect a change in consumer habits.

Recent economic analysis in the field of transportation has focused on the instability of fuel supplies. As gas prices rise and supply becomes increasingly unstable, commuters are more likely to transfer over to cheaper modes of transport. Actions such as an increase in sales for environmentally friendly vehicles may be a positive environmental step but reductions in emissions alone will not solve the urban transport problem.   As congestion affects the environment, society and the economy, the attainment of a secure fuel source or the elimination

of harmful emissions will not solve the core problem of providing sufficient mobility in urban centers to maintain an acceptable quality of life.

3.4   Timeliness

The faster the mode of travel, the more likely a traveller will want to use it. In cities where congestion clogs major routes, transit with priority over local traffic is well adopted because it is the most efficient mode of travel in terms of time. If the current suburban form created around the automobile is not altered, the bus will never be the quicker mode of travel. If densities increase and policies are issued to support transit, this may change. If connections are established to high-speed express rail or rapid bus corridors, transit will be a viable option in terms of timeliness for commuting.

4   Case Study Analysis

Public Transit "does not prevent congestion, but it does allow more travellers to avoid congestion, and may cause a blip on the traffic growth curve. Some European cities have achieved more than that, and slowed or even reversed the growth of traffic" (Breheny, 1992, p. 206). There are many assumptions as to why European and other international cities have experienced large success in the field of public transit. One of the more popular theories centres on a transit culture that is more focused on community than the individual. Although this may be true, it is important to review other factors that have influenced successful systems in attempts to duplicate their successes.

Transit systems can fail for numerous reasons. The purpose of researching ineffective case studies is to learn from mistakes, and identify areas for improvement. When examining case studies it is important to look into areas independent of population density, since it is not

something that is easily controllable.   Low ridership or percentages of population would probably be better indicators into faltering transit networks as they are independent of population.

4.1   Los Angeles, California

A classic example of the bus' failure is the city and surrounding suburbs of Los Angeles. In the 1940s several streetcar lines which served the denser areas of the city were acquired by automobile related manufactures and shut down to eliminate competition (Safdie, 1997, p.126). "Today (1997) there is currently no public transportation other than an extremely limited bus system, one 19-mile and one 4.4-miles stretch of subway" (Safdie, 1997, p.126).   Zoning requires that for every 1000 square feet of office space, 1300 square feet of parking is required. Population density in most of the city is very low with distinct separations of recreation, work and living areas. Traveling in L.A. without a car was described by Joel Garreau as "like going to Venice and not hiring a boat" (Safdie, 1997, p. 127).

Recently the city of Los Angeles has attempted to improve their situation with the building of the Metro Rapid bus service. Buses run in mixed traffic and benefit from wide spacing between stops and priority traffic signals that turn green for approaching buses (Hanson & Giuliano, 2004, p.231). The system runs faster than regular buses, is more frequent, and has increased ridership since it opened in June of 2000. Unfortunately automobile travel still dominates over all other modes of travel, and the bus is non-existent in most suburbs

4.2   Curitiba, Brazil

Curitba is a city of approximately 1.6 million that has over 75 per cent of commuters using public transit despite car ownerships levels being higher than the country's largest city of Sao Paulo. Although the culture of this South American city is quite different from any in North America, there are still some valuable lessons to learn from their success.   There are 65

kilometres of dedicated express busways along 5 routes. The bus system is privately run and is self sufficient, requiring no subsidies. They have multiple types of buses designed differently for a variety of purposes. Small buses operate in low-density areas and feed into express high-capacity bus corridors. Other buses act independent of the city center and service settlements lying on the periphery of the city. Population has intensified along express bus corridors, creating favourable land-use patterns. Over 90 per cent of the city is accessible by the bus network, there is a flat fare system and "Smartcards" are now being used to simplify monetary issues. Although the intricate system of bus-only high-speed road infrastructure may not be plausible in already established North American communities, there are some features that can be replicated to achieve similar results:

- There is a multitude of different buses to serve the different types of communities.
- A central artery with bus priority was created that allowed express travel into the city, and population density increased around its transit nodes. This exemplifies a government that gives priority to transit.
- Privatization without subsidies occurred successfully.
- A city with a population of 1.6 million with high automobile ownership rates, has the potential to sustain a vast effective public transit system
- Government supported system with land-use policy controls produced favourable results

(Bannister, 2005, p.198-199)

4.3   Portland, Oregon

Portland, Oregon, has gained an international reputation for innovation and are self-consciously attempting to slow suburbanization by emphasizing investments in transit rather than in highway capacity and encouraging clusters of dense and mixed-use development (Hanson & Giuliano, 2004, p. 153). Since the 1990's they have invested into light-rail trolley lines with sustainable community policies to better integrate transit into the city. "Pioneer Square in Portland, Oregon, is one of the premier examples in the country where transit is integrated into a public square known as "Portland's Living Room" (Transportation Research Board, 1997, p.22).

Planners adopted land-use models that focused on larger modal choice options, travel times, monetary costs and other non-standard household attributes (Hanson & Giuliano, 2004, p. 135). It should be noted, that although transit oriented development has worked in areas such as Portland and San Diego, it has faltered in areas such as Oakland or Buffalo, due to external conditions such as population characteristics, crime, economic potential, aesthetics and competition (Hanson & Giuliano, 2004, p. 269). Portland's example demonstrates that good transit policy can improve the overall health of a city.

4.4   Oxford, UK

Oxford is a city of 134 000, which in 1993 developed a transport strategy to "achieve significant environmental improvements in the city centre, whilst allowing continued growth of the city centre economy" (Bannister, 2005, p. 121-122). By controlling parking, providing for cycling and walking and allowing for bus priority at signals and on radial routes, they achieved reduction in traffic flows in the city centre by 19 percent. Buses in particular increased in usage, although maintained their same level of percentage in the modal split (Bannister, 2005, p. 121-122). A key theme from this case is that with small improvements and a committed government, increases in bus ridership is possible.

4.5   Zurich, Switzerland

"Zurich is one example where people are now giving up the ownership of their cars in the city, as they do not need it because levels of accessibility are high and public transport is excellent" (Bannister, 2005, p. 78). Just like many other European cities, Zurich has a historic past, a cultural downtown core and favourable transit and land-use policies. Unlike many other transit systems, Zurich implemented a series of low cost transit priorities to give preference to public transit. The result is a city with some of the highest rates of transit usage with almost

twice as many trips taken on average than Europe's largest cities. The preference given to transit allows for fast, reliable transport to anywhere in the city at any time. A series of lines throughout the city are integrated into one network, allowing for the seamless transfer of riders between routes. Driving levels are low since transit is usually the fastest mode of travel. Problems with implementing a system such as this are obtaining the space requirements necessary for bus only lanes as well as the social acceptability of sharing the road with transit (Mineta Transportation Institute, 2001).

5   Discussion of Research Results

A large body of research supports the claim that "a fundamental conflict – a misfit – exists between the scale of cities and the transportation systems that serve them" (Safdie, 1997, p.4). The focus of this section is to extract what core competencies public transit can capitalize on, identify weaknesses to be corrected, and focus on unwanted aspects of automobile travel that could convince consumers to alter their travel patterns. Some of these items include traffic jams, high costs of car maintenance, unreliability from breakdowns and a higher risk of fatal accidents. In order to best attract commuters, an understanding of what is actually being sold to a customer is essential.

5.1   *Mobility vs. Accessibility*

When trying to improve any transportation system, the goals of mobility versus accessibility must clearly be defined. Mobility refers to the ability to move between different activity sites, while accessibility refers to the number of these sites that are available within a certain distance or travel time (Hanson & Giuliano, 2004, p.4). Both are dependant on the built form of a city. Better accessibility can be achieved through efficient land use planning while mobility, although often desired by the public, is not always a good thing. Excess mobility has

allowed citizens to live in distant communities as the automobile still provides access to desirable activity sites. "Americans have more mobility, particularly the kind that is provided by motorized vehicles, than anywhere else on earth" (Hanson & Giuliano, 2004, p. 19). Some even think that too much mobility has led to problems in social health. "Hupkes suggests that, beyond a certain point, extra travel might generate bio-psychological stress" (Hanson & Giuliano, 2004, p .92). While accessibility is important, mobility is what the bus provides.

In order for a bus to be able to compete with other travel modes, the mobility it provides must at a minimum meet the needs of suburbanites. Although an optimal strategy would be to reduce the mobility of the automobile, it would likely be politically impossible. Efforts should be made to increase the bus' ability to move people between different activity sites while a moratorium is placed on policies that would further increase the mobility of the automobile. New roads and freeway expansion projects increase the mobility of highway travellers, but do nothing or even hinder the success of other modes of transportation. Only with increases in public transit mobility can potentially everyone living in an urban area benefit.

5.2   Social Factors

Multiple authors have researched modal movement problems for over 30 years, trying to identify reasons why the bus is not well adopted. Although authors differ on the importance of each of the causes, they agree in general as to a number of personal factors affecting transit ridership. These are: (1) financial: it is perceived that it is more cost effective to take other modes, especially the automobile; (2) comfort: other modes offer a wider variety of comforts, while the environment and the atmosphere of a crowded bus is detested; (3) flexibility/control: the automobile offers the ability to change direction to another destination instantly if the driver so chooses; and timeliness: with current North American infrastructure, it is quicker to travel by

automobile rather than any other form of transport. Although many would argue the exact naming and ranking of these categories, they generally define the reasons why the bus is not well adopted in North American suburbs. The question then would be to ask what societal factors are deterring the increased adoption of public transit?

5.3 *Population Density & Urban Form*

Researchers have identified a plethora of reasons why bus systems are not being well adopted. By gathering data on trip generation, trip distribution, activity forecasts and mode choice, researchers are able to determine what societal factors influence a person's travel patterns. The most emphasized and agreed on aspect would be a city's built form. Population density and transit unfriendly zoning has created a suburban street form which is not conductive to conventional bus travel. Positive policies that encourage public transit and discourage single-occupancy automobile usage such as road pricing, transit tax benefits and parking spot reduction are not being used effectively or are absent altogether. Policy and a city's built infrastructure must properly reflect an ambition towards creating a sustainable city before improvements can be made. Assuming that a suburban or "edge" city is committed to becoming sustainable, the following are recommendations on designs that can improve the built form of troubled cities.

There is much debate into which theory of urban planning is most efficient. Although many experts tout that a compact city with a large population density is essential for good public transit, it is not always the case. "Evidence from the ten largest urban areas in the United States shows no easily identifiable relationship between urban population size and modal choice." (Banister, 2005, p.105). The debate for the compact city is that "higher densities would result in the maximum use of land, reduced travel distances, and a greater intensity and diversity of activity" (Bannister, 2005, p.98).   Although urban areas promote shorter travel distances,

massive congestion slows mobility tremendously. Research carried out between 1983 and 1998 in the United States showed that in some cases a polycentric route network performed better than most of the traditional central business district (CBD)-focused systems, with larger increases in ridership per capita, more passengers per vehicle, and lower operating costs per passenger mile" (Hanson & Giuliano, 2004, p. 226). Rural 'small-town' areas with very low population densities are absent of congestion, however long trips are required using excessive amounts energy to travel to desired activity sites. "Rickaby concludes that either the concentrated nucleated settlement or the disperse nucleated (village) settlement patterns are the two most appropriate urban forms if energy use and accessibility are considered" (Breheny et al., 1992, p.174). Trends suggest that the "urban form generally is moving from monocentric structures to polycentric structures" (Banister, 2005, p.99). Medium populated cities (such as typical North American suburbs) have potential for operating with the greatest efficiency. "Modest concentration of development into local centres within the hinterland of the existing city both saves fuel in transport and improves accessibility" (Breheny et. al., 1992, p. 174). By directing population growth into existing suburban corridors, with access to high-speed transit that connects communities to various city centers, these medium sized cities can develop into ideal urban models. This solution would maintain overall city densities, favour public transport, and would provide for the suburb-to-suburb movements that are neglected by most transport system. "The provision of good public transport systems serving suburban centres is crucial to the approach" (Breheny et al., 1992, p.149).

For any success, it is essential to adopt policies that discourage single occupancy automobile travel and encourage transit usage. As Jane Jacobs said regarding public transit: "in a really healthy city, (public transit) is something that knits the whole thing together …"

(Transportation Research Board, 1997, p.7).   A common theme in either of these settlement patterns is a need for a certain degree of population concentration so as to financially support a public transit system. "With increasing population density, the proportion of trips by car decreases, whilst the proportion of trips by public transport and foot both increase" (ECOTEC, 1993).   Although thoughts of a truly compact suburb are ideal, they are not always plausible in the Western World. Due to a large division of wealth, there will always be some that prefer and can afford to live on spacious properties secluded from others. "While much of the public might agree with the idea of developing a fast, convenient mass transportation system to supplement road travel, few would actually support any policy that appeared to limit their ability to use their own cars" (Safdie, 1997, p.124). Providing corridors for concentration to intensify around would be conductive to buses that can travel along main streets so as to reach the greatest amount of citizens. This would require the intensification of suburban population along a central artery that would be able to efficiently serve the populous.

5.3   Movement Analysis

Even for cities that have bus-friendly transit policies, there are still measures that can be taken to adjust to the evolving form of suburban interactions. Transit investments generally focus on a central city in a region and so will not meet the needs of new forms of travel which would require geographic equity (i.e., spreading the money around all areas within the urban region) (Hanson & Giuliano, 2004, p. 123). "It is essential that we plan rapid rail and traditional or automated highways to link existing and expanding centers, and to no lesser extent, that we use these transportation systems to guide new development that is sensitive and appropriate to its location in the region" (Safdie, 1997, p. 120).

6   Conclusion

"The public will respond where public transport works for them" (Bunting, 2004, p.6). Assuming this statement to be correct, the logical solution would be that buses in North America's suburbs are not perceived as a feasible solution to a resident's transport problems. Whether due to external factors such as land-use planning, financing, political influence or cultural biases, taking the bus does not fit well into the lives of those who should be using it.

Just as original cities were too dense and overcrowded leading to disease, so are suburbs being too spread out and teaming with depression. "Transit lines are incapable of serving even a significant minority of the increasingly dispersed travel demands in the low-density, automobile-oriented outer suburban city" (Hanson & Giuliano, 2004, p. 83). Diversity is a feature that is essential to most systems around the world and yet is absent in the suburbs. In science or physics, various forces are required to balance out any system. The design of an urban form should follow this basic law of nature if it is to retain balance or functionality. Many suburbs are unsustainable because they are all one type of housing, income level or environment. A sustainable community would be one that encompasses a variety of living patterns to respond to the natural diversity of nature and humanity.

When improving a system it is usually not a matter of which policies to use, but at what combination to provide a financially efficient and effective service to the public. As stated earlier, it is not more mobility that people want, but access to the activities that define their daily lives. Although this is dependant on the success of factors that are not easily controlled, there are still things the bus can do to persuade travellers that transit can "work" for them.

7   Recommendations

Radical approaches to solving transportation problems are not plausible since a deep routed societal culture is not going to change overnight. In North America "mobility is essential to current lifestyles and the patterns of production and consumption" (Bannister, 2005, p.8). Development is the leading principle of Western societies and therefore needs to be allowed to grow sustainably such that it results in "non-negative changes of social welfare over time, with social welfare being made up of two correlated components, namely the consumption of man-made products and services and the consumption of environmental amenities" (Breheny et al., 1992, p.143).   Any recommendation must be beneficial not only to the public and the environment, but be financially viable as well. "Sustainable urban development can only be achieved through less travel and better travel… people and firms should be given the opportunity to travel less rather than being 'forced' to travel further" (Bannister, 2005, p.8). Changes can be made that will not negatively affect the economy while improving services to the public.

If public transit is to be successful, taking the bus needs to be more than just transportation from point A to point B. By capitalizing on current trends and emulating the benefits that driving offers, the 'experience' of transit travel can be used to attract the public. As stated earlier, if the car is to be the benchmark for service, than there is a need to redefine exactly what product is being sold to the client. Improved cost and timeliness are possible with technological innovation, better funding and supportive policy. The automobile's control and comfort are what bus passenger's lack. If control was transferred over to bus transportation, the real product being sold would be more that of the flexibility to choose where one can go, how they are going to feel, who they are going to be with and what kind of environment they will experience. There have been attempts to provide similar services in the past, but the following are some further ideas on how to accomplish this goal.

Just like any other efficient business, services sold should attempt to make the experience as enjoyable as possible to the customer, with as little effort needed on their behalf. This means that difficult purchasing modes, long wait times, and inconsistent arrival times should be eliminated. Similar to auto travel, the bus needs to offer options. Just as other products sold in a free market, the experience offered through bus travel can vary along with variability of price.

7.1   Bus Segregation

7.1.1 Culture Class

While workers from the general public crave the mobility that a personal automobile offers, other markets often desire different qualities. While a common driver desires mobility and cost effectiveness, a wealthier traveller may not care as much about price and place a high value on comfort or freedom from driving so they can focus on other tasks. Up-scale customers may also put a high value on riding with others of similar status, while riding with so-called 'common' passengers would reflect badly on their reputation or status. In the case of travel mediums such as rail or air travel, a "first-class" section allows customers that put more emphasis on service and status to pay for these amenities. An application of this pricing strategy to local bus travel, would be to create a first-class bus, which charges higher prices and possibly requires pre-registration to offer all the things a "cultural business person might require". Pre-registration would allow planners to create efficient routes that went door to door, similar to the "yellow school bus" service of some elementary schools. Business needs such as, laptop plug-ins, telephone or internet access and work stations would allow the workaholic to make better use of his/her time. Radical ideas such as a coffee bar or a bus-steward to ensure comfort would increase the price of travel but simultaneously create an environment that would attract this type of customer. The service would reflect all the features from a limousine and first class air travel

and apply them to multi-occupancy local travel. The physical structure of a bus could also be moulded to reflect the exclusive atmosphere of this exclusive bus. Windows can be tinted or covered with curtains, with modified limousine-type seating. Seating may be lowered, and possibly sectioned off to capture the secluded nature of the automobile. If the leaders of major businesses were give free passes to the limo-bus, employees anxious to network with bosses and other influential people would be lured into registering for the service.

7.1.2 Paratransit

When a product enters the maturity stage in its growth cycle, there is need for diversification or modification so as to "re-invent" itself to assure its continuance in a market. Just as many companies diversify their products to reach new or to better serve current markets, the bus can do the same. There is no use sending a high capacity bus into low population density areas. By following the case studies of Curitba, smaller buses that are more manoeuvrable in suburban towns can be used to more efficiently serve residents. "Downtown circulators and shuttles are another strategy used to enable shoppers, visitors and office workers to move more freely about the central business district, thereby contributing to downtown economic vitality and reducing traffic congestion" (TRB, 1997, p. 36). "Paratransit is the term normally given to innovative services that operate outside the regulated fixed route services, and provide more flexible transport, mainly with minibuses" (Banister, 2005, p.203). A diverse bus fleet will also allow cities to adapt easier to land-use changes.

7.2   MOBIL-ID

If the bus is to be seen as a business, and new customers are to be attracted from other mediums, the question would be: where is the largest potential source of new customers? The answer would obviously then be drivers. As outlined in the introduction to this paper, the single

occupancy vehicle is the most inefficient form of travel. It will be essential for any effective policy to capture this target market. Although current users of public transit and those that use more sustainable means of travel such as walking or cycling could also adopt new bus services, the driver is the largest source of potential income and causes most of the problems.

In Ontario, the one thing that all drivers have in common is that they all are required to register and carry a driver's licence. This commonality is the essential key to capturing this market. Problems from previous public transit systems include intercity travel, availability of change and the public awareness of the service. A driver's licence that was converted into a 407/metro pass type card would solve many of these problems. The payment system imitates the structure of an automobile where charges are not felt over the short term but over the long term with monthly payments proportional to use similar to that of drivers who use the 407 Express Toll Road. One of the advantages the car has over the bus is that its fees are spread out over a longer time period, with a large portion of the cost (the purchase price or insurance) being fixed, so drivers tend not to quantify the true value of its usage. Under this new system the perception for entering a bus would be that it costs nothing, or generates a stigma that riding the bus is saving them money. If combined with income tax rebates, commuters would become more aware of potential savings. The card would be provincially run and be applicable to all municipalities so as to reduce the barriers of intercity travel. Once owned by a citizen, the card would constantly attract users to the bus as they would always perceivably have a "free pass" to jump on a bus whenever they wanted.   The system should also reflect the idea of a societal shift away from "driver" towards the actual mobility that people inherently want. One possible marketing name for this all encompassing card could be "Mobil-ID" - providing multiple options for your transportation needs". It would reflect the need for mobility while concurrently

providing the official identification that a driver's licence has also come to represent. The introduction or conversion of the card could also motivate those that are not registered to obtain cards and provide valid verification for non-drivers.

The potential marketing data from digitalizing these cards is also tremendous although slightly controversial. Being able to track a person's daily movements and habits can better transform routing, scheduling and systems planning. This will not only make the transit faster and more efficient for the consumer, but cheaper for providers. This plan targets many stigmas of the automobile as it distances a perception of payment for the customer, generates marketing data to provide better service, facilitates better cross boundary cooperation and attracts non-users of public transit. Success will depend heavily on a well planned advertising campaign as well as proper funding for capital costs to convert licences and bus systems. Although initially costly, a province wide transportation network will produce benefits over the long term.

Recently, the Greater Toronto Area developed a solution to cross boundary transit problems called the "Presto Card". The card which is in its introductory stage will allow users to pay to board any transit system in the area as well as the light rail provider 'Go Transit' (Presto, 2007). Although this is definitely a step in the right direction, it fails to focus on the other key aspects of a sustainable transport. The Presto does not target specifically the single occupancy automobile driver. Although perceivably simple, the act of purchasing a card acts as a barrier for those that would never think of taking public transit.

7.3   Involvement of the Private Sector

Like other public services, the option of privatization or having a larger involvement of the private sector is a possibility to generate funding for transit improvements. One of the main problems with transport development has been from strong political interference. "Since the

governing boards of such transit authorities usually include both state and local government officials, they are highly politicized" (Hanson & Giuliano, 2004, p. 204). Before 1960 "most public transit operators (in the U.S.) were for-profit, privately owned companies, and as such did not receive government subsidies, nor were the heavily regulated by government" (Hanson & Giuliano, 2004, p.203). With a lack of transit innovation, non-existent marketing, a market fascinated with the growth of the automobile and incompetent management, the public sector was required to bail them out (Hanson & Giuliano, 2004, p.203). The reason why no new pressure has been made by business for change is that there traditionally was never much money in public transit. With the implementation of favourable land-use zoning, road pricing and transit priority policy as implemented in Curitiba, transit can become profitable. It may also act as an opportunity for automotive companies to redefine themselves in the face of trends that threaten the route of their entire industry.

In Canada and many areas of North America, auto unions and stakeholder groups strongly have traditionally opposed the implementation of policy that deters automobile usage. It is therefore important to include them and other stakeholders into policy making. Just as public transit organizations have to redefine the product that they are selling, automobile interest groups should follow suit. The creation, operation and maintenance of a city-wide rapid bus system would require some creative thinking and human resources that could be supplied by a re-defined auto sector.

When analyzing a company competing in the free market, it is important to identify core competencies, weaknesses and benchmark targets. A bus system's core competencies are what it does best, and the reason why it would have an advantage over other travel mediums. In this case, the low cost of travel and the environmental advantages are the most advantageous

qualities to taking the bus.   Through effective marketing, accompanied with better transit-friendly policies, these aspects can be used to sell the service to non users. The perception that buses are an uncomfortable, boring ride that takes longer than a car needs to be altered if there is to be any significant change.   Since the main source of potential customers lies with single occupancy drivers, the benchmark for comparison would be the car.   To attract more riders, marketing must aim to teach that transit service is equal to if not better than that of a car.

The automobile which can be seen as a symbol of North American culture, offers many luxuries. It is "always available and never to far away … one can feel safe and isolated from the dangers outside, and enjoying the luxury that it provides" (Banister, 2005, p.5).   Many researchers have eluded to the elevated status one gets when owning a vehicle and have gone as far to say that it is "an extension of the home, as a detachable room that could be taken to different places" (Banister, 2005, p.6). The growth of technology has also allowed the car "to become a more sophisticated office with mobile systems for telephones, e-mail and Internet access, so the driver can make the best use of time with even more flexibility" (Banister, 2005, p.7). All these aspects must be taken into consideration when attempting to attract customers by providing similar or better services through the bus. Some travellers enjoy the time they spend in a car since it captures their desire to be alone. There are some things that the bus will not be able to achieve, however the intended goal is to provide an all around better package that includes aspects listed above as well as things such as timeliness and cost. The experience of the private sector working with the educational experts will be essential as "the simple needs of automobiles are more easily understood and satisfied than the complex needs of cities" (Jacobs, 1961, p.7).

It should be noted that although a large percentage of research has gone into work transportation, it is not the sole reason for travel. "Commuting only accounts for about 20 per

cent of all trips and that the growth in travel demand is now taking place in non-work based activities, in particular for social, shopping and recreational purposes" (Bannister, 2005, p.124). In North America, the current shift is now away from malls and toward Power Centers (Garbarine, 1998). These stores often dubbed 'big-box's' offer bulk merchandise or other commercial goods such as electronics and books. As many of the stores require delivery companies, city operated shuttle buses could provide services that would benefit customer, business and government. By modifying buses to be 'easy loadable' with drivers doubling as movers to assist customers with dollies and securing equipment, delivery costs for customer and business would be lowered. These special power center shuttle buses would act as paratransit, delivering straight to a customer's door. A comfortable ride with room to deliver large merchandise may sacrifice speed for the customer, but supplant it with function and improved price. Extending this idea, buses whose routes past through shopping areas or grocery stores could offer larger storage capacity. The idea would be to provide a better service for these activities that make up a large proportion of a person's total road trips.

Bus systems do not merely reflect those used in public transit. Private operated shuttles are also very beneficial for the environment, users and employers. Company run transports that pick up employees at standard meeting points are more sustainable than single occupant automobile travel, and should also be encouraged. Systems such as these often allow workers to pay less and create a more reliable arrival time for employers. Social interactions for employees may be enjoyable, but can also be beneficial for businesses since it produces a more intimate team environment conducive to better business. Measures to support these systems and to encourage new participation in similar programs should be implemented. An existing city bus system can offer the use of some of its buses (smaller preferably) to local corporations that

employ a good percentage of the population. These companies could then organize their employees to take the bus, and provide schedules to operators for efficient travel. A company would benefit from reliable arrival times, provide a good service for employees, create an atmosphere for inter-office networking while the bus system would profit from increased ridership and more efficient allocation of resources.

7.4   *Capitalize on Digitalization*

"We are now in the midst of a new technological revolution, and its impacts are likely to be just as profound as the agricultural and industrial revolutions in changing society and cities, and the ways in which we actually do things" (Banister, 2005, p.211). There have been many technological improvements to buses over the years. Diesel engines have been replaced by cleaner burning sources, suspension systems are now able to lower entrances for easier access, and passenger stop alerts are easier provide abetter service to riders. Continuing with this trend, there are many existing technologies that can be adopted by transit companies to further enhance the bus experience while also being beneficial to operators and owners. The digitalization movement can be used to improve public transit, and should be capitalized on. "Technology and transport are integrally linked, as technology has a key role in replacing physical movement, in controlling movement on existing infrastructure, in ensuring that vehicles are operating efficiently, and in providing real time information .. Technology permits the provision of a 'seamless' transport system" (Banister, 2005, p. 161 -179). Communication Technology can be used to increase the reliability of the system so as to attract more customers. "Travel is not only undertaken for functional reasons (e.g. shopping and work), but is also instrumental in establishing social networks (Putnam, 2000). Trends such as tele-working and e-commerce may

decrease total travel, but will only serve to replace undesirable trips. Trips that are enjoyable to

travellers are unlikely to be replaced with Communications Technology.

7.4.1 Electronic Transit Passes

Massive amounts of information can now be stored in objects the size of a typical bus

pass. In 2000, New York introduced magnetic-stripe fare card technology called the MetroCard

which provided a variety of new fare options for all its bus and subway service. The result was

an increase of ridership by 30 per cent with virtually no new services added (Hanson & Giuliano,

2004, p. 205). By capturing small bits of personal information into these cards, operators can

generate large databases of travel data which can allow system analysts to schedule buses more

efficiently. Preferences for temperature, music and any other personal feature stored onto a card

can also give drivers more accurate information in which to create an enjoyable bus environment.

Buses are now equipped with technology that announces and displays upcoming stops as

they approach.   When swiping a personal bus card, options for destinations can be recorded to

an on-board system that would alert the rider by nick name or number, as to when their next stop

is approaching. Swipe cards containing pre-registered data specifying records of travel with

destination and pick up locations can be useful for future system planning. Since people often

change their minds in between stops, variable options would still be possible. By specifying

destinations upon entry, drivers will be able to better plan accordingly to reduce redundancies in

routing. If no one is registered to get off at a station, drivers can take a short cut, speed up or

stay in a moving lane to reduce total travel time.

Since passengers will be registered, discounts or tax breaks can be administered easier to

frequent travellers so as to better motivate citizens to take public transit. Offering discounts on

popular routes will also be possible. For example, since a variety of people get off at multiple

stops along a route, this can slow down the travel time of a bus. If discounts were given to those that get off at popular, more well used exits, customers would be motivated to get off at major stops, thereby encouraging quicker trips and more healthy walking for customers.

7.4.2 Cell Phones

Another technology that has potential to make a big difference to the bus would be the cell phone, a device that has become common place amongst people of all demographics and income levels. "The number of users of cellular phones and personal digital assistants capable of sending and receiving faxes, email and accessing the Internet has jumped from 77 million in 1998 to well over 300 million in 2001" (Hanson & Giuliano, 2004, p.39). People are constantly talking, 'texting', using the Internet or being further entertained with their phones. As these phones have become a primary communication medium between people and the world around them, so can the connection between a bus and its travellers be strengthened. For example, registered users who have inputted data such as the stop closest to their house and the time they wish to take a bus, can receive computerized text messages sent when a bus passes a given point. If a text is sent out to all the users of a given pick up point indicating that the bus is a certain distance away it will help customers control their departure times. The same text messaging service can also be used to indicate the arrival of a person to their destination. By communicating more with the customer, a rider will be more informed which will produce greater feelings of control and comfort.

A good opportunity to generate revenue from this system would be to involve local businesses. As a bus approaches a major store or attraction, the on-board bus speaker or texting service would alert the customer(s) of the site. Businesses would profit, customers would be more knowledgeable and public transit would receive large influxes of advertising revenue. As

the main proportion of users of these digital devices are teenagers, marketing strategies should follow accordingly. By testing the system first on those who take the city bus regularly for school purposes, it will be a good indicator as to whether the service works. If it is deemed successful, than incentives for teenagers to educate and transfer their knowledge to their parents (who are the target market for single occupancy drivers) would allow for a quick spread of the system. It should be noted that there are privacy considerations that should be embedded into the technology to ensure that there are no abuses of the transit rider's rights.

7.4.3 Mass Transit = Mass Media

For anyone that has ridden the bus lately in a North American suburb, it would be almost impossible not to see someone plugged into some sort of electronic media device. Whether walking, at work or school and even driving, people are constantly talking on their phones, listening to music and surfing the internet. The public transit industry can capitalize on this trend by making adjustments to buses to cater to a user's digital needs. Just as the bus is a part of mass transit systems, it can be a medium for mass media. Simple things such as outlets for recharging electronic devices, or wireless internet access would make the bus more attractive to the constantly growing digital savvy market. Interactive monitors that provide access to well known socially approved websites will entertain riders during long trips. Although the major problem with this would be the high cost and lack of funding, there would be plenty opportunities for advertisers to contribute. Websites wishing to have their site published on the mass transit network so that thousands of riders could read their ads daily would wish to invest. The service could also be used to increase a rider's control and speed of trip as better access to transit scheduling times, mapping and route information would be more accessible. As technology becomes cheaper and more wide spread, other expensive electronics may be practical in the

future. Things such as on-board file sharing services, personal monitors for viewing or onboard television stations similar to plane travel are all plausible ideas to encourage bus travel. The important thing to remember is that even though the main product being sold is transportation, keeping the customer happy is what is most important. "Public transport must perform well in all areas of importance to the customer… effective marketing requires a complete business system that ensures that all aspects of service meet expectations." (Bunting, 2004, p. 87)

8   Epilogue

8.1   Realistic Expectations

When attempting to create a sustainable inter-urban transportation system in a region whose infrastructure is built for automobile mobility, it will be incredibly difficult to totally eliminate the use of the car. Although it is true that major global trends may render the automobile obsolete, expecting a complete turn around in these communities is improbable without a major motivator. An urban transport system must develop a diversity of transit modes that rely on alternative energy sources so as not to 'put all their eggs in one basket'. This creation of a multitude of legitimate travel options will be more flexible and able to adapt to future problems while concurrently satisfying the present needs of a city and its hinterland.

Improvement of bus systems alone will not produce a sustainable transit system. As discussed in this paper, other mediums, proper policy and funding are required to develop an efficient system. Challenges will focus on "the efficiencies of moving people about the dispersed, polycentric city of realms" (Hanson & Giuliano, 2004, p. 24). Buses themselves may not be useful in some areas, however their efficiency in high density corridors dictates that they will continue to proliferate in the transport market. In order for buses to dominate over other vehicles, governmental policies **must** reflect this fact. For example, buses operating on congested streets

must have some sort of road-use priority over other vehicles or any real advantage over the automobile is lost. A government that does not back the proliferation of public transit and continues to promote single occupancy vehicular use will never be sustainable.

The debate over land density versus profitable public transit is similar to the "chicken and the egg" debate. To profitably operate public transit, sufficient population density is needed, however this will not occur unless there is sufficient public transit. Similar to this, is the debate between developed and developing nations regarding carbon emissions. North Americans want growing countries such as China and India to curb their emissions while they themselves have some of the highest rates in the World. Because of this, it is going to be important to lead by example since Americans have more resources and are more able to organize this change.

The theory of triple convergence for transportation enforces the notion that increased highway capacity will never effectively reduce congestion. It states that when a new lane or roadway is made available, vehicle trips that normally used to take alternate routes, occurred during different times, or were conducted by other transportation modes fill new capacity in two to three years. This would mean that continually building infrastructure to support automobile traffic is not a sustainable solution. Many would also suggest that attracting users away from highways onto public transit would also entice more users to use the freed up highway capacity. "Evidence suggests that any slack in road use created by a new system is rapidly taken up by formerly congestion-suppressed traffic demand" (Breheny, 1992, p.205). This means that a limit must be placed on new highway capacity in order for transit to flourish. Transit system operators and planners must work to ensure that the product they offer is more favourable than free-flow automobile use.

8.2   The Public

Although there have been massive amounts of historical data surveying the public regarding their thoughts on public transit, their input should not be overlooked. The small but growing percentage of citizens who choose to use public transit because of its environmental or social benefits should inspire some optimism. As shoppers change their buying habits by buying 'green' or socially friendly products, so might the affects of urban congestion convince them to make similar living pattern alterations. Although expecting people to 'be better' for reasons that do not enhance personal utility is a major fault in many failing policies, a concerned, educated and motivated public would be the best tool in making any real accomplishment in improving the sustainability of a city.

Although public input has historically been gathered through focus groups or surveys, a more evolved role of the public in the policy making process may generate the legitimacy needed for effective action. Just like any other policy that affects the majority of the public, those that use the service have the most accurate understanding and may have some very good ideas. "Such an allocation of responsibilities begins to bridge the gap between politicians and citizens, so that decision-making can be democratized and public support is created" (Banister, 2005, p. 93). Since transportation also contains a strong degree of social interaction, involving some key figures of the public who have greater authenticity in communities could be effective in increasing bus usage. Word of mouth is known in marketing as the most effective form of advertising. As discussed earlier, involvement of the private sector, or attracting influential employees with incentives onto the bus would encourage other employees to follow accordingly.

8.3   The Role of Policy makers

Making policy is a difficult feat as benefits to one stakeholder will always be seen as losses to others. A possible exception would be that "transportation is the one central, shared

concern of governing entities within one region. It is the one subject around which disparate municipal governments have real incentive to cooperate and rally" (Safdie, 1997, p. 119). Throughout this analysis there have been numerous references to a bus system being a business in a free market attempting to offer a service to its customers that is superior to its competitors. Extending this metaphor, policy makers need to represent the typical parties of a successful business. Federal politicians should resemble the Chief Executive Officer, setting the direction for its cities on a sustainable path, creating a mission statement for what the country is trying to symbolize and identifying global trends that will affect its organization. Just like the CEO, the federal government must also ensure proper funding is allocated to its different parties to allow municipalities to grow accordingly. In Canada, the role of the president would then fall on the provincial government, assuring all the different departments (cities) are functioning well together and working to achieve mutual goals. Municipalities would then represent the managers who work on the ground floor assuring that policies are being implemented properly and examining results in order to gather feedback. As occasionally experienced, and in many failing businesses, a fractured line of vertical communication leads to poor working relationships that are not conductive of healthy businesses. The responsibilities outlined are not mutually exclusive and should be shared among the three parties. "The successful implementation of a sustainable urban development strategy, together with radical transport policies, is enormously dependent on leadership and vision" (Bannister, 2005, p.207).   If the political system were a cake it would not take the form of a hierarchical layer cake, but a marble cake "with local, regional, state and federal interests all mixed together through multiple programs in which different governments cooperate, compete, regulate and represent their unique interests and concerns" (Hanson & Giuliano, 2004, p.145).

8.4 Effects of In-Action

If the features required for a sustainable urban transportation system are implemented, the bus will undoubtedly play a strong role, benefiting all members of society. If polices are not implemented, bus systems will be forced to drop un-profitable routes and focus on areas that are more transit friendly. Congestion will get worse, further inhibiting trade, damaging the environment and negatively affecting the health of society. An urban area that lacks diversity in transport options is inflexible and therefore dangerously susceptible to current global trends that threaten their only means of mobility.

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