MEGACITIES AND AFFLUENCE:
TRANSPORT & LAND USE CONSIDERATIONS

Jean-Claude ZIV and Wendell COX,
Conservatoire National des Arts et Metiers, Paris

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Abstract

This paper has two principal purposes:

(1) To provide a definition and listing of world megacities and

(2) To propose considerations for using transport and land use policy to facilitate economic growth and the reduction or eradication of poverty. In one form or another, this is a virtually universal objective, underlying public policies in nations around the world.

Current transport and land use preferences are examined. It is generally observed that these current preferences may not best serve the economic interests of megacity residents, especially in medium-income and low-income megacities.

Introduction

Throughout history, urban areas have been magnets for people seeking greater opportunity. This is because urban areas have developed the agglomeration economies that create more efficient labor markets, which tend to increase both economic growth and job opportunities. It can thus be argued that the principal purpose of cities is economic growth and the reduction or even eradication of poverty.

Before World War II, there was a strong movement from rural and smaller towns to larger urban areas in the high-income western world. After World War II, this trend accelerated and spread to other emerging economies, such as Japan. More recently, urbanization has virtually exploded, with huge urban areas developing around the world, virtually regardless of income status.

This paper provides an overview of the world's megacities --- urban agglomerations likely to have more than 10,000,000 residents in less than a decade (2015). The paper also provides analysis and observations on urban transport and land use policy issues of particular importance with respect to economic growth, affluence and poverty reduction in megacities.

The starting point is to suggest a principle --- that a primary purpose of public policy in urban areas is to facilitate sustainable economic growth for the greatest share of residents (and certainly not to retard economic growth).

Based upon this thesis, much of the focus of the paper will be on lower and middle-income megacities, instead of the high-income megacities, in which a considerable amount of broadly enjoyed affluence has been created.

Background: Megacities and Other Urban Terms

Megacity: "Megacities" is a term used to describe "cities" of 10,000,000 or greater population. There are, however, significant definitional problems, beginning with the apparently simple term "city." The term "city" can be defined on at least three levels, the municipality, the urban area (or urban agglomeration) and the metropolitan area (or labor market). In some nations, the term city principally connotes the urban settlement or the metropolitan area, without regard to political boundaries. In other nations, especially the United States, the term city is often also used to denote a municipality. The result is that the term "city" cannot be understood without further clarification.

Municipality: The first level of "city" definitions is the municipality, often the central city of a metropolitan area or urban area. For example, at this level, the city of Paris (ville de Paris) is the core municipality, with a population of approximately 2.1 million. This does not include suburbs (contiguous urbanization outside the municipality) or exurbs (urbanization outside the continuous urbanization, but within the metropolitan area. The "municipality" definition is, however, of little use in comparisons because of substantial differences in the nature and expanse of central municipalities. For example, the central municipality of Melbourne has less than two percent of the urban area population. At the other end of the scale, the city of Shanghai is larger than the urban area and has a population approximately one-quarter greater than the urban area. Municipalities are not an appropriate level for comparative urban area analysis because they do not reflect the reality of urban areas.

Urban Area (Urban Agglomeration): The second level of "city" definition is the urban area, which is the area of continuous urbanization (continuous urban development) or the urban footprint. The urban area may also be called an "urban agglomeration" or "urbanized area." Urban areas are generally not constrained by political boundaries.[1] Census authorities in at least Australia, Canada, France, India, the United Kingdom and the United States designate urban areas using similar criteria (more often than not, using a population density threshold of 400 persons in per square kilometer[2]). For example, the Paris urban area has a population of approximately 10 million, more than four times the population of the ville de Paris. Even among these nations, there are definitional differences. For example, some nations (such as France and India) define urban areas at the municipality (commune) level, while other nations (such as the United States, Australia and Canada) define urban areas at lower level census geographies (census tracts in the United States and equivalent territories elsewhere). Each of these methods has tends to overstate the land area of the urban area, because outer jurisdictions and census geographies often contain expanses of non-urban (rural) land. The overstatement of urban land area is likely to be greater where the component parts are municipalities rather than lower level census geographies.[3]

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[1] As defined herein, an urban area or metropolitan area would be constrained by boundary across which free movement of labor is not permitted. Hong Kong and Shenzhen, for example, which are continuous urbanization, are considered to be two separate urban areas or metropolitan areas, because there is not free movement of labor between the two.

[2] In the United States, a threshold of 1,000 per square mile is used to define urban areas, which is approximately the same as the 400 per square kilometer definition used in most other nations defining urban areas.

[3] The comparatively small geographical size of municipalities in France make the urban areas of that nation relatively comparable to those of Canada and the United States, containing a minimum of rural land. In India,

Metropolitan Area (Labor Market): The third level of "city" definition is the metropolitan area,[4] or the labor market area. The metropolitan area is generally larger than the urban area and contains rural areas or exurban areas outside the urban area from which people commute for work to the principal urban area. Some nations formally designate metropolitan areas, such as Australia, Canada, Brazil, the United States and others. The European Audit's Urban Zones (LUZ) can also be considered metropolitan areas. There is less standardization with respect to metropolitan areas than urban areas among the nations using the designation. Moreover, as in the case of urban areas, most nations do not formally designate metropolitan areas.

Lists of Megacities: There are various lists of world urban areas and metropolitan areas. The most notable urban area list is produced by the United Nations, which is based upon data reported by national statistical agencies. The 2003 United Nations list included 408 urban areas with 1,000,000 or more population. There is little definitional consistency in the United Nations list, which results in considerable difficulties. In some cases, the list reports municipality or a political jurisdiction population, instead of urban area, as in the case of Kuala Lumpur, Seoul and Manila.[5] In other cases, the UN shows metropolitan area, rather than urban area population, such as for Dhaka, Tianjin, Sydney and Buenos Aires. The result is that the United Nations list sometimes presents a reasonable reflection of the urban area population, sometimes a reasonable reflection of the metropolitan population and sometimes no reasonable reflection of either the urban area or the metropolitan area. Finally, the United Nations urban area list does not provide urban land area data (area of continuous development). Perhaps the most reliable metropolitan area list has been compiled by Forstal, Greene and Pick, though they include only the largest 20 metropolitan areas (Forstal, Greene and Pick, 2006).[6]

Demographia World Urban Areas: In recent years, we have prepared a growing list of world urban areas (areas of continuous development), under the title *Demographia World Urban Areas*.[7] This list contains data for approximately 700 identified urban areas in the world with 500,000 or greater population. *Demographia World Urban Areas* uses national census authority data, where available and considered reliable. For other urban areas, estimates of the area of continuous urbanization have been constructed using satellite photographs. This data is

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however, some urban areas are composed of particularly large municipalities, containing considerable rural land, rendering that nation's urban agglomeration definition non-comparable with those of the United States and Canada.

[4] The term "metropolitan area" is sometimes confused because of jurisdiction names. For example, the Tokyo Metropolitan Government is the government of the prefecture that includes Tokyo. Both the urban area and the metropolitan area extend far beyond the prefecture, yet some analysts mistake the prefecture for the metropolitan area. Similarly, the Municipality of Metropolitan Toronto includes only one-half of the metropolitan area population.

[5] The UN list shows "Metro Manila," which is a province level designation. The urban area stretches into adjacent provinces. The use of this geography results in a reported population estimated at 40 percent less than that of the urban agglomeration in 2005.

[6] Even so, the Forstal list includes Hong Kong-Shenzhen, which is not a genuine labor market because free movement of labor is not permitted across the border. By definition, a metropolitan area must be an integrated economic entity, which requires the free movement of labor and people. As a result, adjacent metropolitan areas such as Hong Kong and Shenzhen, Detroit and Windsor, Kinshasa and Brazzaville, Geneva and Annemasse or San Diego and Tijuana are not single metropolitan areas. On the other hand, adjacent Lille and Moscron can be considered a single metropolitan area because there is unrestricted movement of labor and people across the border of France and Belgium.

[7] Available at http://www.demographia.com/db-worldua.pdf.

combined with population data from various sources, producing an estimate of population, land area and population density.

Megacity List: The focus of this paper is megacities using the "urban area" or "urban agglomeration" definition. This focus is used because urban areas, as areas of continuous development, best reflect the urban footprint within which transport and land use planning occurs. Metropolitan areas include large areas of rural development, which, by definition, are not urban. Moreover, the urban area represents the area of principal interest with respect to transport.

Location	Urban Area (Urban Agglomeration)	2005 Population Projection	Rank: 2005	2015 Population Projection	Rank: 2015	Estimated Annual Growth Rate	Latest Density Estimate: Per Square Mile	Latest Density Estimate: Per Square Kilometer
Japan	Tokyo-Yokohama	34,250,000	1	35,240,000	1	0.3%	11,300	4,350
Indonesia	Jakarta	18,200,000	5	24,420,000	2	3.0%	15,200	5,850
India	Delhi, DEL	17,380,000	6	24,110,000	3	3.3%	29,000	11,200
India	Mumbai, MAH	18,550,000	4	23,070,000	4	2.2%	68,000	26,250
United States	New York	20,220,000	2	21,260,000	5	0.5%	4,500	1,750
South Korea	Seoul-Incheon	19,850,000	3	21,080,000	6	0.6%	26,000	10,050
Mexico	Mexico City	18,100,000	7	19,690,000	7	0.8%	18,600	7,150
Brazil	Sao Paulo	17,800,000	8	19,530,000	8	0.9%	16,600	6,400
Philippines	Manila	16,250,000	10	19,190,000	9	1.7%	32,500	12,550
Egypt	Cairo	15,500,000	11	18,180,000	10	1.6%	26,300	10,150
Japan	Osaka-Kobe-Kyoto	17,250,000	9	17,400,000	11	0.1%	12,800	4,950
China	Shanghai, SH	13,900,000	14	17,330,000	12	2.2%	11,800	4,550
United States	Los Angeles	14,900,000	12	17,290,000	13	1.5%	6,200	2,400
India	Kolkota, WB	14,110,000	13	16,620,000	14	1.6%	34,800	13,450
China	Shenzhen, GD	11,000,000	18	15,750,000	15	3.7%	22,000	8,500
China	Beijing, BJ	11,550,000	17	14,950,000	16	2.6%	9,600	3,700
Russia	Moscow	14,000,000	15	14,510,000	17	0.4%	9,300	3,600
Argentina	Buenos Aires	13,220,000	16	14,480,000	18	0.9%	11,100	4,300
Nigeria	Lagos	8,850,000		13,680,000	19	4.4%	30,300	11,700
Turkey	Istanbul	10,660,000	20	12,460,000	20	1.6%	21,600	8,350
Pakistan	Karachi	8,700,000		11,910,000	21	3.2%	30,000	11,600
Brazil	Rio de Janeiro	10,900,000	19	11,820,000	22	0.8%	17,900	6,900
France	Paris	10,400,000	21	11,290,000	23	0.8%	8,900	3,400
Bangladesh	Dhaka	6,940,000		10,000,000	24	3.7%	50,000	19,300

Table 1
MEGACITIES (URBAN AREAS OR URBAN AGGLOMERATIONS)
RANKED BY 2015 PROJECTED POPULATION

2005 and 2015 population based upon latest estimate, adjusted to account for growth rate (United Nations rate except in China, France and the United States where local growth rates are used).
Based upon Demographia World Urban Areas database (http://www.demographia.com/db-worldua.pdf).

The research concerns all urban areas that are projected to have more than 10,000,000 population in 2015. The population of the world's largest urban areas has been projected to 2015, based upon population and urban land area data from *Demographia Urban Areas* and projected growth

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rates from various sources. It is estimated that there will be 24 urban area megacities by 2015, an increase from 21 in 2005 (Table 1).[8]

Megacities and Urban Areas: History: Megacities are a creation of recent history. By 1800, perhaps two urban areas (Baghdad and Beijing) had achieved a population of more than 1,000,000, but had not maintained this population.[9] In 1801, the London urban area had approximately 950,000 people, while New York and Paris were considerably smaller.[10]

By 1900, urban areas had achieved unprecedented population levels. London had more than 5,000,000 residents, New York 3.8 million and Paris 3.5 million. By 1930, New York had become the world's first megacity, with more than 10,000,000 population.[11] Today, the largest urban area in the world is Tokyo-Yokohama, with a population of approximately 34 million, while another 10 urban areas have populations of 15 million or more.

Population Density: Historic population densities were much higher than present densities, megacity or otherwise.[12] Ancient Rome had a population density of approximately 50,000 persons per square kilometer.[13] In the middle 17th century, Paris is had a population density of nearly 100,000 per square kilometer.[14] At that time, Paris had more than 30 times the current Western European urban density average[15] nearly four times that of Mumbai and nearly seven times the present low-income megacity average.

Geographical Expansion: At the same time as urban areas were increasing in population, they were occupying considerably more land and population densities were declining markedly. This was principally the result of transport improvements, principally public transport in the 19th century and the automobile in the 20th century. In 1800, it is estimated that the Paris urban area covered less than 20 square kilometers, a figure that increased to 160 square kilometers by 1990. By 1999, the Paris urban area covered approximately 2,750 square kilometers, 17 times its 1900 land area. Over the same period, the Paris urban area less than tripled in population. The London urban area of the present covers 5.7 times the land area of 1900, while the population is 1.7 times that of 1900.[16]

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[8] Lagos has often appeared on megacity lists. However, the 2006 census produced results indicating that the urban agglomeration remained below 10,000,000 population. Moreover, during final editing, new population data became available that would indicate megacity status by 2015 for Ho Chi Minh and Kinshasa. Time did not permit revision of the paper to include these two urban areas.

[9] London was the first urban area to achieve and maintain a population of more than 1,000,000 (by 1811). Baghdad is estimated to have reached 1,000,000 in approximately 900 A.D., while Beijing exceeded 1,000,000 from 1800 to 1850 (Chandler, 1987).

[10] Estimates from various sources. See: http://www.demographia.com/db-parisua.htm and http://www.demographia.com/db-lonuza1680.htm.

[11] See http://www.demographia.com/db-nyuza1800.htm.

[12] It is estimated that Hong Kong has the highest population density of any urban area over 500,000 population, at 29,400 per square kilometer (76,200 per square mile). See http://www.demographia.com/db-worldua.pdf.

[13] Calculated from Ausubel and Marchetti, 2001.

[14] See, http://www.demographia.com/dm-par90.htm.

[15] Calculated from information in Chadych and Leborgne, 1999.

[16] See: http://www.demographia.com/db-parisua.htm. http://www.demographia.com/db-nyuza1800.htm, and http://www.demographia.com/db-lonuza1680.htm.

London, as the world's largest urban area, covered approximately 260 square kilometers in 1900. Presently, it is estimated that at least 250 world urban areas with 500,000 or more population cover more land area than London in 1900.[17]

The drop in urban population densities occurred in two ways. First; newer development on the urban fringe was considerably less dense than existing development. Second; there were significant density declines in the historic urban cores, driven principally by the reduction in average household size and an increase in the size of the average dwelling unit.

For example, the most dense Paris arrondissements (districts) lost one-half of their population during the 19th century. During the last one-half of the 19th century, New York's urban population density declined by one-third, despite enormous density increases in lower Manhattan from immigration. Core densities have dropped substantially from their peaks, including 45 percent in Mexico City, more than 60 percent in New York and Tokyo and more than 70 percent in Paris.[18]

By 2000, the Los Angeles urban area, renowned for its suburbanization (pejoratively called "urban sprawl), had become 30 percent more dense than the New York urban area and was only 35 percent less dense than the Paris urban area. As suburbanization spread throughout the world, jobs followed residences and the share of workers commuting to the core dropped dramatically. By 1999, more than 80 percent of the Paris population lived in the suburbs, which contained nearly 70 percent of the employment.[19]

Historically, urban areas have spread (suburbanized) as they added population. Post-World War II suburbanization, like that of eras before, has been driven by urban transport advancements. Moreover, this process of suburbanization has not been materially altered despite strong regulatory attempts. For example, in London and Seoul, greenbelts induced even greater suburbanization, beyond the protected areas, creating large exurban areas.[20] Even in much newer Portland, Oregon, some of the world's strongest densification and development centralization have failed to stem decentralization, with 80 percent of inward domestic migration locating outside the urban growth boundary.[21] As urban areas have become more affluent, their cores have tended to decline in population, or at a minimum to remain static, while virtually all growth has occurred in the suburbs.[22]

Megacities: Income: The first megacities were in the high-income world, such as New York before World War II and Tokyo after World War II. Now, the majority of the world's megacities are in the low-income and middle-income worlds. By 2015, megacities are expected to be distributed as follows:

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[17] Based upon data in http://www.demographia.com/db-worldua.pdf.
[18] See: http://www.demographia.com/db-intlcitycores.htm.
[19] Calculated from INSEE 1999 census data.
[20] A principal purpose of the London greenbelt was to decentralize population and force growth to the outside.
[21] Net domestic migration to the Portland metropolitan area 2000-2006. Calculated from US Bureau of the Census data.
[22] For example, nearly all urban growth in Western Europe, the United States, Japan, Canada, Australia and New Zealand has occurred in the suburbs over the past 40 years (http://www.demographia.com/db-highmetro.htm).

- Eight of the megacities will be low-income urban areas (in nations with a gross domestic product per capita, purchasing power parity of less than $5,000).[23] These low-income megacities are projected to have an average 33.5 percent population growth from 2005 to 2015 and an average urban population density of 13,700 per square kilometer.

- Ten megacities will be middle-income urban areas (in nations with a gross domestic product of between $5,000 and $20,000. These middle-income megacities are projected to have an average 17.3 percent population growth from 2005 to 2015 and an average urban population density of 6,700 per square kilometer.

Table 2 Megacity Density, Growth Rate and Gross Domestic Product (PPP) Per Capita			
Income Category & Urban Area	Density	Decade Growth Rate	National GDP/Capita 2005
LOW INCOME	13,700	33.5%	$2,900
Cairo	10,150	17.3%	$3,900
Delhi	11,200	38.7%	$3,300
Dhaka	19,300	44.0%	$2,100
Jakarta	5,850	34.2%	$3,600
Karachi	11,600	36.9%	$2,400
Kolkata	13,400	17.8%	$3,300
Lagos	11,700	54.6%	$1,400
Mumbai	26,250	24.4%	$3,300
MIDDLE INCOME	6,700	17.3%	$8,500
Beijing	3,700	29.5%	$6,800
Buenos Aires	4,300	9.6%	$13,100
Istanbul	9,450	16.9%	$8,200
Manila	12,050	18.1%	$5,100
Mexico City	7,150	8.8%	$10,000
Moscow	3,600	3.7%	$11,100
Rio de Janeiro	6,900	8.4%	$8,400
Sao Paulo	6,400	9.7%	$8,400
Shanghai	4,550	24.7%	$6,800
Shenzhen	8,500	43.1%	$6,800
HIGH INCOME	4,600	6.6%	$32,800
Los Angeles	2,400	16.0%	$41,800
New York	1,750	5.2%	$41,800
Osaka-Kobe-Kyoto	4,950	0.8%	$31,500
Paris	3,400	8.6%	$29,900
Seoul-Incheon	10,050	6.2%	$20,400
Tokyo-Yokohama	4,750	2.9%	$31,500
ALL	8,100	19.2%	$12,700

- Six megacities will be high-income urban areas (in nations with a gross domestic product greater than $20,000. These high-income megacities are projected to have an average 6.6 percent population growth from 2005 to 2015 and an average urban population density of 4,600 per square kilometer.

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[23] Based upon estimates (principally 2005) from the United States Central Intelligence Agency, 2006.

The 24 megacities are projected to have an average population growth of 19.2 percent from 2005 to 2015 and an average urban population density of 8,100 per square kilometer (Table 2).

Observations on Megacities: The following observations are offered on megacities:

- Urban areas have become far larger during the past 50 years than ever before in history, both in terms of population and land area. Megacities have emerged over the past 75 years, in accelerating numbers.

- Nearly all population growth of megacities and other urban areas has been in peripheral (suburban) areas.

- Urban population densities have fallen markedly, due in large part to improved urban transport technologies (public transport, automobiles and motorcycles).

Mobility and Affluence

As noted above, megacities have developed because they attract people from agricultural areas and smaller urban areas. Low-income megacities often portray an image of intense poverty to high-income world observers. However, poor as they may be, people who migrate to the low-income megacities and other large urban areas do so because their economic prospects appear better in the megacities than where they came from.

Virtually all nations seek to improve the economic status of their population. Benjamin Friedman argues in *The Economic Consequences of Economic Growth,* that economic growth is more than desirable; it is a necessity for social cohesion (Friedman, 2005).

An important key to making a megacity function is transport, which plays a crucial role in making labor markets more efficient and contributing to economic growth and expanding household incomes.

Research: Prud'homme and Lee find that as the percentage of jobs that can be reached increases in a particular period, urban economic production (gross regional product) improves by a factor of 0.18 (Prud'homme and Lee, 1998). Thus, a 10 percent improvement in employment access would theoretically lead to an improvement in economic output of 1.8 percent. At the same time, more efficient transport aids in the movement of freight, which results in lower product prices, which allows people to purchase more with their incomes. The importance of internal freight movement is illustrated by recent research in Portland, Oregon (Economic Development Research Group, 2005) and Vancouver, BC (Delcan and Economic Development Research Group, 2003), on the necessity for improving traffic flows to improve urban area competitiveness.

Our urban area research found that urban travel is strongly associated with higher urban income levels. This econometric analysis of data from the 99 urban areas indicates that average gross product per capita is strongly related to at least two factors --- (1) the extent of economic freedom, as measured by the Heritage Foundation *Index of Economic Freedom*, and the amount

of travel (Johnson and Sheehy, 1996).[24] This research finds much weaker relationships between higher incomes as other factors, such as public transport market share, public transport service intensity, and total population.

This research tends to indicate that the efficiency of urban economies is improved as travel speeds are improved and mobility maximized, whether for people or freight. The mechanisms of personal mobility, principally the automobile and the motorcycle, have a great advantage over public transport in this regard. Public transport requires longer travel times for most trips in urban areas. In the United States, the average work trip travel time by public transport was 70 percent more than that of the automobile in 2000.[25] In 2005, the average public transport work trip travel time was 80 percent higher in Canada than the average automobile commute.[26] Public transport work trip travel times in the Paris area are approximately double the automobile commute time (Gerondeau, 1997).

Moreover, it is becoming increasingly clear that providing the mobility throughout the urban area to expand low-income employment opportunities requires cars. Raphael and Stoll, at the University of California, estimate that if automobiles were available to all African American households, the gap between non-Hispanic-white and African-American unemployment would be reduced by nearly one-half (Raphael and Stoll, 2000). A Brookings Institution report concluded: "Given the strong connection between cars and employment outcomes, auto ownership programs may be one of the more promising options and one worthy of expansion" (Blumenberg and Waller, 2003)

A study by the Progressive Policy Institute, a research organization affiliated with the Democratic Leadership Council (of the Democratic Party), noted (Waller and Hughes, 1999):

> *In most cases, the shortest distance between a poor person and a job is along a line driven in a car. Prosperity in America has always been strongly related to mobility and poor people work hard for access to opportunities. For both the rural and inner-city poor, access means being able to reach the prosperous suburbs of our booming metropolitan economies, and mobility means having the private automobile necessary for the trip. The most important response to the policy challenge of job access for those leaving welfare is the continued and expanded use of cars by low-income workers.*

Findings such as these led President Clinton to propose reforms to encourage greater automobile ownership among welfare recipients.[27]

Cars are necessary to improve the low-income quality of life because public transport service that would serve the same function does not exist. This is illustrated by a Federal Transit Administration study of Boston, which has one of the best public transport systems in the United

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[24] Both of these independent variables were significant at the 99 percent level of confidence, and had high elasticities the overall "R squared was 0.74 (89 cases from the UITP *Millennium Cities Database* and 10 additional urban areas from the United States,

[25] Calculated from US Census data. See http://www.demographia.com/db-msajtwtime2000.pdf.

[26] Calculated from Statistics Canada data for 2005. See Turcotte, 2006.

[27] Press release, "President Clinton Announces Transportation Grants to Help Low-Income Families," White House, October 16, 2000.

States. The study found that only 14 percent of jobs in the high-growth suburbs of Boston were within one hour's transit ride of inner-city low-income areas (Lacombe, 1998).

A similar dynamic is evident in Paris, which may have the best public transport system in the western world. Research indicates that from the new towns with RER (regional metro) service, the car provides access, within one hour, to 84 percent of the jobs in the Ile-de-France. This is more than double the 41 percent of employment that is accessible in one hour by public transport.[28]

Thus, two related issues are crucial to maximizing mobility and economic rewards --- faster travel times and access.

Research and Policy: Nonetheless, current urban planning thinking tends to favor strategies that would require people and freight to travel for longer periods or even not to have access for some trip. The principal source of this dissonance is strategies that seek to substitute public transport use or even biking or walking for automobile use. Each of these alternatives increases travel times for most trips and, as a result, reduces the area that can be reached in a specified period. Slower travel is generally associated with less economic output.

This urban planning thinking is illustrated in a European Commission report, which credits Budapest for having far lower journey to work automobile share than Sheffield (European Commission, undated). Yet, the average resident of Sheffield spends 22 minutes traveling one-way to work, while the Budapest resident spends 70 minutes each way. The research would indicate that Budapest is disadvantaged, not advantaged by the greater use of public transport, because its citizens must spend more time traveling than in Sheffield. If average work trip travel times were as extended in Sheffield as in Budapest, it is likely that economic performance would be less. It would seem more reasonable for the focus of policy to be on sustainable economic advancement of the urban area, than on the mode of travel.

Funding Inconsistencies: Governments have tended to spend disproportionate amounts of funding to improve public transport, especially on metros and light rail (trams). For example, in the United States, regional planning organizations have committed a substantial part of future funding to public transport. Overall, 17 large U.S. metropolitan areas plan to spend, on average, 50 percent of their financial resources on public transport.[29] This is justified in virtually all cases by an interest in increasing public transport use and discouraging automobile use.

In none of the cases cited above does the regional transportation modeling predict a material transfer of automobile use to public transport. At the same time, the regional plans generally anticipate a worsening of traffic congestion.

As is indicated by the research on mobility and affluence, this will result in an economic cost, which is likely to fall hardest on less affluent households. This economic dimension appears to be largely ignored in transport planning. There is thus a serious disconnect between the objective

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[28] Calculated from Fouchier and Michelon, 1999.
[29] Based upon information in Orski, 2002. Similar data is provided by

of discouraging automobile use and expanding affluence, which requires the greater mobility that is only available with the automobile.

A case in point is the Portland, Oregon area, The United States Department of Transportation Federal Highway Administration criticized regional transportation plan in early 2007 with the following comments.[30]

> *"It is difficult to find the transportation focus in this opening chapter of (the) Regional Transportation Plan." Instead, the plan focuses on bike trails, light rail, and expensive skyline transport.*
>
> *"The plan should acknowledge that automobiles are the preferred mode of transport by the citizens of Portland. . . . They vote with their cars every day*."

This policy direction continues a long-term trend, according to Alan Altshuler and David Luberoff (Altshuler and Luberoff, 2003) note that US public transport has received approximately one-half of all transportation public funding spent in urban areas since the 1970s.

This funding inconsistency, found in many high-income world urban areas, represents a full reversal of 1960s transport policies, which were to favor automobile transport to the exclusion of other modes. In view of the fact that the more substantial funding of public transport in recent years has produced virtually no material movement of demand from automobiles (below), it would seem that a better balance could be struck.

Public Transport Market Share: Despite the disproportionate spending on public transport, public transport has not materially increased its share of travel in urban areas.

- In the United States, public transport's share of motorized urban travel declined eight percent from 1995 to 2004 and now represents less than two percent or urban passenger kilometers.[31]

- In Western Europe (EU-15), urban and rural public transport experienced a slight decline in market share from 1995 to 2003.[32]

- In the three largest agglomerations of Japan, Tokyo-Yokohama, Osaka-Kobe-Kyoto and Nagoya, *all* new urban travel demand has been for automobile demand since 1990.[33]

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[30] See http://www.oregonlive.com/news/oregonian/index.ssf?/base/news/1170125713258090.xml&coll=7.
[31] Calculated from US Department of Transportation data. See http://www.publicpurpose.com/ut-usptshare45.htm. This excludes school buses, which carry nearly as many passenger kilometers on school days as public transport in US urban areas (http://www.publicpurpose.com/sch-tr96.htm).
[32] Calculated from European Union data. See http://www.publicpurpose.com/ut-eu15-share2003.htm. The metro and tram market share remained unchanged, while the bus market share declined more than five percent. Urban data is not readily available.
[33] Calculated from Japan Bureau of Statistics data. See: http://www.publicpurpose.com/ut-japan3met19902003.htm

The continuing market share losses and rising costs led Remy Prud'homme, of the University of Paris, and a team of researchers to question whether public transport is sustainable in Western Europe (Prud'homme, Darbara, Newbury, Diekman, and Elbeck, 1999).

Personal Mobility: At the same time, citizens of megacities and other urban areas increasingly purchase mechanisms of personal mobility, especially two and three-wheeled motorcycle based vehicles and automobiles. At least part of the reason is that personal mobility tends to provide users with far greater access to jobs and other opportunities throughout the urban area. Because of their slower speeds and less comprehensive coverage, current public transport systems, from the rich megacities to the low income megacities are generally incapable of providing comprehensive mobility that competes with the personal modes.

The automobile generally provides the highest levels of mobility, comprehensively, throughout the urban area. For the most part, virtually any location in urban areas from the smallest to the largest can be reached within convenient walking distance by car. Further, many urban origins and destinations are not within walking distance of public transport service or would require far longer to access by public transport than by car (as the Boston and Paris cases indicate, above).

Weighing Economic and Environmental Factors: To the extent that, as the data indicates, transferring automobile demand to public transport increases travel speeds or makes some travel within the urban area either impossible or infeasible, the research indicates that economic productivity will be retarded. Moreover, the likelihood is that, with less economic growth, there will be a higher rate of poverty. From an economic perspective, then, public transport would seem to be a viable alternative to the automobile only where there is no economic loss --- where the same trips can be made at within a time frame that is competitive with travel by personal mobility options, principally the car and motorcycles.

Generally, the public transport favoring strategies have not taken into account the economic impacts. These impacts must, of course, be carefully weighed against any negative environmental factors. However, it does not seem sufficient to assume that environmental factors necessarily negate economic factors --- the analysis needs to be performed. A policy framework that is skewed toward any mode --- public transport or automobiles --- runs the risk of misallocating resources by attempting to accomplish objectives that are beyond a mode's capability.

Public Transport Expectations

There are recurring suggestions that the best means for reducing traffic congestion is public transport. Public transport is routinely invoked as the solution to a wide range of problems, such as energy independence, reduction of air pollution and greenhouse gas emission reduction. Yet, as is described below, virtually no urban area has developed either a public transport plan, much less a public transport system that would attract material shares of automobile drivers. This paper attempts to estimate the cost that would be required to achieve the expectation of transit as a material replacement for the automobile throughout the urban area.

Automobile Competitive Public Transport: The potential for public transport to replace automobile travel can only be known if the costs of a system that could attract a material share of

automobile demand are known. Such a system would necessarily be automobile competitive and would provide time and access competitive public transport from virtually every point within the urban area to every other point.

An idealized model is presented that estimates the cost of providing "automobile competitive" public transport throughout urban areas using grade separated urban rail (Cox, 2002). The model is built on a specification that requires every location within the urban areas to be within walking distance (400 meters) of a public transport station. This requires, at a minimum, an 800-meter grid of routes, which to achieve automobile competitive travel times, would need to be grade separated. The required, frequent station spacing of no more than 800 meters would retard the metro operating speeds. It could be challenging for metro technology to provide travel times that are competitive with the automobile.

Non-grade separated modes, such as surface buses and surface trams would simply not be able to replicate the mobility provided by the automobile, because of their slower speed. It may be that the strongest indication of the inability of conventional transit modes to provide automobile competitive service throughout an urban area is the fact that virtually none have been proposed (or generally even discussed).

The model produces capital and operating cost estimates using both an underground and elevated rail based design. Most trips would require transfers, which would mean that service frequencies would have to be minimized to compete with automobile travel times. The model assumes that service would be provided at high frequencies (every minute), using automated vehicles similar to the Lille, Toulouse or Vancouver automated rapid transit systems. This must be considered a skeletal system. No adjustment has been made to provide additional vehicles on higher demand routes, to provide routings involving more than one rail line or to minimize transfers, each of which would add expense.[34]

The costs of this skeletal system are estimated as follows (Table 3):

- Among low-income world megacities, the annual costs are estimated at from 1.14 times the annual gross domestic product per capita for an elevated system to 1.69 times the annual gross domestic product per capita for an underground metro system.

- Among middle-income world megacities, the annual costs are estimated at from 0.79 times the annual gross domestic product per capita for an elevated system to 1.18 times the annual gross domestic product per capita for an underground metro system.

- Among high-income world megacities, the annual costs are estimated at from 0.35 times the annual gross domestic product per capita for an elevated system to 0.53 times the annual gross domestic product per capita for an underground metro system.[35]

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[34] The model assumes current US annual capital and operating cost characteristics for an 800 meter grid of intersecting automated guideway transit throughout the urban area, with stations at each junction.
[35] In lower density urban areas of Canada, Australia and the United States, such as Vancouver, Perth, Houston and Portland, the underground cost per capita would exceed the national gross domestic product per capita.

Overall, the megacities would require an average of from 0.53 times the annual gross domestic product for an elevated system to 0.76 times for an underground system. It would seem more likely that an underground system would be required, since there would be considerable community opposition to an 800 meter grid of elevated rail lines and their large stations.

Income Category & Urban Area	Table 3 Automobile Competitive Public Transport: Cost			
	Skeletal Cost per Capita: Underground Metro	Skeletal Cost per Capita: Elevated Metro	GDP Share: Underground Metro	GDP Share: Elevated Metro
LOW INCOME	$4,900	$3,300	1.69	1.14
Cairo	$5,600	$3,700	1.44	0.95
Delhi	$5,100	$3,400	1.55	1.03
Dhaka	$2,900	$1,900	1.38	0.90
Jakarta	$9,700	$6,400	2.69	1.78
Karachi	$4,800	$3,200	2.00	1.33
Kolkata	$4,500	$2,900	1.36	0.88
Lagos	$4,800	$3,200	3.43	2.29
Mumbai	$2,100	$1,400	0.64	0.42
MIDDLE INCOME	$10,000	$6,700	1.18	0.79
Beijing	$15,700	$10,300	2.31	1.51
Buenos Aires	$13,400	$8,800	1.02	0.67
Istanbul	$8,000	$6,800	0.98	0.83
Manila	$4,700	$3,100	0.92	0.61
Mexico City	$7,900	$5,200	0.79	0.52
Moscow	$15,900	$10,400	1.43	0.94
Rio de Janeiro	$8,200	$5,400	0.98	0.64
Sao Paulo	$6,300	$4,300	0.75	0.51
Shanghai	$12,600	$8,300	1.85	1.22
Shenzhen	$6,800	$4,500	1.00	0.66
HIGH INCOME	$17,400	$11,500	0.53	0.35
Los Angeles	$24,000	$15,800	0.57	0.38
New York	$33,200	$21,800	0.79	0.52
Osaka-Kobe-Kyoto	$11,600	$7,700	0.37	0.24
Paris	$16,800	$11,100	0.56	0.37
Seoul-Incheon	$5,600	$3,700	0.27	0.18
Tokyo-Yokohama	$13,100	$8,600	0.42	0.27
ALL	$9,700	$6,700	0.76	0.53

What Density would be Required? An alternative method for analyzing the requirements for automobile competitive public transport throughout an urban area is to estimate the population density that would be required to generate sufficient economic output to support the system at current financial rates. According to the Millennium Cities Database (International Union of Public Transport, 2001), Berlin spends the greatest portion of its gross regional product on public transport of any high-income world urban area, at 2.6 percent. To achieve automobile competitiveness throughout the urban area, while spending no more than the Berlin rate would necessitate exorbitantly higher densities (Table 4).

- Low-income megacities would need, on average, urban densities of from 430,000 (for the elevated alternative) to 640,000 per square kilometer (for the underground alternative). This is from 31 to 47 times the current average density and equals or exceeds the population densities of the most dense small areas in Hong Kong.[36] Further, there is no indication that densities of this magnitude were ever historically achieved even in the most dense walking urban areas.

- Middle-income megacities would need, on average, urban densities of from 160,000 to 225,000 per square kilometer. This is from 24 to 34 times the current average density.

- High-income megacities would need, on average, urban densities of from 45,000 to 65,000 per square kilometer. This is from 10 to 12 times the current average density.

By comparison, highest density megacities are considerably less dense. Mumbai, which is the most dense megacity, has 26,250 persons per square kilometer, well below the average population density threshold level that would be required in the high-income, middle-income and low-income megacity classifications. The urban population densities that would be required to establish an automobile competitive rail based public transport system seem beyond the practically or politically achievable.

However, the analysis above indicates that there are serious limits to the feasibility of replacing large volumes of automobile use with public transport. Thus, public transport expectations may be well beyond its capabilities at least at this point. This is not to suggest the impossibility of a technological breakthrough that could permit public transport to attract material amounts of automobile demand in an urban area. However that cannot be accomplished without genuine point to point automobile competitiveness throughout the entire urban agglomeration.

INCOME CATEGORY	GDP PPP	Public Transport Expenditure @ Berlin (2.6% of GDP)	Density Required: Underground Metro	Density Required: Elevated Metro	Actual Density	Underground Metro: Multiple of Current Density Required	Elevated Metro: Multiple of Current Density Required
Low-Income	$2,900	$75	640,000	430,000	13,700	46.7	31.4
Middle-Income	$8,500	$221	225,000	160,000	6,700	33.6	23.9
High-Income	$32,800	$853	65,000	45,000	4,600	14.1	9.8
United States	$41,800	$1,087	50,000	35,000	2,100	23.8	16.7
Outside US	$28,300	$736	75,000	50,000	5,800	12.9	8.6
Average			325000	220000	8,100	40.1	27.2

Table 4
Population Density Required to Afford Skeletal
Automobile Competitive Public Transport System

Public Transport's Important Niche Markets: Nonetheless, public transport serves important market niches. In some applications, public transport can be faster than the automobile,

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[36] Based upon analysis of Hong Kong constituency area data, see http://www.demographia.com/db-hkca.htm.

especially to the most congested and large urban cores, such as the Manhattan (New York) central business district, inner London, central Paris, inside the Osaka Loop or inside the Yamanote Loop in Tokyo. However, for the most part, public transport travel times are considerably greater than automobile travel times for trips throughout the balance of the urban area.

Public transport also serves important welfare markets, by providing service to households without automobiles and physically disabled people who are not able to drive automobiles.

Observations on Mobility and Affluence: The following observations are offered:

- Urban areas tend to be more economically productive (there is less poverty and more widespread affluence) where mobility opportunities are maximized (travel speeds are minimized), point-to-point, throughout the urban area.

- Personal mobility strategies currently provide the least costly and most effective means of point-to-point mobility throughout urban areas. This is a principal reason why transferring demand from automobiles to public transport is so difficult.

- People tend to use the mobility options that they perceive to best serve their interests. As a result, automobile and motorcycle based transport is inevitably increasing and will continue to increase, especially in middle and lower income urban areas, where the potential for expansion is the greatest.

- It may be virtually impossible for public transport to compete with personal mobility strategies, except in niche markets where its strengths can be best used. The most obvious such market is mobility to and within concentrated core districts.

- There is a research need to identify what, if any, potential exists for lower cost public transport systems to provide comprehensive automobile competitive service throughout megacities.

- There is a research need for road system designs that can best serve urban areas of higher densities, in effect to identify the upper density limits of road transport designs.

The principal conclusion is that people will continue to use cars for a greater proportion of trips, especially in low and middle-income megacities where personal motorization has yet to become saturated. Transport policy needs to be based upon this reality.

Land Use and Affluence

The predominant view in urban planning is that automobile use must be curbed and that urban areas should become more dense (more compact). However, the economic externalities of such policies have generally received little attention. This is similar to the dichotomy Godard notes in the potential policy conflict between limiting mobility to reduce greenhouse gas emissions and the need to increase mobility to reduce poverty(Godard, 2007).

Thus, a review of urban planning should include a complete analysis of the economic context of modern urban areas.

Variations in Economic Progress: Economic growth and prosperity are not inevitable. A high standard of living is relatively new to the world. It might be suggested that the history of economics and the quality of life is largely a history of poverty. This is illustrated by the work of economist Angus Maddison (Maddison, 2003), who estimated historical economic performance for the Organization for Economic Cooperation and Development (OECD). These inflation-adjusted estimates indicate that much of the world continues to live near or below the 2000 poverty threshold in the United States.[37]

Moreover, on the eve of World War II, much of today's high-income world lived below or near poverty rates by today's standards. In 1939, per capita income in Canada and Western Europe was barely above the 2000 U.S. poverty threshold, while per capita income was much lower in Japan. The United States, Australia, and New Zealand were somewhat more affluent, but far less affluent than they have since become (Figure 1)[38] Over the past one-half century, the high-income nations have become far more affluent.
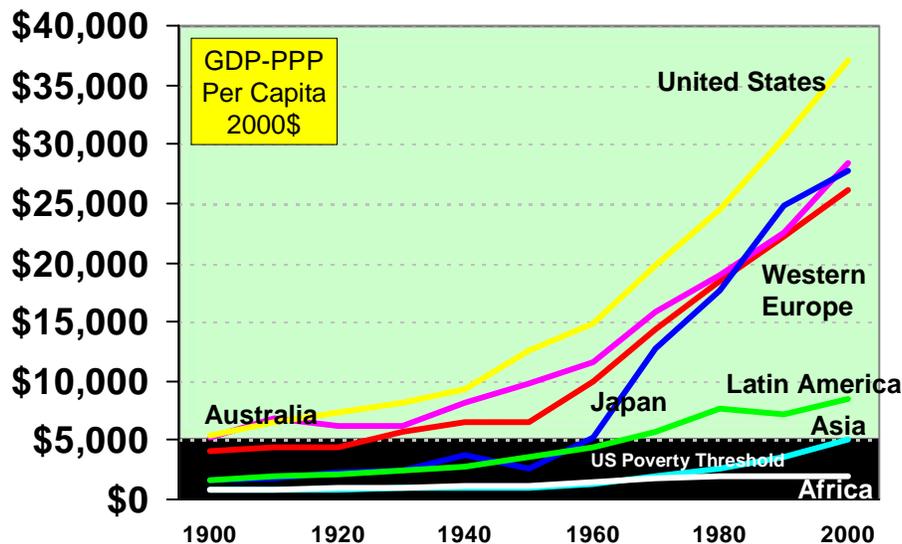

Figure 1

However, strong economic growth has not been universal. Less than 15 percent of the world's population lives in high-income nations, while 85 percent live in middle-income and lower-

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[37] Poverty threshold for a family of three, per capita.
[38] Estimated based upon Maddison OECD data, using a 0.858 relationship between gross domestic product and gross personal income (the 2000 rate in the United States).

income nations. Per capita economic growth since World War II stagnated in Asia and Latin America, at less than 20 percent, and at less than 10 percent in the former Soviet Union and Africa. Some formerly prosperous nations have had faltering economic growth. For example, Argentina, which had one of the highest gross domestic product per capita in 1910 fell to middle-income status by 2000.

Property, Home Ownership and Wealth Creation: Hernando DeSoto notes the importance of clearly defined property rights to the economic growth of urban areas (Desoto, 2000). Millions of households do not have title to their property, which makes it difficult for them to produce wealth. Without the rule of law and property rights, modern high-income economic performance cannot occur. According to North and Thomas, property is at the very heart of wealth creation (North and Thomas, 1973); indeed, "economic growth will occur if property rights make it worthwhile to undertake socially productive activity."

At the same time, prosperity has been largely democratized in the high-income world, as objective poverty has been significantly reduced. The democratization of prosperity has been closely associated with the defining characteristics of suburbanization, such as low-cost housing, usually owner-occupied, on the urban fringe, low-cost personal mobility throughout the urban area. Since World War II, home ownership rates in a number of high-income world countries have increased rapidly, providing through the building of equity opportunities for wealth creation. Home ownership creates wealth through the accumulation of equity that would be less likely to occur through conventional savings programs. This is because a mortgage is, in effect, a forced savings program. In addition, as the value of the home appreciates, the owner gains additional wealth. This wealth can be used for securities investment, retirement, new businesses, education and other uses.

Yet, there remains much poverty to be eradicated, especially in lower and middle income world urban areas. Moreover, poverty continues to exist in high-income world urban areas. Urban and transport planning policies should facilitate (or at least not interfere with) the economic growth that is necessary to reduce or eradicate poverty.

Two Visions: The Natural City and the Compact City

There are two principal visions of urban and transport development, which might be referred to as the policies of the "natural city" and the policies of the "compact city."

The Natural City: The dominant historical urban area might be called the "natural city" --- an urban area in which development was generally permitted, with a minimum of regulation. As environmental concerns emerged, greater regulation was applied, but large high-income urban areas continued to develop liberally, while observing stronger environmental and public health standards. The unprecedented wealth creation that has occurred since World War II has generally occurred in this "natural city" environment, in which suburban development and the automobile have emerged as dominant.

The Compact City: The prevailing view in urban planning generally opposes the automobile and the land use policies of the "natural city". A principal justification is the view that the "natural city" creates negative environmental externalities that must be corrected.

The alternative to the natural city is the compact city, the object of policies referred to as "smart growth," "growth management," or "urban consolidation." Generally, these policies seek to reduce the expansion of the urban footprint, by increasing population densities and to substitute public transport use for automobile use (above), out of concern that the natural city is not sustainable.

Natural Cities v. Compact Cities: However, there is serious dispute about the comparative environmental impacts of natural cities and compact cities. For example:

The Human Footprint: It is claimed that the natural city footprint has become too large and that further geographical expansion must be stopped or seriously constrained. Yet, the overall human footprint --- urban and agriculture --- is generally being reduced, as more productive agricultural processes allow greater production on much less land. For example, in the United States, the net reduction in the human footprint (urban and agricultural) since 1950 has been equal to an area the size of Texas and Oklahoma.[39] According to the 2000 United States Census, 97.4 percent of the nation's land area is non-urban.

In Australia, over 25 years, the human footprint has been reduced by the equivalent of the land area of Victoria, Tasmania and New Zealand's South Island.[40] It is estimated that the urban land area of Australia amounts to less than 0.3 percent of the total land area, while in Japan the number is under 15 percent.[41] In Japan, there has been a reduction in the human footprint over the past quarter century, including within the three largest metropolitan areas.[42] Urbanization in France is estimated at approximately 12 percent of the land area, while Germany and the Netherlands are much higher at approximately 28 percent[43]. Generally, the open space gains that would be achieved by compact city policies are small compared to the overall open space gains that are occurring because of the reduced need for agricultural land.

Traffic Congestion: There are claims that the natural city results in greater traffic congestion. Yet, the evidence shows that traffic congestion is more intense in more compact cities (higher densities). Passenger vehicle hours per square kilometer are greater at higher densities (Table 5). It would thus appear that more intense traffic is a negative externality of compact city policies. Given the association between greater traffic congestion and slower travel speeds, compact city policies would appear to retard economic performance.

Air Pollution: Similarly, it is claimed that the natural city produces greater air pollution. Yet, as traffic congestion increases, travel speeds slow. As traffic operates more slowly, air pollution emissions intensify. Moreover, in the slower, more congested traffic there are more stops, which further intensifies air pollution emissions. As regards local air pollution emissions, compact city policies appear to have negative externalities.

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[39] Calculated from US Bureau of the Census and Department of Agriculture data, See: http://www.demographia.com/db-agtxok.htm.

[40] Calculated from Australian Bureau of Statistics data. See http://www.demographia.com/db-aus-ag.htm.

[41] See: http://www.demographia.com/db-intlualand.htm

[42] Tokyo-Yokohama, Osaka-Kobe-Kyoto and Nagoya. Calculated from Ministry of Land, Infrastructure and Transport data. See: http://www.demographia.com/db-japancultura.htm.

[43] See: http://www.demographia.com/db-intlualand.htm

Table 5 Vehicle Hours per Square Kilometer by Density		
Population density (per square km)	Vehicle Hours per Square KM	Average Speed (KMPH)
Under 1,000	788	51.4
1,000 - 2,000	901	47.1
2,000 - 4,000	1,347	38.7
4,000 - 8,000	2,263	31.4
8,000 +	2,529	32.2
Calculated from UITP Millennium Cities Database		

Greenhouse Gas Emissions: It is often claimed that automobile use must be curbed to reduce greenhouse gas emissions. Yet, the overall share of greenhouse gases produced by cars is small. In Canada, for example, if all automobile use were to cease, the nation would still fall significantly short of its targets under the Kyoto accords.[44] US research indicates that the highest potential for reducing greenhouse gases from cars is from improving vehicle technology, principally by improving fuel efficiency. The same study finds comparatively little potential for reducing greenhouse gas emissions from land use policies (Green and Schafer, 2003). Thus, the economic advantages can be retained, while technological advances improve the performance of the personal mobility system.

Infrastructure: It is claimed that suburbanization imposes significantly higher costs on the community than development in core areas. These conclusions are principally based upon modeled or theoretical data. However, our research, using actual Bureau of the Census data, found that the lowest per capita sewer and water fees are in the newest suburbs, those that are generally farthest from the core in the United States (Cox and Utt, 2004). The highest sewer and water fees are in the core cities. The research also found that suburban areas generally have lower total municipal expenditures per capita than core cities.

Transport: As the discussion above indicates, transferring material amounts of demand from personal mobility to public transport, as compact city strategies anticipate, has generally not occurred and appears beyond achievement.

Housing Affordability and the Quality of Life: Compact city strategies are being cited in the unprecedented loss of housing affordability, principally through the rationing of land for residential development, such as through urban growth boundaries, growth areas and other policies that increase the price of housing (principally the price of land).

For example, Edward Glaeser and Joseph Gyourko, in work published by Harvard University, reported that the principal cause of differences in housing affordability between US metropolitan areas is more restrictive zoning and land regulation (Glaeser and Gyourko, 2002). The United

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[44] Canada's Kyoto target is to reduce greenhouse gas emissions to a level six percent below 1990. In 2003, light gasoline and diesel vehicles (cars, SUVs, trucks and motorcycles) produced 93,000 kilotons, compared to the 180,000 kiloton reduction that would be required to achieve the Kyoto target. (Environment Canada, undated).

Kingdom Barker report indicates that stringent land use regulation is the "main" reason that housing prices have risen so steeply. From 1971 to 2001, average house prices increased 2.4 percent annually, more than double the 1.1 percent rate in Europe, where land-use regulation tends to be less restrictive than in the United Kingdom (Barker, 2004). More recently, the Governor of Australia's Reserve Bank has attributed housing affordability losses to compact city policies, while a similar connection has been noted by the Prime Minister, John Howard, and the national Treasurer Peter Costello. Finally, the New Zealand parliament has ordered an inquiry into the housing affordability problem in New Zealand, where larger urban areas have adopted strong compact city policies.[45]

Our *Third Annual Demographia International Housing Affordability Survey* suggests a strong relationship between unaffordable housing markets and stringent land use regulation. This review of 159 metropolitan markets in six nations finds that historical housing affordability ratios have been retained in markets that have permitted the natural city to exist by not applying stringent land use regulation. For example, Atlanta, Dallas-Fort Worth and Houston, three of the fastest growing major metropolitan areas in the high-income world, have Median Multiples (median house price divided by median household incomes) of one-half to one-third that of highly regulated markets such as San Francisco and Sydney. As late as 1995, the highest Median Multiple in a US market was 4.0 in San Francisco. In San Diego, with its comprehensive "smart growth" policies, the Median Multiple has reached over 10.0, more than three times the historic norm of 3.0. The cost of the median priced house, including purchase price and mortgage interest has risen by $800,000 (inflation adjusted), the equivalent of more than 14 years median household pre-tax income.

Thus, it seems likely that the most important negative externality of compact city policies is its impact on housing affordability.

A Theory: How Compact City Policies Retard Housing Affordability: The following provides a perspective of how compact city land rationing policies raise housing prices. One of the purposes of compact city policy is to create a "clear edge" between urbanization and rural areas. Land rationing policies seek to put limits on the land available for urban development and to avoid the "ragged edge" that occurs as development on the fringe in the absence of such policies. The, in effect, serial development requirements of the compact city interfere with the operation of the market in a number of ways. Landowners within the areas of permitted development are aware that the amount of land available for development is more limited and require higher prices when the land is sold for residential development. This is illustrated by the finding in the United Kingdom government's Barker report that raw land with residential planning permission is valued at more than 250 times land without planning permission (Barker, 2006).

The competition for land that formerly occurred between developers becomes less intense because there is less land to be sold. In the natural city, purchasers would seek land further from the urban fringe if closer land was too expensive. In the compact city, this is no longer possible, because the more remote land will be off-limits to development. The defense is often offered that the compact city policies provide a "20 year" or "30 year" supply of land. However, the mere

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[45] See http://www.parliament.nz/en-NZ/SC/SubmCalled/0/7/9/07969b3802794267b7bc7e256abe6037.htm.

designation of land for development (and prohibition on development on other land) over a certain period of time raises its price in the market.

The smaller supply of developable land encourages land banking, as firms in the land and housing industries protect themselves by purchasing land to ensure that they can continue operating in the longer run. In this competition for less land, larger, better financed firms tend to prevail, reducing the number of participants. This also tends to lead to higher prices.

The problem of escalating housing prices relative to incomes appears to be a fundamental characteristic of the compact city. Because of the importance of home ownership to wealth creation, this apparent characteristic of the compact city would seem likely to lead, in the longer run, to less affluence and even greater poverty. On the other hand, the market driven fringe development of the natural city has been associated with a high degree of housing affordability.

*Compact City Policies and Out-migration***:** Moreover, there is developing evidence that housing affordability is exerting a strong influence on demographics in the United States. US Census estimates indicate that 3.97 million people have migrated from the most unaffordable housing markets to more affordable markets in just six years (2000-2006).[46] For example, San Diego, which had been among the fastest growing US metropolitan areas over the past 60 years, experienced a net out-migration more than twice that of Pittsburgh, which has been the most depressed large metropolitan area over the same period of time. The same data shows unprecedented in-migration to more affordable Midwestern and inland Eastern metropolitan areas that had experienced decades of out-migration.[47]

Compact City Policies and Economic Growth: Consistent with the out-migration noted above, compact city policies have been associated with less robust economic development. Research indicates that stringent land-use regulations in the United States lead to lower levels of economic growth. A paper by Raven Saks of the Federal Reserve Board concluded, "metropolitan areas with stringent development regulations generate less employment growth than expected given their industrial bases (Saks, 2006)." Thus, slower economic growth may be an negative externality of compact city policies.

Observations on Land Use and Affluence: The following observations are offered:

- The natural city has been associated with an unprecedented wide distribution of wealth among households in high-income nations. The natural city is generally associated with personal mobility and a liberal land development regime.

- Various claims about the environmental superiority of the compact city are debatable.

- Compact city policies that drive land prices up (such as urban growth boundaries and other overly restrictive policies) are likely to lead to less economic growth and greater income disparity.

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[46] Calculated from US Bureau of the Census data. See: http://www.demographia.com/db-metmigramm.htm
[47] Calculated from US Bureau of the Census data. See: http://www.demographia.com/db-2005migdom.pdf

- Megacities following less restrictive land use policies are likely, all things being equal, to perform better economically and to experience a greater sharing of wealth creation among households.

The principal conclusion is that compact city policies may be incompatible with the maximization and widest spread of affluence, by virtue of the limits they place on wealth creation through land rationing.

Overall Observations

The following overall observations are offered:

- Economic growth is both desirable and necessary.

- People will tend to make choices that they perceive to be in their interests. Generally, personal mobility will expand and that housing on the periphery will be sought.

- Planning needs to be goal oriented, not principally focused on modes of travel or the urban form, but rather on facilitating the broad expansion of affluence, while observing sound environmental principles. Planning policy that reduces the potential for wealth creation or its distribution would appear to be inconsistent with widely held public objectives to expand economic growth and minimize poverty.

The principal conclusion is that urban and transport policies cannot be sustainable if they are not acceptable to the populace. Acceptable policies are likely to be adopted only if there is a full and objective interplay of research covering all dimensions of urban areas and transport, including the economic and behavioral implications.

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