



Figure X. Sprawl outside of Calgary, Alberta
Photograph by

1. As North America's population moved outwards from the central cities, urbanized population density dropped dramatically. In the United States this trend has continued with a drop from 3,175 persons/square mile in 1960 to a density of 2,191 persons/square mile in 2000 (Cox, 2001). A similar pattern can be seen in Canada where the urbanized population density dropped from 6,803 persons/square mile in 1960 to 5,062 persons/square mile in 2000 (Cox, 2001).

2. In Canada the rate of decentralization was most pronounced between 1941 and 1961 and again between 1966 and 1971 when there was a second major expansion of highway construction in metropolitan Canada (Edmonston et al. 1985). "Focused primarily on the single function of moving motor vehicles, urban freeway planning has formed the armature for urban growth patterns in all of our major metropolises and their hinterlands" (Edmonston et al. 1985). There are clearly a number of factors influencing growth and development patterns in cities (see Burchfield et al. 2006; Ellis 2001) however there is little doubt of the significant role highway construction has on expanding boundaries and decreasing density in metropolitan areas (Handy 1993). In the words of Dr. Mike Hirsch, head of sociology at Huston Tillotson University in Austin, Texas, "interstate highways transformed urban America and gave rise to urban sprawl as we know it. It opened up for development the peripheries of cities...and facilitated the blending of communities along those corridors" (Milner 2007).

3. Pucher and Renne (2003) show that public transit ridership (all trip purposes) in the United States has continued to decline, falling from 3.2% in 1969 to 1.6% in 2001. According to Schimek (1996) transit ridership declined most rapidly from the 1950s, stabilizing somewhat in the 1970s. Transit ridership is lowest in the suburbs where low population densities make reliable service difficult. This is illustrated by the difference in auto-oriented areas such as South Surrey/Langley, BC where the transit ridership is 3% and streetcar neighbourhoods such as Vancouver, BC where the transit ridership is 20% (Canadian Facts 2000). In Canada transit ridership has been consistently higher (approximately twice that of the United States) which Schimek (1996) attributes to a combination of subsidies and urban development patterns. However, with the exception of a small number of major population centres, most communities in Canada are too sparsely populated to provide comprehensive transit services (Cohn, 1999).

Chapter One: A Short Review of the Disease and its Symptoms

There are many books describing the current failures in the North American metropolitan landscape. *Suburban Nation* by Andres Duany, Elizabeth Plater-Zyberk and Jeff Speck, and the *Geography of Nowhere* and *The Long Emergency* by William Kunstler are three compelling works that aptly describe the cultural, political, and physical incapacities intrinsic to our post WWII urban landscape. While indebted to these books and others like it this book is not in their class. This is a book for citizens who know their cities and regions are sick, and want to help heal them.

Thus all we need is a bit of context: a concise summary of the disease that has stricken the North American city, and its symptoms. The intention is not to convince the reader that there is a problem. Having chosen this book the reader likely agrees with that proposition already. Rather, the intention is to organize the symptoms of the illnesses that afflict most North American metropolitan regions in a logical and concise way, identifying key areas of concern that will be repeatedly returned to in later chapters.

The Search for Affordable Housing.

The search for affordable housing for families was the primary motivating force behind most of post WWII development in North America. After the war a variety of policy inducements, notably the mortgage interest deduction and the development of the interstate highway system in the US, led to a massive redistribution of population across the metropolitan landscape.¹ Middle class and working families that had previously found homes in higher density walk able and transit served neighborhoods fled, for better and worse, to much lower density and car dependent suburbs.² Average densities began to fall and transit ridership as a percentage of all trips began to fall with it. Older pre war parts of the metropolitan landscape still maintained healthy transit ridership, but transit use in newer areas plunged to near zero.³ For the first three decades the relatively new interstate system allowed car owners to move large distances to employment centers with relative ease, making it possible for workers to live very far from jobs. Buying fuel for the family car was an insignificant consideration as prices were

4. In the United States families spent an average of 3.1% of their household expenditures on transportation; by 1950 this number had risen to 13.8% (Johnson and Tan 2001). Adjusting for inflation, personal consumption expenditures in real terms have risen 3.1% annually over the 1960-1992 period (US Bureau of Transportation Statistics 1994). In 2001 households spent 21% of all household expenditures on transportation surpassed only by the amount they spent on housing which was 31%. Between 1991 and 2001 consumer spending on private transportation increased substantially. Even when expenditures were adjusted for inflation the amount households spend on new and used motor vehicles increased by 47%, vehicle expenses increased by 14% and fuel expenditures increased by 3% (US Bureau of Transportation Statistics 2003). Berstein et al. (2005) found that lower income households generally spend more than the average 19% but regions that have invested in public transportation are not being hit as hard, even as gasoline prices are rising. In Canada, Marshall and Bollman (1999) demonstrate a discrepancy between urban and rural transportation spending. In 1996 they found that in rural households transportation accounted for 15% of their total expenditure while in urban areas this number was 12%. Urban households spent 10% of their total transportation budget on public transit, compared to only 3% for rural households (Marshall & Bollman (1999).

5. In both US and Canadian cities commuting distance is increasing. Between 1969 and 2001 commuting distance in the United States increased from 15.12 km (9.4 miles) to 19.48 km (12.11 miles) (Hu, 2004) while in Canada the commuting distance increased by 0.2 km between 1996 and 2001 with one out of eight people traveling more than 25km to work (Statistics Canada, 2001). In the United States this increase in commuting distance was greatest between 1983 and 1990 with a jump from 13.75km (8.54 miles) to 17.15km (10.65 miles) (Hu, 2004). In the US the average commuting time increased by 2.1 minutes between 1990 and 2000 resulting in a much higher increase than the 40 second increase from 1980 to 1990. The relatively small increase in travel time in the 1980's has been attributed to a greater number of suburban and exurban residential areas and employment centers resulting in commutes that are longer but traveled at faster speeds. The decline in travel time is also influenced by changes in commuting modes, with a decrease in transit and carpooling and an increase in driving alone (US Department of Transportation, 2003). In Canada travel time has increased from 54 minutes in 1992 to 63 minutes in 2005 (Statistics Canada, GSS 1992, 1998, 2005).

low.⁴ Much more important was the time required to get to and from work. Interstate highways meant that workers could, for the first time in history, conveniently hold jobs located 25 miles or more from their home.⁵ To give some sense of how great a distance this is, in 1950 the Boston metropolitan urbanized area was only 345 square miles. It now sprawls 1736 square miles (US Census Bureau). Since land was generally less expensive on the peripheries of the metropolitan area, development occurred ever further away from the metropolitan center, with single family homes generally dropping in price as you moved further out. This concentric phenomenon gave rise to the saying “drive till you qualify,” a widely used and humorous phrase meaning that home buyers are induced to push a home search further and further out from the center of the region until their income matched the qualification requirements for the mortgage on a new house. With so much unprecedented freedom of movement in this new urban landscape, house price became a much more important factor than location.



Figure X. An aerial view of Levittown, NY (1948) shortly after completion
Photo: Associated Press

School quality was a crucial deciding factor however, and here newer communities had a distinct advantage over older ones. Newly developing areas naturally had new schools while older areas had older schools populated by children from families without the economic resources to follow the migration, and in cities hampered by declining property values (also a consequence of the devaluing influence of middle class flight exacerbated in many areas by white flight) to fund them adequately.

Unquestionably, this new low density and car dependent city successfully supplied millions of new housing units at prices that North Americans could afford. This success has led many to claim that sprawling urban areas are more affordable than those with controls. Well financed lobbying groups have attacked Oregon's land use law on this ground for decades, even though

6. Condon, P. and J.M. Teed. 1998. Alternative Development Standards for Sustainable Communities: Design Workbook. Available online: <http://www.jtc.sala.ubc.ca/projects/ADS.html>

7. The common assumption is that by limiting the supply of developable land, all growth management policies reduce the supply of housing. Basic economic theory suggests that if housing supply is low relative to demand, then the price for it will be high, reducing its affordability. While this reasoning may seem logical, it is far too simplistic. Housing prices are actually determined by a host of interacting factors, such as the price of land, the supply and types of housing, the demand for housing, and the amount of residential choice and mobility in the area (Nelson, 2002). Evidence supports the fact that Urban Growth Boundaries can affect land values but their effects on housing affordability remain in dispute. Research done in Portland shows that growth in housing prices is more attributable to increased housing demand, increased employment, and rising incomes than urban growth boundaries (Phillips, 2000). Traditional zoning and land use regulations often place greater limits on the supply and accessibility of affordable housing (ie. low-density-only, minimum housing size, bans against attached or cluster homes) (Nelson et al. 2002). Properly designed growth management programs protect green space or farmland but also increase densities and mandate a mix of housing types including affordable housing.

8. Davidoff (2005) found that the Boston MSA is heavily income sorted by jurisdiction and that housing quality and extra-governmental amenities play a large part in this process. Boston's suburbs show a large range in both median home price and household income. Newton has the highest median home price at \$438,400 (in 1999 dollars) compared with Lawrence at \$114,100 (Census Bureau 2000). The highest median household income of \$141,818 is found in Dover while the lowest, at \$27,983, is found once again in Lawrence (U.S. Census Bureau 2000).

Portland's housing costs are lower than other comparable Western US communities like San Diego, Seattle, San Francisco and Sacramento – metropolitan areas that do not have similar land use controls. At its core the claim that low density is more affordable than higher density cannot be credible.⁶ Low density sprawl costs much more per dwelling unit to service than higher density development. A small lot subdivision of single family and duplex detached units on 3,000 square foot lots can be serviced for 75% less per dwelling unit than single family homes on lots of 7,000 square feet. The land component of the house cost will also be proportionately less as density increases.⁷ This is simple fourth grade math that the current allegiance to post WWII patterns is somehow blinding us to.

Separation by class and income

The “drive till you qualify” concentric rings of increasing affordability discussed above does not capture the whole story. After the war a second finer grain distinction emerged, particularly noticeable in metropolitan landscapes made up of dozens of quite small former rural communities like Boston's. Whether by accident or intent, Boston's new suburban towns adopted zoning policies which insured that new residents would occupy a narrow income demographic.⁸ Towns that allowed subdivisions comprised of land into one eighth, one quarter, or half acre lots attracted middle class and lower middle class home buyers. Towns that allowed only large lots of two, four, or five acres per dwelling unit attracted only upper income earners. At these low densities, land was quickly used up (it only takes 122 houses at one per five acres to consume a square mile of land). In many cases these low density communities went so

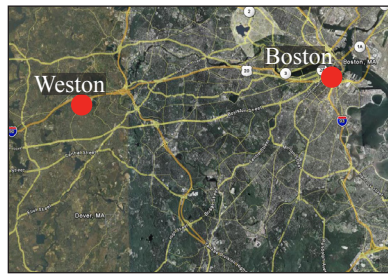


Figure X. Boston area context map



Figure X. Weston, MA has excellent access to freeways and commuter rail but the population density remains low at 1 dwelling unit per 3 acres

9. Central Cities are defined by The Office of Management and Budget (OMB) as the largest city in each metropolitan statistical area (MSA). Additional cities may be central cities if they meet specified population and commuting thresholds. According to the U.S. Census Bureau (2000) 21% of the total U.S. population lived in central cities in 1910 while only 7% lived in suburbs. From 1910 to 1930 population increased rapidly in both central cities and suburbs however after 1940 suburbs accounted for more population growth than central cities and by 1960 the proportion of total U.S. population living in the suburbs (31%) was almost equal to the proportion living in central cities (32%). From 1940 to 2000 the proportion of the population living in central cities remained relatively stable (ranging from 30 to 32.8%) while the proportion living in suburbs continued to grow steadily, finally reaching the 50% mark in 2000.

10. Transportation plans from the 1920s and 1930s were simpler designs with less capacity and lower speeds than those eventually built; they were meant to facilitate a multimodal system, were often connected to adjacent land uses, and were tied closely to existing roads (Taylor, 2000). However, ambitious planning goals including rejuvenating communities, reducing congestion, preserving central business districts and improving public transit suffered dramatically when the depression brought a severe drop in property tax revenue and with it, urban road and highway finance (Taylor, 2000). State departments and federal transportation boards took control from cities and implemented their own agendas focused around moving people long distances quickly rather than supporting local communities (Taylor, 2000). Broad, limited access freeways were adopted by engineers as the best way to guarantee high speed intercity movement (Brown 2005)

far as to exclude any new commercial development to serve new residents, leaving it to neighboring communities to supply supermarkets and other shops.

The Problem Emerges

The cracks in the system began to emerge after the 1974 oil shock, where the national security implications of car dependence became more obvious. Spending hours in line for fuel exposed the weakness of the economy to outside interruptions of oil, by now a clearly vital resource. Unfortunately the crisis provoked little action, as car dependence and dependence on imported oil has increased dramatically in the intervening decades. These were the same decades during which suburban low density development moved the US from being a country where most of its residents lived in districts where options to the car were possible to one where the majority of residents now live in districts where options to the car do not exist.⁹ Rather than put in place national, state and regional policies to reverse or at least mitigate an ever rising per capita use of fuel for the single passenger automobile the reverse occurred. Transportation bills from the 70s through the 90s favored the expansion of the interstates and feeder highways over transit, and no policy proposals to require walking distance access to transit and commercial services in new districts was ever seriously considered.¹⁰

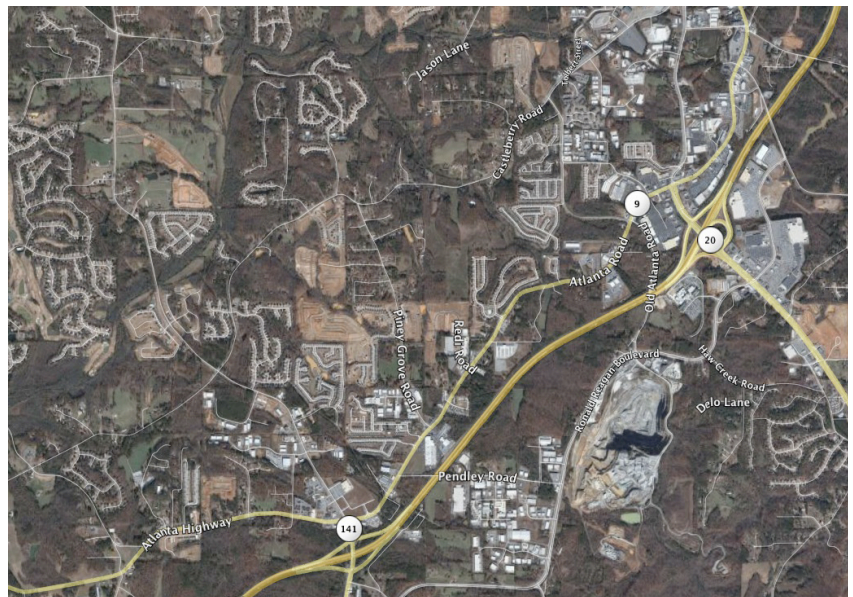


Figure X. Leapfrog sprawl at the exurban fringe north of Atlanta where agricultural land is subdivided for residential or commercial uses without the benefit of a plan. Eventually former rural roads become congested and dangerous suburban collector and arterial streets.



Figure X. The urban blocks shown in this photo were once filled with homes. Now only a small fraction of these homes remain. Billions of dollars worth of urban infrastructure now goes unutilized in Detroit. Its upkeep puts tremendous strain on local taxbases, furthering the collapse of city life.

11. U.S. cities with the largest population losses from urban cores to lower density exurbs and suburbs, in order, are Detroit, Philadelphia, St. Louis, Baltimore and Cleveland (Joint Centre for Housing Studies of Harvard University 2006). Birch (2005) found that between 1970 and 2000 the cities with the largest decreases in central city populations were St. Louis (-52%), Columbus, OH (-52%), Columbus, GA (-46%) and Detroit (-46%). Berry and Dahmann (1977) attribute growth away from central cities in part to the building of the highway system in the United States. Chi (2006) found that the growth of suburban areas often occurs as a result of the impacts of highways on central cities: congestion, residential deterioration and increased access to the city's fringe areas. Goldberg and Mercer (1980) argue that urban freeway development reduces the viability of central areas, and enables the availability and accessibility of cheaper suburban land which further reduces the competitiveness of central city locations for people and commerce. In Canada, Saskatoon and Regina exemplify this "donut hole effect," but in a less extreme way. According to the 2001 census Saskatoon's core population grew by 1.6% while its surrounding grew by 14.6%; Regina's core declined by 1.2% while its surrounding increased by 10% (Statistics Canada 2001).

12. Turcotte (2008) shows that the proportion of people aged 18 and over who went everywhere by car rose from 68% in 1992 to 74% in 2005 while the proportion of Canadians who made at least one trip by bicycle or on foot has declined from 26% in 1992 to 19% in 2005. In low density neighbourhoods over 80% of residents made at least one trip by car per day while less than half of the people living in very high density neighbourhoods did so (Turcotte 2008). In Canada, the Montreal Metropolitan Region has the lowest percentage of people making all their trips by car (65%) and also has the lowest proportion of single-detached houses (4% compared to Vancouver's 21%) (Turcotte 2008). In the United States the number of miles driven every year per capita by Americans rose by 151% between 1977 and 2001 (Polzin 2006).

Absent any national and state policies (Oregon was the single exception with the passage of Senate Bill 100 the "Land Use Law" passed in 1973) average densities in metropolitan regions continued to drop till at least the year 2000. Exceptions were few, Vancouver BC notable among them. More numerous were the extreme examples of centrifugal forces pushing population to peripheries, impelled by vast new highway expenditures, even where regional population was stable. Detroit and St. Louis are two instructive examples. Unabated freeway construction even absent significant population increase has left the older center cities of St. Louis and Detroit virtually abandoned, losing two thirds of their population to the suburbs during that period.¹¹

Current aerial photos of once attractive Detroit single family home neighbourhoods, many of them single family home districts on small lots, show urban blocks with all but one or two houses razed. The same population that once lived there has been spread out over a landscape four times its original size. Now a population that prior to WWII lived almost entirely in walkable transit served communities mostly lives in auto dependent low density districts.

The problem of infinitely increasing car dependence

All of these forces combined to create an entirely new North American urban landscape. Many thoughtful voices argue that this is a good landscape where families can find a house they can afford with a yard for the kids in a community of their own choosing. This is a strong argument, but an argument that can only be sustained if we are willing to forever increase the percentage of our national treasure we commit to highway construction and the amount of personal wealth poured into the gas pump. The trends are not hopeful. Per capita driving is steadily increasing and until 2008 was resistant to large increases in fuel prices.¹² Driving is no longer a discretionary expense. There is no other mode to shift to. Walking and taking the bus are not possible in these landscapes. When fuel becomes unaffordable discretionary trips are eliminated, forcing families to give up the activities they once enjoyed to preserve fuel for trips to work.

Auto dominated landscapes have forced families to devote ever larger shares of family income to transportation, a share that now for the first time in history approaches the share consigned to paying for a home. While in 1965 most families owned one

13. In both Canada and the United States the number of vehicles per capita has been steadily increasing from 1950 to 1995 (Schimek 1996). In 1940 there were nearly 40% more cars per licensed driver in the U.S. than in Canada however by the 1970s this gap had significantly narrowed (Schimek 1996). By the 1980s there was one vehicle per licensed driver in the U.S. (Schimek 1996). Historical data shows that in 1947 the proportion of total household spending dedicated to transportation was 9% and housing was 24.2% (Johnson et al. 2001). In 1966 transportation spending rose slightly to 11.1% and housing rose more rapidly to 30.2% but by 1979 transportation spending had risen significantly to 21.1% while housing spending actually decreased to 29.9% (Schimek 1996). Lipman (2006) found that when many working families move far from work to find affordable housing they end up spending their savings on transportation and by moving 12 to 15 miles the increase in transportation costs outweighs the savings on housing.

14. Much work has been done on the sociological impacts of suburban living, particularly on those members of the community that lack regular access to a car. For many people the suburban home is little more than a place to sleep, eat a meal or two and store personal belongings; most of their waking hours are spent elsewhere, either at work, school or in recreation (Gurstein 2001). This leaves people who work from home, especially those with young children, particularly isolated. Because the majority of people in their age group work outside of the community, the streets and other public spaces where passive social interaction would normally occur are empty and therefore ineffectual places for socializing (Gurstein 2001). Similarly, suburban teenagers suffer from the lack of active and passive participation in street life. Neighbourhoods separated from their main streets and from each other in highly disconnected street networks deter walking (Barnett 1995) and create a street environment often devoid of life. By the early 1990s, 60% of women living in the suburbs were in paid employment but they were “disadvantaged by the lack of locally available, affordable, quality child care at convenient locations and easy access to appropriate paid employment opportunities” (England 1993). Research has shown that suburban women are willing to forego well-paid jobs in favour of locally available but less well paid positions that allow them to attend to their domestic obligations (England 1993).

15. Ewing et al. (2003) found that residents of sprawling counties were likely to walk less during leisure time, weigh more and have a greater prevalence of hypertension than residents of compact communities. Frank et al. (2004) found that land-use mix had the strongest association with obesity and that each quartile increase was associated with a 12.2% reduction in the likelihood of obesity. Their study also found that each additional hour spent in a car per day was associated with a 6% increase in the likelihood of obesity while each additional km walked per day was associated with a 4.8% reduction in the likelihood of obesity. Papas et al. (2007) reviewed the literature on built environment and obesity between 1966 and 2007 and found that 84% reported a statistically significant positive association between some aspect of the built environment and obesity.

car, now two cars is the norm.¹³ The growth in two income households is one crucial contributor to this trend. The two incomes needed to pay off the mortgage on the home can only be maintained if both workers have a car to get to work. Dropping children at daycare and driving older children to otherwise inaccessible schools makes a car even more indispensable.

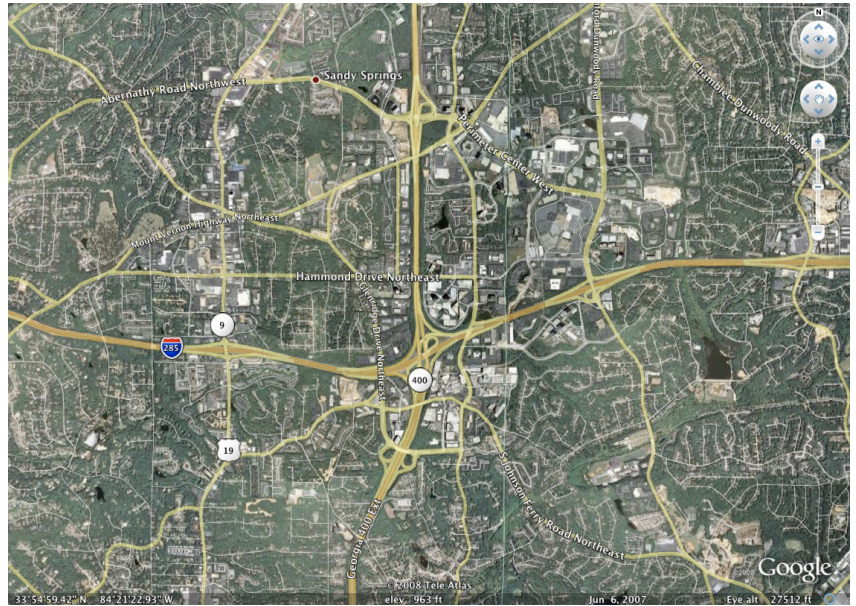


Figure X. Sprawl pattern at interstate 285 and Georgia rt. 400 north of Atlanta. Classic features include commercial services only accessible by car and pod development lacking any connectivity between the streets of one pod development to the streets of the adjacent pod development. Many situations exist where the walking distance to commercial services is only a minute or two as the crow flies from many homes, but on foot would be an hour or more due to the winding dendritic street pattern dominated by pod development and cul-de-sac streets. As a result, walking is avoided.

Health effects

But its not just “bread winners” who need a car. Everyone of driving age needs one too. To be without a car in these landscapes imprisons one in the home. Imprisonment leads to a strong desire for escape and a car of your own is the only means. But escape does not mean freedom.¹⁴ A landscape where walking is impossible is a landscape where our legs are only used to get from the couch to the refrigerator and from the front door to the driveway. Residents of auto oriented suburbs walk less and weigh more than people in walkable areas. While direct causation is difficult to definitively ascribe the evidence is highly suggestive. The body is designed primarily for walking. If walking is systematically denied by ones environment this cant be a good thing. Many studies suggest that the epidemic increase in teenage obesity and alarming rise in juvenile onset diabetes can at least partly be ascribed to the physically paralyzing influence of auto oriented landscapes.¹⁵

16. Over the past 15 years Houston has invested billions of dollars annually in highway improvements resulting in significant progress in relieving traffic congestion, far above that of most other metro areas in the United States (Cervero 2003, p159).

17. Litman (2008) found that assuming there are two to three off-street parking spaces per capita there would be approximately 1,000 square feet of parking pavement per capita and 2,000 square feet of urban land devoted to paved roads and parking per capita. In Canada this is about three times the land devoted to homes (Litman 2008). A study in the United States from Purdue University surveyed the total area devoted to parking in a midsize Midwestern county and found that parking spaces outnumbered resident drivers 3-to-1 and outnumbered resident families 11-to-1 (Purdue University 2007). Myrup and Morgan (1972) calculated that 14 percent of Sacramento, California was streets (including curbs and sidewalks) and 22 percent was “other impervious surfaces” (defined as parking lots, airport runways, and highway shoulder strips). McPherson (1998) who also analyzed Sacramento found that in low-density residential areas paved surfaces accounted for 27 percent of the land while in industrial areas they accounted for 50 percent. Manville and Shoup (2005) conducted an extensive literature review and found that no such aerial analysis has been done on Los Angeles to determine the percentage of land given over to the automobile therefore most region-wide estimates are simply guesses. However they did find that although denser cities tend to use a larger share of the land for streets they also use less street space per capita. For example, while New York’s share of land in streets is 2.3 times that of Dallas, low-density Dallas has 1,575 square feet of streets per capita while compact New York has only 345 square feet per capita (Meyer & Gomez-Ibanez 1983). Los Angeles has the most lane-miles per square mile (7.6) of any urbanized area in the United States but a fairly low number of lanes miles per 1,000 persons (1.4) (2000 U.S. Census as cited in Manville and Shoup 2005). In terms of freeway lane-miles per square mile, London has 0.58, Paris and New York are similar with 1.52 and 1.50 respectively and Los Angeles has 2.57 (Demographia 2006).

Spending and spending to stay in one place

For these and other reasons a system that had the capacity to accommodate the family trips of thirty years ago utterly fails now that family trips have doubled. Yet the highway system as built absolutely necessitated this doubling and should have been foreseen. To get the system back to the efficiencies of thirty years ago would require a doubling of highway lanes per square mile in most metropolitan areas,¹⁶ a proposition that most metropolitan regions have understandably shied away from.

But even if we could double the amount of national treasure committed to such an enterprise the dream cannot become real. The space demands of the car are such that in many sprawling metropolitan areas there are ten parking spaces scattered around

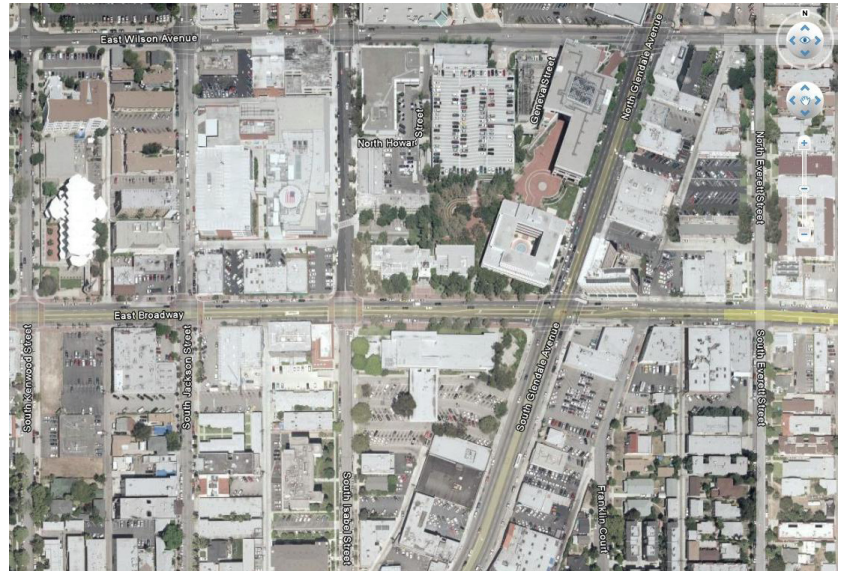


Figure X. This aerial photograph shows an example of the extent of paved area typical in Los Angeles, Florida.

the region for every car. That’s an acre of land for every fifteen cars not counting the roads, garages, driveways and freeways they also demand. In the city of Sacramento, California over 35% of all city lands are paved,¹⁷ devoted to car use. As auto dependence increases the percentage of land required to keep the system smoothly flowing increases steadily even beyond 35% to absurd heights. Many metropolitan areas are in danger of being consumed by roadways and parking lots while worthy destinations to drive to and from become increasingly rare. If one accepts the thesis that the trend towards more and more per capita driving is the inevitable consequence of the system as described above then at some future point it cannot be sustained, even if tax and personal resources poured into the system double and triple.

18. Transportation-related final demand is the total value of transportation-related goods and services purchased by consumers, businesses and government. This includes personal consumption such as the purchase of new vehicles, fuel and services as well as government investment in the construction, maintenance and administration of transportation infrastructure. In 2003, the total transportation-related final demand in the United States reached \$1.113 trillion and accounted for 10.7% of the national GDP (US Bureau of Transportation Statistics 2005). In Europe the transportation of goods and people accounted for 7% of the Gross National Product (EurActiv Policy 2006) while in Canada the total transportation expenditures in 2003 accounted for 13% of all expenditures in Canada's economy. Personal expenditures on transportation accounted for 8.5% of the Gross Domestic Product (Transport Canada 2003). A passenger-mile of travel is a traditional measure of transportation output and represents the movement of one person for one mile. In the United States expenditures per passenger mile rose from 3.71 cents in 1960 to 4.95 cents in 1970, 11.67 cents in 1980 and 16.55 cents in 1990 (US Bureau of Transportation Statistics 1994). Even when accounting for inflation, expenditures per passenger-mile have increased more than either the Consumer Price Index (CPI) or the Implicit Price Deflator (IPD) for most the recorded years.

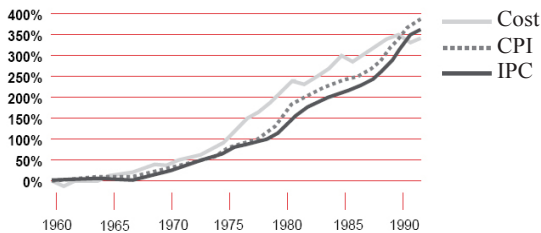


Figure X. Passenger Transportation Costs (per passenger-mile) vs Consumer Price Measures

19. In 2006 the US transportation sector's Greenhouse Gas (GHG) emissions from fossil fuel combustion totaled 1,856 TgCO₂ Eq., accounting for 26.3% of the total GHG emissions in the United States (US EPA 2008). This estimate did not include vehicle, fuel or infrastructure lifecycle emissions such as the extraction and processing of raw materials, production of fuel or infrastructure construction and maintenance. The total lifecycle emissions for the transportation sector (not including raw material production of non-highway vehicles or emissions from the construction and maintenance of transportation infrastructure) are estimated to be 27 to 34% higher than direct fuel combustion emissions (US EPA 2003). Emissions associated with the construction and maintenance of transportation infrastructure have yet to be studied in depth but CO₂ emissions from the chemical process of cement production is the second largest source of industrial CO₂ emissions in the United States at 45.7 TgCO₂ Eq. (US EPA 2008). According to the World Business Council for Sustainable Development (2002) only 50% of the CO₂ emissions produced from the production of cement come from this chemical process; 40% are from the combustion of fossil fuel for energy and are not included in the GHG inventory for the cement industry. Taking the chemical, combustion and energy emissions into account Worrel et al. (2001) estimate that the cement industry is responsible for 5% of global anthropomorphic CO₂ emissions.

No economy however vibrant should be so burdened with supporting a system that seems to produce so much energy and money consuming motion without productive purpose.¹⁸ The strain of the current system on taxes has been apparent for years and is, according to many, already a crisis – a crises made vivid by the collapse of the Mississippi crossing of I 35W in Minneapolis in 2007.

Climate Change

The impossibility of curing congestion through road building absent any strong regional and national land use controls should be obvious to a sixth grader. But if the inevitability of eventual fiscal failure and congestion paralysis are not convincing enough we can add the collapse of our planetary support systems to the list. Thirty percent of the worlds CO₂ production comes from the United States and Canada, where about 6% of the worlds people live. Of this about a quarter comes directly from transportation, and the bulk of that from single passenger automobiles. This number does not include the CO₂ consequences of the immense infrastructure of car manufacturing and support, and the CO₂ production consequent to building the roads and highways all those cars need (concrete production is the largest single industrial producer of climate change gas, with most concrete in North America used for highway and bridge construction).¹⁹ Factoring those in brings the number closer to 40%.

The community of nations is finally agreeing that planetary meltdown can only be avoided if we cut climate change gases by 80% by 2050. Even the US and Canada, who have heretofore been the most reluctant of the G8 nations to acknowledged the crisis have agreed. During a period where just the US alone will add 130 million more people, it is madness to assume a 85-90% per capita reduction can be achieved unless we reverse the trend to ever greater auto dependence. No breath will here be wasted to debunk the pathetic faint hope of industry technocrats who point to hydrogen and ethanol as the way out of the dilemma without telling the truth. Both of those sources do nothing to change the fundamental entropy of our transportation choices, require huge energy inputs in their creation, lead to food scarcity in third world countries, and in the case of corn based ethanol require more petroleum to make the fertilizer, drive the farm equipment, and to truck the raw materials here and there than they give back in fuel.

Reasons for hope

At this depressing point no doubt the reader is tempted to reach for a strong drink and ignore the problem. It seems too big to solve. When completely unpacked in all its depressing detail, anesthesia beckons. But all is not lost. Robert Yaro, director of

20. Looking at neighbourhoods of varying age in five study areas (Maricopa County, Arizona; Orange County, Florida; Minneapolis-St. Paul, Minnesota; Montgomery County, Maryland; and Portland, Oregon), Knapp et al. 2004 found that lot sizes rose between 1940 and 1970 and then fell continuously, reaching an all time low in 2000. Hubble (2003) found similar trends in Las Vegas where the average lot size for a new home fell 500 square feet in the last two years. In 2001 only 13% of new residential lots were smaller than 4,000 square feet, however, in 2003 this number had doubled to 26% (Hubble, 2003). According to the US Census Bureau's American Housing Survey the median lot size fell 26% between 1995 and 2001 (US Census Bureau). The US Census shows an increase in the density of urbanized areas in the United States from 3,052 people per square mile in 1990 to 3,176 in 2000 (Demographia 2001)..

21. Northwest Environment Watch. 2002. Sprawl and Smart Growth in Greater Vancouver: A comparison of Vancouver, British Columbia, with Seattle, Washington. Northwest Environmental Watch/Smart Growth BC. Available online at: http://www.sightline.org/research/sprawl/res_pubs/sprawl_smart_van

the Regional Plan Association of New York often says: "The bad news is that we have massively overbuilt the freeway system. The good news is that we have massively overbuilt the freeway system." By the first part of this sardonic aphorism he means: America has over invested in a system that has, in the absence of any other land use planning controls, made a sprawling and highly inefficient urban landscape inevitable, as the excessive transportation demands that this infrastructure unleashes became impossible to satisfy. By the second part he means: The exact same system that unleashed these forces is of such a size and extent that it could accommodate through infill the massive increases in population expected. Less than ten percent of all land in North America's most sprawling metropolitan area is covered by buildings. The rest is consumed by parking areas, service roads, other roadways, highway rights of ways, driveways, yards and the other elements of the suburban landscape. Here, two cars per family are the minimum requirement for survival. Services are always too far away to get to on foot and too dispersed to be efficiently served by transit. If a way could be found to increase the intensity of all of the land within the freeway service area to double or triple its present level (and surely given the low coverage by buildings such a thing should be easily possible), then per capita demand for long distance travel should gradually drop. When land use intensity increases, alternatives to the car become possible, allowing a gradual mode shift to transit walking and biking. What this suggests is that the retrofit and intensification of the North American suburb is both eminently possible and a means to address the three linked sustainability problems of the city; our downward cycle of ever increasing car use, our increasingly unaffordable infrastructure maintenance costs, and the larger global crisis of climate change and our own responsibility for it.

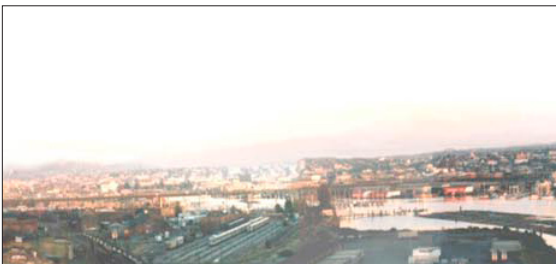
The good news is that this infill is already underway in many areas. According to the US Census Bureau, the year 2000 marked the first time in fifty years that the average density of metropolitan areas has gone up. This is not just because young professionals are flocking to high density warehouse districts; it's much more systemic than that. The five room ranch house of the 1950's, a 1,200 square foot home on a 20,000 square foot lot is now a thing of the past. Now the 2,500 square foot home on the 5,000 square foot lot is much more the norm.²⁰ While these puffed up houses on smaller lots are decried by many, they represent a huge shift in the market to a density that is at least conceivably compatible with walkable and transit served communities. This trend is most advanced in Vancouver, where in the years between 1986 and 2001 the percent of Greater Vancouver's residents living in compact neighbourhoods increased from 46% to 62%.²¹ Vancouver also has been North

22. Nationally, the average time spent commuting to work in Canada increased between 1992 and 2005 from 54 minutes to 63 minutes. In contrast, residents in Vancouver spent no more time on average getting to work in 2005 than they did in 1992. (Source: Turcotte, M. 2005. The Time it Takes to Get to Work and Back. Statistics Canada, General Social Survey on Time Use: Cycle 19, Catalogue no. 89-622-XIE)



Figure X. Pearl District in Portland, OR

The two photographs below, taken from the exact same spot but 25 years apart on Granville Street Bridge, show the dramatic change in Vancouver's skyline between 1978 and 2003.



America's most successful example of center city densification. In the ten years between 1990 and 2000 the population of the downtown peninsula increased from 40,000 to 80,000. During that same time the total number of car trips into and out of the downtown actually decreased, while average commute times in the region dropped by six minutes (Vancouver was the only Canadian city where commute times went down during this period, a period where no additional freeway miles were added but during which population increased by over 20%).²²

And there is more. Center city urban infill projects have been very successful in this decade, notably in Portland's "Pearl District". Three decades spent maintaining Portland's compact metropolitan region, often against the weight of tremendous political and industry opposition, have helped Portland avoid the value flight experienced in Detroit and St. Louis. By controlling land use and limiting freeway construction Portland successfully protected inner city values, making reinvestment in that city's former warehouse district possible. What is now sadly inconceivable in Detroit or St Louis is an accepted fact in Portland: There is a strong market for center city high density housing even in a relatively small city like Portland. Young professionals are willing to invest up to \$500 per square foot for an urban lifestyle, if past decisions have been such that there is any urban life remaining (sadly in the case of St Louis and Detroit there is not). The success of Vancouver, echoed later by Portland, and increasingly copied by San Francisco and San Diego give reason to hope that efforts to infill, complete, and re urbanize the metropolitan landscape are possible, and indeed seem to be compatible with current market demand.

So while the symptoms of the disease are most certainly debilitating, and the disease itself life threatening, there are signs that the patient is capable of responding. As in so many other things there has to be a desire for change, and this desire is starting to be made manifest. The first step in recovery is always an admission that there is a problem and a taking responsibility for change. But proven therapies for restoring the health of the region are required. Citizens are justifiably insecure about how and what to change. Changing the way we build regions is like changing any habitual behavior. Habitual behaviors, like drinking, smoking or drugs, anesthetize us in the near term, but lead to larger problems in the long term. Building sustainable regions is the same. A reflexive NYMBYism in the face of development proposals that exceed existing district density is tremendously satisfying for citizens who justifiably feel they have protected their community through their opposition; but the long term effects of this action, multiplied by many thousands of other equally habitual actions, is to worsen the disease. A set of principles, call them rules for healing cities if you will,

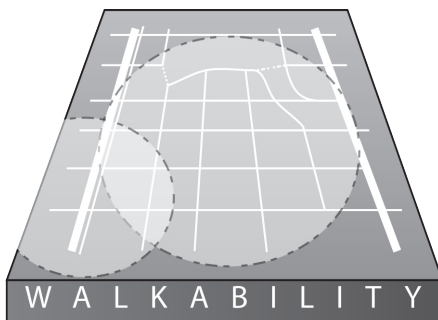
are a necessary tool for recovery. Over the years many have recognized the same thing. The list of simple rules, or “steps to recovery” that form the core of this book are not original. A debt is owed to hundreds who have worked developing and promulgating similar design principles to correct the pathologies of the North American city. What is unique to this book is the attempt to simplify and order them clearly as a set of integrated urban design therapies for healing the North American urban landscape. The hope is to provide citizens and leaders in the public and private sector with a simple but credible framework for action. What follows then is listing of the principles followed by a one sentence explanation, which introduces and anticipates the seven following chapters where they are explicated in much greater detail.

Seven principles for sustainable communities



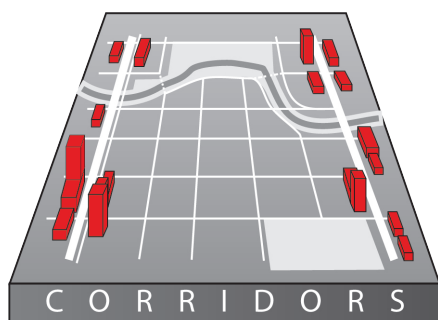
1. A restored Streetcar City

The North American city was and is a streetcar city. Streetcar cities are characterized by easy access to transit, medium density, and linear commercial and activity corridors. Planning and design strategies of the past 50 years have largely ignored this fact. It needs rediscovery.



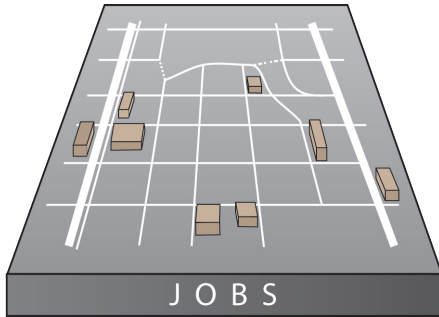
2. A five minute walking distance to commercial services and transit

North Americans will walk if there is something to walk to. The most important walking destination is the corner store and a bus stop with frequent service. A minimum density of ten dwelling units per acre gross density is required for this to work.



3. An interconnected street system

It does no good to be five minute walking distance from the store if it's as the crow flies. Interconnected streets are as important to pedestrians as they are for cars. Fine grain grids disperse congestion and insure that walking trips are as short as possible.



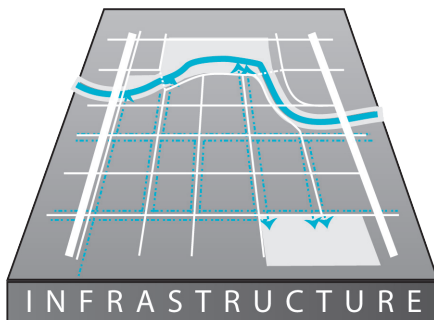
4. Good jobs near home

The trend to ever larger commute distances for workers must be reversed. “Good jobs close to home” is a fundamental requirement. The vast majority of new jobs in North America are compatible with complete neighborhood districts.



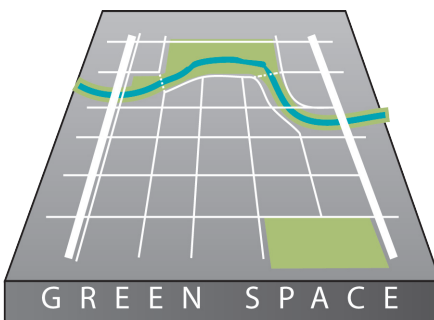
5. Different housing types on the same street

Zoning laws have been an instrument to segregate communities by income. Communities designed for only one income cannot be complete and when repeated throughout the region add to transportation problems.



6. Lighter, greener, cheaper, smarter, infrastructure

Suburban homes have at least four times more infrastructure per dwelling unit than do walkable streetcar neighborhoods. Exaggerated standards for road widths and cul de sacs cost too much, are difficult and expensive to maintain, and destroy watershed function. Smarter, cheaper, and greener strategies are required.



7. Linked parks and natural areas

To meet the performance targets of the water quality act requires a rethinking of urban drainage systems and stream protection policies. Articulation or recovery of these systems must be a first design move when planning new communities. Far from protecting these systems through restriction, these systems must form the public space armature of new and restored communities.

Love one principle, love them all

These principles represent the elements of a whole. Achieving one without the others, and particularly if it is at the expense of the others, will be of limited value and could be counterproductive.