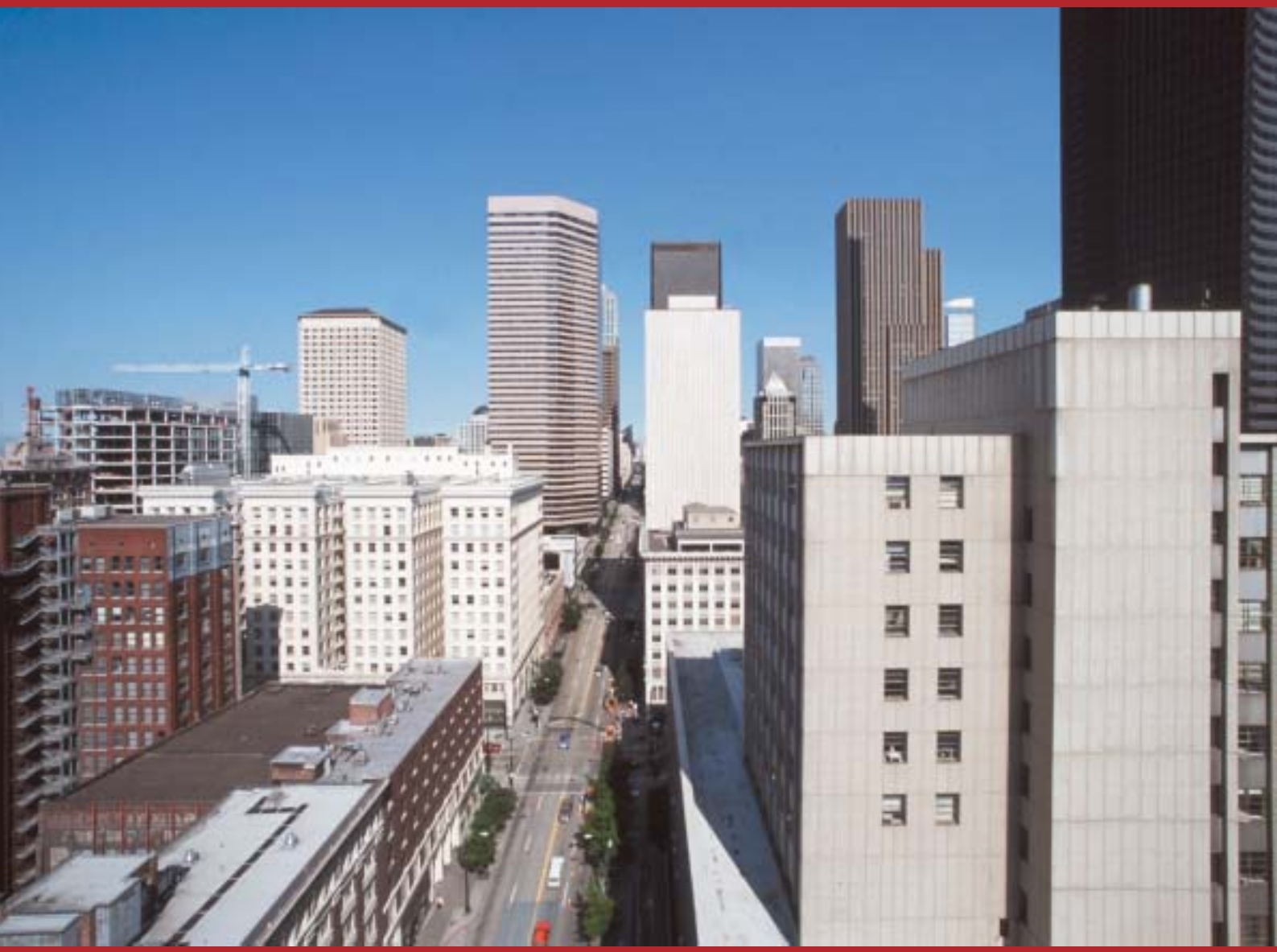
# *Urban Areas* 10



# Urban Areas

North America is a highly urbanized region. In the past 30 years, North America's urban population increased from 72 to 77.2 percent (see Figure 50) (UNCHS 2001). The actual increase in urban populations over the period is even higher and more significant. By the year 2020, some 300 million people will be living in the region's urban or metropolitan areas (see Box 61).

Urbanization is related to many of the environmental issues highlighted in this report, including the loss of agricultural land, wildlife habitat and biodiversity loss and degradation, regional air pollution, global climate change, coastal degradation, an expanded urban-wildlife interface, and polluting inputs to fresh and marine waters.

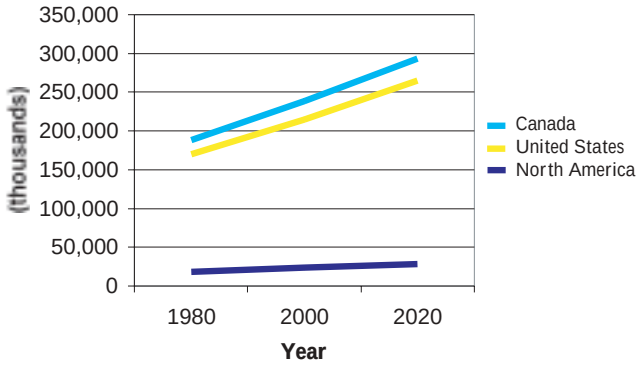
Suburban sprawl, a key characteristic of North American settlement patterns, has an important impact on the environment and is a high-priority issue in the region. A house in the suburbs is often a component of what has been called the 'American Dream'. In general, a large percentage of North Americans have enjoyed a high quality of life since the 1950s, and during this time, ever-larger proportions of the population could aspire to possess a single-family home with garage and yard, removed from the downtown core. But as the social, economic, and environmental consequences of sprawling suburbs come to light, more and more municipalities are encouraging denser settlement patterns confined to urban boundaries.

While dense settlement patterns have the potential to reduce environmental impact if planned for sustainability, at present,

**Figure 50**
Trend in urban population, 1980-2020

*Source: WRI, UNEP, UNDP, and World Bank 1998*

**Trend in Urban Population, 1980-2020**



**Box 61: Definition of Urban Areas**

The US Census Bureau defines an urbanized area as all territory, population, and clusters of housing units with at least 387.59 people per $km^2$. It includes the surrounding census blocks with an overall density of at least 193 people per $km^2$ (US Census Bureau 2000). Statistics Canada defines a census metropolitan area (CMA) as an urban core population of at least 100,000, together with urban and rural fringes possessing a high degree of social and economic integration with the urban core (Statistics Canada 2001a). Canadian census authorities are now using a definition of 400 persons per $km^2$, which is close to the US definition (Wendell Cox Consultancy 2000a).

North American urban populations use high levels of energy and other resources and dispose of large amounts of waste. The concentration of people and industry has implications for the production, removal, and treatment of solid waste generated as a by-product of regular consumption, as well as hazardous wastes produced by industry. Canadian and US citizens are some of the highest per capita producers of municipal waste in the world, putting out, respectively, an annual average of 630 and 720 kg per person in the mid-1990s. These amounts represent respective increases of 24 percent and 19 percent since 1980 (CEC 2000). Quantities of waste and pollution generated by North America's urban-industrial complex are part of the make-up of the region's ecological footprint, which is an aggregated measure of human impact on the global environment. Because of their significant contribution to both regional and global pollution and to declines in the earth's natural resources, North American cities have large ecological footprints. The implications of the region's global impact is a high-priority issue for the North American environment as well as the global one.

## Sprawl

By the 1970s, North America's postwar exodus from central cities had led to a settlement pattern characterized by low-density suburbs surrounding city cores, commonly referred to as sprawl (see Box 62). In the United States, a cycle of

**Box 62: Sprawl**

Sprawl may be defined as low-density, non-contiguous, automobile-dependent residential development (Dowling 2000). It is equated with intrusion into rural or undeveloped land on the periphery of a central city or town, beyond the edge of service and employment areas (Chen 2000). Sprawl's dominant characteristic is that each of its components—clusters of housing, shopping centers, offices, civic institutions, and roadways—is strictly segregated from the others (Duany, Plater-Zyberk, and Speck 2000). Abetted by a vocal grassroots movement, federal, regional, and municipal governments are increasingly recognizing the environmental and social impacts of sprawl and attempting to address them.

transit declines, rising car use, and commuting longer distances took place over the 1970s and '80s and was mirrored by Canada during the 1990s. These changes were fueled after World War II by a number of polices that encouraged the settlement dispersal. In the United States, loan programs provided low-cost mortgages for new, single-family suburban construction. At the same time the government launched a 65,983 km interstate highway program and provided subsides for road improvement, helping to make commuting by car affordable and convenient for the average citizen (Duany, Plater-Zyberk, and Speck 2000). Local single-use zoning and subdivision ordinances also encouraged the pattern of isolated residential, retail, and workspaces characteristic of sprawl (ULI 1999). In addition, governments funded the extension of sewers and water lines to sprawling developments, paid for emergency services to them, built new schools, and helped suburban developers in other ways (Sierra Club 2000a).

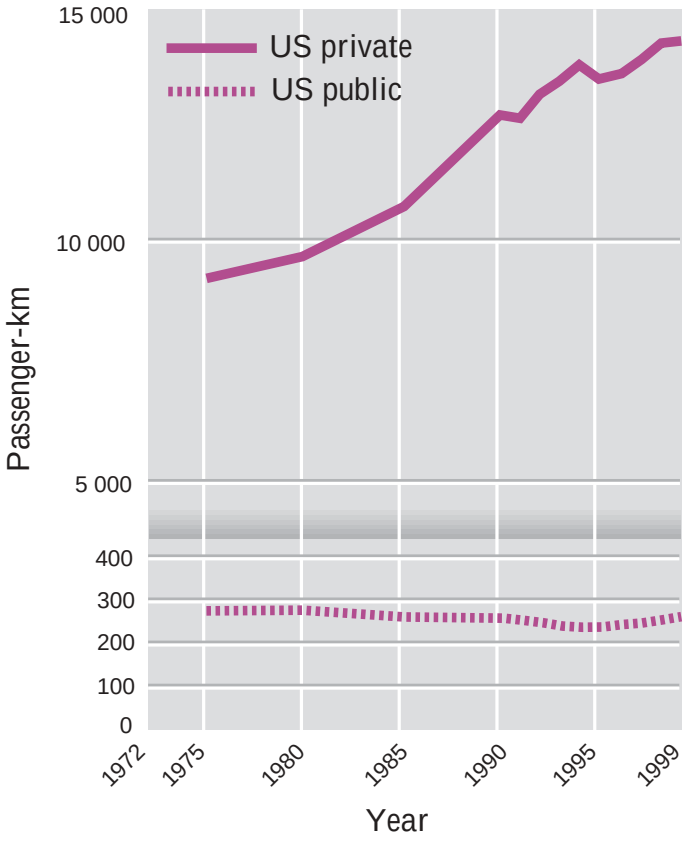
State-level powers over programs and services devolved to local governments, undermining the potential for coordinated regional land use and transportation policies (Raad and Kenworthy 1998). While government infrastructure subsidies, middle-income families, and tax bases left for the suburbs, city centers encountered rising service costs. US cities came to be impoverished city cores surrounded by car-dependent suburbs serviced by malls.

Until recently, sprawl has been relatively more controlled in Canada. A strong tradition of land use planning and higher transit usage created urban areas that are more integrated with their surrounding suburbs. In response to suburban growth, municipalities initially amalgamated or created upper-tier agencies to coordinate regional services and infrastructure and reconcile the needs of suburbs with those of the central city (Raad and Kenworthy 1998). During the 1970s and 1980s, large-scale government subsidies helped transit systems to expand, curbing low-density sprawl. Across the country, public transport

**Figure 51**
US per capita private and public transport use, 1972-1999.

*Source: compiled from EC 1998b; Wendell Cox 2000; and United Nations Population Division 2001*

**US Per Capita Private and Public Transport Use, 1972-1999**



was usually a coordinated, high-quality, and relatively profitable service that helped maintain thriving central cities (Pucher 1998).

During the 1990s, however, low-density suburban sprawl expanded significantly in Canada while continuing apace in the United States. A growing population in Canada increasingly spilled over into areas outside regional government control. Mirroring fragmented municipal governance in the United States, responsibility for social services including transit began devolving to municipalities, depriving regional governments of the tools to contain sprawl (Pucher 1998; Raad and Kenworthy 1998). Large fare increases and service cutbacks, stagnating subsidy levels, and escalating operating and capital costs contributed to declining transit use, and a cycle of car use increases, sprawling suburbs, longer commuting distances, and further transit decreases began. Between 1981 and 1991, the number of car kilometers traveled by Canadian and US citizens grew by 23 and 33.7 percent, respectively, while the distances traveled by public transport shrank (see Figures 51 and 52) (EC 1998; Raad and Kenworthy 1998). Although US cities have higher car use and lower transit use, the rate of growth in the number of car kilometers traveled in Canada began to resemble the United States, rising 20 percent and 23 percent respectively between 1981 and 1991 (Raad and Kenworthy 1998).

The 1990s saw new road building in the United States, which continued to encourage driving and fed into the cycle of sprawl and car dependency. At the same time, the high costs of roads deprived public transit services and other transportation options of potential funding. Between 1996 and 1997, new road construction in 21 US states consumed over half of transportation dollars at the expense of transit (Pope 1999). One report reveals that today, about 85 percent of US federal transportation money encourages sprawl (Dowling 2000). Artificially low gas prices in North America also benefit the suburban commuter rather than the urban transit user (Baker 2000).

**Canadian Per Capita Private and Public Transport Use, 1972-1995**

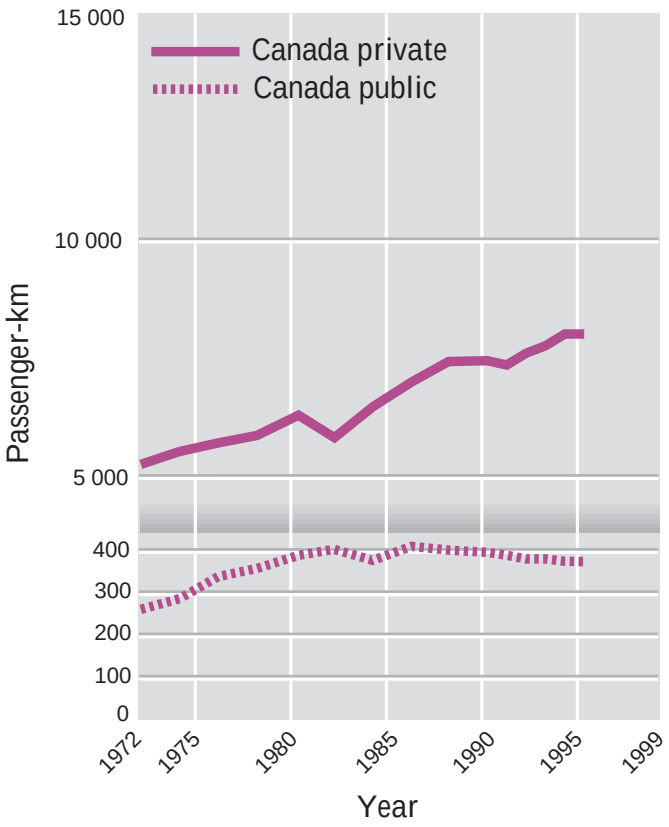



**Figure 52**
Canadian per capita private and public transport use, 1972-1995.

*Source: compiled from EC 1998b; Wendell Cox 2000; and United Nations Population Division 2001*

**Increase in Vehicle Miles of Travel and Population in the United States, 1980-1997**

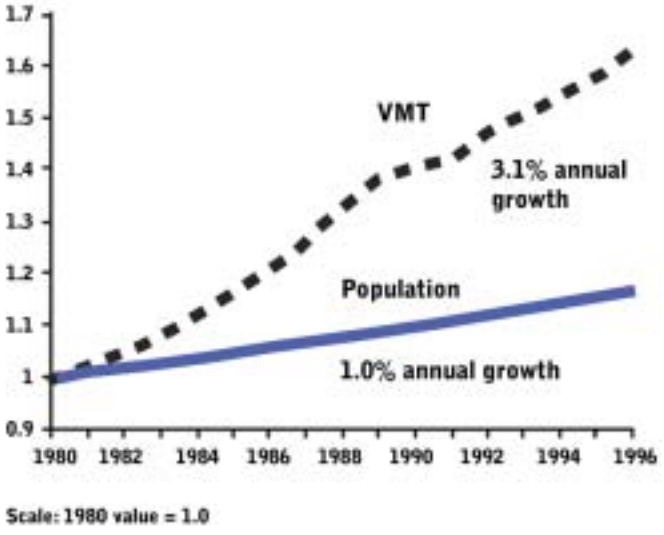



**Figure 53**
Increase in vehicle miles of travel and population in the United States, 1980-1997.

*Source: EPA 2001*

Contributing to recent suburbanization trends in both countries is the substantial loss of central-city jobs (Pucher 1998). High-tech employment, for example, is growing 30 percent faster in US suburbs than in cities, helping

**Urban Sources of Sprawl in the United States, 1970-1990**

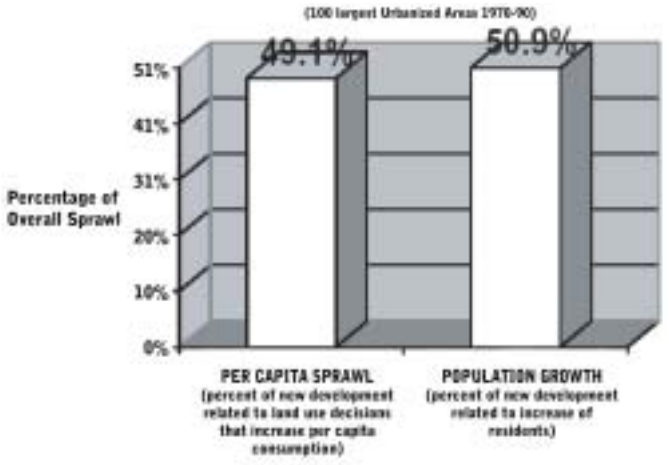



**Figure 54**
Urban sources of sprawl in the United States, 1970-1990.

*Source: Kolankiewicz and Beck 2001*

to drive residential and business development to fringe settlements (HUD 2000). While the close proximity of jobs and housing can promote more sustainable urban settlement patterns, the question of whether employment centers in suburban areas are part of a sustainable solution to sprawl is still being debated.

Demographic trends are also fueling sprawl. For example, the percentage of the population between the ages of 25 and 64—the segment most likely to own households and cars and to commute to work—is growing (Pucher 1998; NAHB 1999). But population growth does not entirely explain the increases in travel miles. For example, between 1980 and 1996, the increase in the number of vehicle miles traveled in the United States exceeded an annual growth rate of 3 percent while annual population growth was only 1.0 percent (see Figure 53).

The growth of ex-urban housing also reflects the ability of an increasingly affluent segment of society to afford a 'dream house' in a country setting. Indeed, in both nations, sprawl is as much an effect of the preference for house type and locations as it is of population growth. As the overall US population grows, suburbs are growing faster than central cities: suburban population grew by 11.9 percent between 1990 and 1998, compared to 4.7 percent for central cities (Pope 1999; Baker 2000; HUD 2000). Only one-half of US sprawl appears to be related to population increase, with the other half attributable to land use and consumption choices that increase the amount of urban land occupied per resident (Kolankiewicz

and Beck 2001) (see Figure 54). Similarly, the growth of suburbs in Canada is reflected by a steady decline in population densities—from an average of 1,030 persons per km² in 1971 to 796 per km² in 1996. The accelerated expansion of urban areas was influenced by preferences in housing location and type of homes, resulting in more land per urban dwelling. Almost 60 percent of all dwellings in Canada are single detached houses (Statistics Canada 2001b).

The North American suburban lifestyle has many benefits that are coveted by other, less developed regions of the world. But some North Americans increasingly recognize the multiple negative effects of unbridled growth in low-density suburban development (Chen 2000). The environmental consequences of sprawl begin with land conversion. The total amount of land dedicated to urban uses in the United States expanded by more than 7.7 million ha between 1970 and 1990 (Sierra Club 1998). The American Farmland Trust estimates that between 1982 and 1992, an average of 1,620 km² a year of prime farmland in the United States was developed (Sorensen, Greene, and Russ 1997). During the following decade, this loss rate doubled as almost 65,000 km² of private forest, agricultural land and open spaces were claimed by development so that by the end of the 1990s, some 4,050 km² continued to be lost each year, a substantial portion of which was devoted to suburban homes on lots of half a hectare

**Urban Land Occupying Dependable Farmland in Canada, 1971-1996**

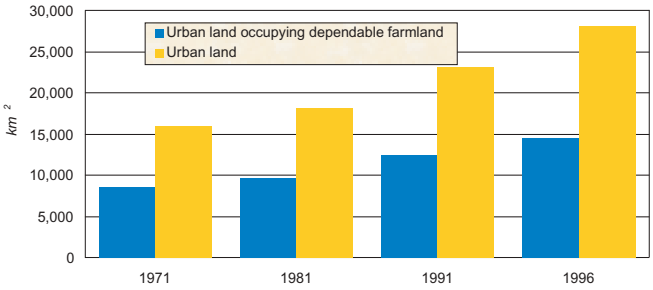



**Figure 55**
Urban land use occupying dependable farmland in Canada, 1971-1996.

*Source: Statistics Canada 2000c*

(Dowling 2000; HUD 2000). In Canada, the amount of urban land occupying 'dependable' land (suitable for long-term crop production) increased from about 9,000 km² in 1971 to 14,000 km² in 1996 (see Figure 55). During this period, some 12,250 km² of land, half of which was dependable agricultural land, were converted to urban uses (Statistics Canada 2000b).

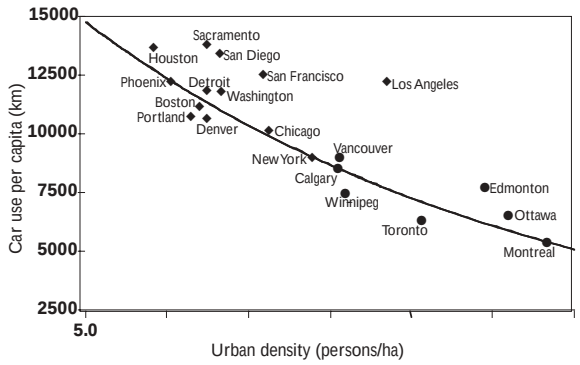
Apart from agricultural land, other natural landscape features are also lost to urban and suburban development, such as wetlands, forests, and wilderness areas, as well as the services they provide, such as wildlife habitat, flood and runoff control, and soil productivity (Parfrey 1999). Sprawl is a serious threat to wildlife and plants as it destroys and degrades the habitat on which these species depend for their survival. Habitat conversion to urban, suburban, or agricultural development accounts for 2 to 20 percent of species loss in the lower 48 states (The Biodiversity Project 2000). In the 10 years between 1982 and 1992, fully 2,085,945 ha of forestland, 1,525,314 ha of cultivated cropland, 943,598 ha of

## Box 63: Smart Growth

In the past 10 years, a 'smart growth' movement has emerged in North America to combat sprawl. Smart growth is promoted by a broad coalition including environmental NGOs, social justice activists, local government officials, urban planners, affordable-housing advocates, and most recently, among some developers and others in the real estate industry (Katz and Liu 2000). The movement—including sustainable city initiatives (see Box 64) and the new urbanism approach, which advocates redesigning conventional suburban developments as small towns—promotes high-density neighborhoods characterized by a balance of mixed residential, office, and retail land uses in close proximity, with civic buildings clustered in a town center; the shrinking of travel distances, which encourages walking and cycling and privileges public transit; the preservation of open green spaces and farmland; the involvement of residents in city planning processes; and respect for the area's history and architecture (Parfrey 1999; Baker 2000; Duany 2000; Sierra Club 2000b). This agenda emphasizes 'smart' growth, rather than 'no' growth, and seeks to reform codes and ordinances to permit the development of smart growth characteristics and create urban growth boundaries (ULI 1999). Figure 56 shows that where urban density is highest, car use per capita is lowest, and illustrates the fact that Canadian cities are much less affected by sprawl than their US neighbors. Public transportation use is three times higher and population densities 1.8 times greater than in US metropolitan areas (Raad and Kenworthy 1998).

Compact development techniques advocated by smart growth include building within an already urbanized area, redeveloping on cleaned-up contaminated sites or 'brownfields', and cluster development on reduced-size lots. Such development encourages smart growth attributes by using up less land area and helping to reduce travel distances; encouraging walking and cycling; privileging public transit; preserving open green spaces, wildlife habitat, and farmland; and reducing impervious surface areas in order to improve drainage and water quality (EPA 2001).

### Urban Density vs Car Use in 20 North American Cities, 1990-1991




*From The US and Us: Canadian Cities are going the way of their US counterparts into car-dependant sprawl,* Alternatives Journal, *24:1 (Winter 1998), p.17.* www.alternativesjournal.ca

**Figure 56** *Source: Raad and Kenworthy 1998*

pastureland, and 774,029 ha of rangeland were converted to urban uses in the United States (WRI, UNEP, UNDP, and World Bank 1996).

The spread of paved areas accompanying urban and suburban sprawl increases the risk of floods as rain flows into gutters instead of seeping into the ground to replenish groundwater supplies. Urban runoff is also a significant source of pollutants such as oil and heavy metals that are washed into water courses (WRI,

UNEP, UNDP, and World Bank 1996). With accumulated sediments, habitat disturbance, and declining water quality, many US urban watersheds are suffering changes to the natural hydrological cycle (Samuelsohn 2001).

Sprawl also has social and economic consequences, including traffic congestion and related costs for petrol burned and time lost, deteriorating inner cities that are often fragmented along class and racial lines, and suburban problems of isolation and lack of sense of community (Raad and Kenworthy 1998; Dowling 2000). Sprawl-exacerbated congestion costs an estimated US $72 to 78 billion a year for lost time and fuel in the United States, representing an estimated 4.5 billion hours of extra travel time and 25.7 billion liters of fuel wasted during traffic jams. The average annual delay per person rose from 11 hours in 1982 to 36 hours in 1999 (Dowling 2000; TTI 2001). Studies also reveal that low-density, non-contiguous settlement requires more money for municipal services and infrastructure than compact development does (Chen 2000).

Car-centered development can exacerbate disparities between the rich and poor and worsen the plight of the underprivileged. For example, although the automobile is the only practicable means of transport in some US cities, one-third of the nation's population is too young, too old, or too poor to drive a car (O'Meara Sheehan 2001). Inner cities and their residents also bear the costs of sprawl. Once-thriving downtown businesses in some places close as urban tax bases lose funding. Furthermore, most US federal housing subsidies

**Box 64: Sustainable Cities**

Sustainable city and community approaches, which address economic, environmental, and social issues through public participation, have also been applied to urban sprawl, and inner-city and brownfield development to build healthy communities with the features characteristic of smart growth (Lachman 1997).

Seattle, Washington, was one of the first US cities to explicitly incorporate sustainability into its community development plans. One of the city's policies, the Seattle Comprehensive Plan, aimed to increase the density of jobs, housing, and amenities; reduce urban sprawl and traffic congestion; and create an 'urban village' of distinct neighborhoods (Lachman 1997). Seattle also developed a set of sustainability indicators to measure the quality of economic, ecological, social, and cultural health in its communities, and its 'Sustainable Seattle' reports have won international awards and inspired other communities in North America and around the world to monitor their own progress toward a more sustainable future (SCN 1998).

A number of 'urban villages' throughout Canada display some of the features of sustainable neighborhoods: Kitsilano in Vancouver, Fort Rouge in Winnipeg, the Beaches in Toronto, Plateau Mont-Royal in Montreal and Spring Garden in Halifax (CMHC 2001). North America is home to 44 of the some 350-member governments of the International Council for Local Environmental Initiatives (ICLEI), which commits them to develop sustainability plans (ICLEI 2000).

go to well-off suburban homeowners, not to inner-city residents. While there has been a recent trend toward resurgence in many US downtowns, such as Philadelphia, Chicago, New York, Denver, and Houston, it has generally benefited better-off residents. Also, there is evidence that gentrification of inner cities can raise housing costs and slow employment growth (Jud 2001), pushing out low-income families. A 2001 United Nations report warns that despite North America's general prosperity compared to other world regions, problems of residential segregation, discrimination in housing markets, and affordability persist, particularly in its larger cities (UNCHS 2001).

As highlighted in the atmosphere section, the increased reliance on automobiles that is both a cause and consequence of sprawl has created air quality problems and related human health impacts from car emissions. Cleaner, more efficient vehicles and more stringent emissions regulations have generally improved air quality in many North American cities since the 1970s. These gains are being eroded, however, due in some degree to decentralized development. Although today's cars are 90 percent cleaner than those of the 1970s, US citizens now drive on average more than twice as many kilometers as they did in the 1970s (see Figures 51 and 52) (Dowling 2000; HUD 2000). Furthermore, as underscored in the atmosphere section, transportation is a leading contributor to greenhouse gases, and the consequences of climate change due to human activity are a cause of increasing concern. Health can be affected in other ways, too. For example, the sedentary lifestyle that often comes with reliance on cars contributes to obesity problems in adults and children (Chen 2000).

Increasingly, state and local governments are implementing smart growth and sustainable city plans to address sprawl (see Boxes 63 and 64, previous page). Successful 'infill' projects in which decaying properties or vacant lots are developed to help cities rebound are now more common. On the other hand, in many places it is still less expensive in the short term for developers to buy and build on land outside city zones (Chen 2000).

The smart growth movement in the United States has enjoyed a broad base of popular support over the past decade. In 1998, voters passed 70 percent of 240 smart growth ballot initiatives focused on preserving green space (Dowling 2000). Although most activity has

been directed at the planning levels of government, the agenda has more recently gained acceptance by national and municipal leaders across the country (Nelson 2000). At the federal level, smart growth has been endorsed through a number of new initiatives. In 1996, the US Environmental Protection Agency joined with several non-profit and government organizations to form the Smart Growth Network (SGN) to encourage sustainable urban development (Arigoni 2001).

The US 1998 Transportation Equity Act (TEA-21) reduces the share of funding dedicated to new highways and provides some additional funding for transit and paths for pedestrians and cyclists (ULI 1999). But critics point out that TEA-21 dedicates more than four times more money to highways than to public transit (Sierra Club 2000a). The Livable Communities Initiative budget also gives money to mass transit, invests in local initiatives to ease congestion, and acts as a clearinghouse to help voluntary grassroots initiatives find resources to combat sprawl (FTA 2000). The 2000 budget included a large one-time investment for land protection through the Land Legacy Initiative (Baker 2000). And another federal initiative, the New Markets urban revitalization plan, is intended to stimulate business investment in poor communities and reverse or curb gentrification that pushes poor families out (HUD 2000). Business initiatives are also appearing: in 1999, the National Association of Home Builders published its policy on smart growth, which includes the promotion of building to higher densities, revitalizing cities and older suburbs, and preserving meaningful open space and protecting environmentally sensitive areas (NAHB 1999).

The anti-sprawl movement is not as strong in Canada, largely because sprawl and its impacts are less evident. However, most of Canada's major urban regions are instituting long-range transportation plans aimed at reducing car dependency and adopting strategies for higher-density, mixed-use urban development (Raad and Kenworthy 1998). The province of Ontario's initiative involves developing a vision and overall goals for smart growth, growth plans for 5 zones through stakeholder consultation, and a 10-year US $5.9 billion Transit Investment Plan (Government of Ontario 2001). The Transportation Association of Canada (TAC) provided national leadership for sustainable urban transportation through its 1993 long-term generic vision for multi-use urban development, compact communities, and viable transport options that include pedestrian, cycling, and transit infrastructure. Many local governments across the country have adopted the TAC's New Urban Vision key objectives and principles (Stephens 2000). Reflecting this trend is the rise in the popularity of public transit since 1996, with a major surge in ridership in 1999 and 2000 (EC 2001).

**Box 65: Bilateral Cooperation**

Canada and the United States share a common airshed, common watersheds and common routes for migratory species in the transboundary Georgia Basin/Puget Sound region of the west coast. Through the Joint Statement of Cooperation for the Georgia Basin/Puget Sound Ecosystem, Environment Canada and the US EPA agreed to develop and identify forums and mechanisms for residents and decision-makers to share information on Smart Growth/Sustainable Development issues. Two such forums in 2001 gave multi-stakeholder participants a chance to share their experience and knowledge on best practices in smarter urban design and sustainable growth. The two countries are also developing a suite of coordinated transboundary sustainability indicators (EC 2002)

As part of its action plan on climate change, in 2000 Canada established the Green Municipal Fund to stimulate investment in innovative municipal infrastructure projects and environmental practices to help municipalities reduce greenhouse gas emissions, address air, water, and soil pollution, and promote renewable resources (FCM 2001). The Canada Mortgage and Housing Corporation also recently began promoting housing in sustainable neighborhoods that feature smart growth attributes (CMHC 2001). Canada and the United States also joined forces to tackle sprawl in the ecosystems they share in the Georgia Basin (see box 65).

There are still many hurdles on the path to smart growth and sustainable cities: powers to address sprawl are generally fractured among federal, state/provincial, and local governments and their proper roles are still undefined (Stoel Jr. 1999; Dowling 2000); adequate funding and effective compliance regimes to ensure policy implementation are lacking (Raad and Kenworthy 1998); policy solutions fail to reflect the many forces driving development patterns and to make the link between affordable housing and smart growth; and transportation strategies are short of funding and clear thinking. To some, smart growth implies the loss of individual freedom and property rights, and this fear fuels an anti-smart growth lobby (Stoel Jr. 1999; Katz and Liu 2000). Vested interests of the car manufacturing industry are so powerful and suburban sprawl is so entrenched in the North American landscape, infrastructure, and psyche that reversing the trend is a formidable challenge.

## Ecological Footprint

North America's urban and suburban pattern of growth is one of the principal forces driving the global increase in energy demand, even though the region has only 5 percent of the world's population (WRI, UNEP, UNDP, and World Bank 1996). North American cities, with three-quarters of the region's population, are major consumers of the world's natural resources and major producers of its wastes. As a result, their impact on the global environment is larger than that of any other region.

Urbanization has a profound effect on the amount and kind of

energy consumed, and, along with population growth, economic development, industrialization, and low-priced energy, it is one of the principal forces driving the global increase in energy demand (WRI, UNEP, UNDP, and World Bank 1996). Per capita consumption rose steadily over the past three decades: on average, in industrialized countries such as Canada and the United States, it grew at 2.3 percent per year over the past 25 years. Like all urban areas, North American cities need to import their basic requirements of food, fuel, and water from a distance. Globalization has been an important driving force in changing consumption and production patterns as the accelerated movement of goods, information, and people provides consumers with an

## Box 66: The Ecological Footprint

The impact of a region, a nation, a city, or an individual on the global environment is increasingly referred to as the ecological footprint. This term expresses the impact of a given population as the amount of productive land and water needed to produce the resources it consumes and to assimilate its wastes, using prevailing technology (Wackernagel 1999). Thus, it is not simply a measure of the amount of land consumed by an average city resident or by an entire city within its national borders, but rather includes all the land or land equivalent in other parts of the world required by that individual or city to function. The ecological footprint is measured in 'area units' with one unit representing one ha of biologically productive space. Although the approach is still evolving, it is a useful tool to aggregate human impact on the earth into one number. It vividly expresses the notion that the larger the footprint of an individual, a city, or a nation, the more of the world's global resources it consumes and the more it uses the planet's available waste sinks. According to *The Living Planet Report 2000*, in 1996, North America's total ecological footprint was about four times larger than the world average (WWF 2000) (see Figure 57). Compared to the amount of land the average US citizen uses to support his or her current lifestyle, however, the average Canadian lives on a footprint that is 30 percent smaller (Redefining Progress 2002).

**Comparison of Ecological Footprints by World Region, 1996**

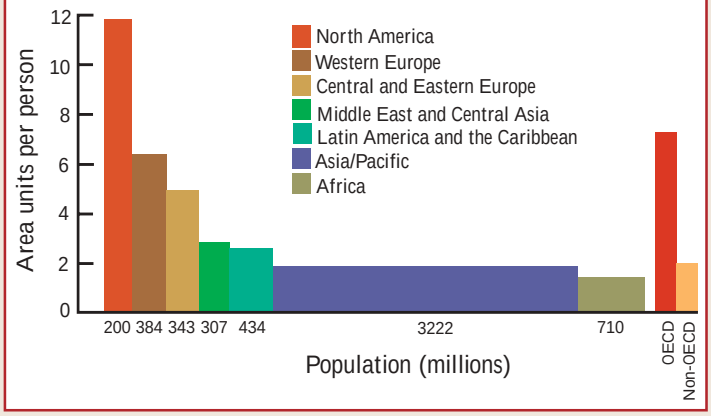



**Figure 57** *Source: WWF 2000*

A person's ecological footprint can be calculated by dividing the regional or national total consumption by its population size. Using this method, the City of Toronto needs about 7.6 ha of productive ecosystem per capita to satisfy primary consumption of food, wood products, fuel, and waste-processing capacity, which means that the city, newly amalgamated to include its suburban neighborhoods, impacts an area over 280 times its actual size (Onisto, Krause, and Wackernagel 1998).

increased variety of choices (UN 2001). Wealthy cities and the wealthier groups within cities tend to appropriate more materials, food, and energy as well as waste assimilation capacity from other regions. Thus, wealthy cities, or neighborhoods in cities, of which there are many in North America, contribute disproportionately to global environmental and social problems (WRI, UNEP, UNDP, and World Bank 1996; Onisto, Krause, and Wackernagel 1998). This is especially the case when the materials consumed originate in countries where environmental, public health, and worker protection laws are inadequate (US IWG 1999).

One of the most significant aspects of North America's large impact or its ecological footprint (see Box 66, previous page) is its large and growing energy use and related $CO_2$ emissions from fossil fuels (see also the atmosphere section). Total energy use in North America grew by 31 percent between 1972 and 1997 (UNEP 2001). Although the efficiency with which it uses energy has improved over the past few decades, in per capita terms, efficiency gains have been much slower, reflecting an overall increase in energy use (OECD 1998). In 1996, North America's energy consumption represented 25 percent of total world primary energy consumption (UNEP 2001).

Between 1972 and 1996, the region's $CO_2$ emissions increased from 1.3 to 1.6 billion tons of carbon equivalent (Marland, Bowden, and Andres 1999). As shown in the atmosphere section, the United States is the leading producer of greenhouse gas emissions; by comparison, per person, they generate about 20 times the per capita emissions of India (Sandalow and Bowles 2001). Although Canada produces only 2.5 percent of global greenhouse gases, Canadians are the world's second-largest per capita energy consumers. Cities are not responsible *per se* for increased greenhouse gas emissions, but presently urban lifestyles, especially of the wealthy, are linked to higher consumption and energy use patterns. An estimated 40 percent of total North American carbon dioxide emissions come from 50 metropolitan areas (UNDP, UNEP, World Bank, and WRI 2000). In 1996, North America's $CO_2$ footprint was almost five times that of the world average (WWF 2000) (see Figure 58).

In terms of fuel, North America's per capita annual gasoline consumption for motor vehicles was 1,637 litres per person in 1997, or nine times the world average (UNDP,

**Comparison of $CO_2$ Footprints by World Region, 1996**

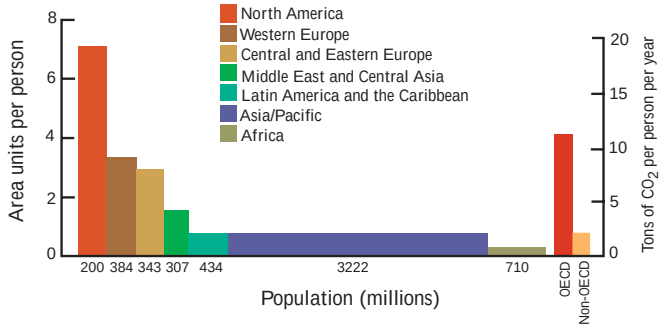



**Figure 58**
Comparison of $CO_2$ footprints by world region, 1996.

*Source: WWF 2000*

UNEP, World Bank, and WRI 2000; UN 2001). In addition to fossil fuels, the region consumes more per capita of many other raw and processed resources than any other region in the world. There is, however, a modest trend toward decoupling economic growth and natural resource use (WRI 2000). Per capita consumption is relatively stable, except for plastic and paper, but population growth means that total resource consumption is still increasing. In 1990, the United States used almost seven times the per capita world average in plastic and petroleum feed stocks (PCSD 1996a).

The nation also consumes nearly a quarter of the world's industrial round wood, of which about 40 percent is used for construction. Most of this wood goes to building homes. Three times as many homes were built in the past 30 years as in the preceding three decades and although the average US family size dropped by 16 percent, the size of newly built single-family homes expanded by 48 percent (Abramovitz and Mattoon 1999; Bartuska 2000). Wood is used more efficiently, however, as old-growth forests decline and economic and social pressures spur improvements in forest practices and in new harvesting, processing, and recycling technologies (Abramovitz and Mattoon 1999). Paper consumption is also large and growing despite the growth of paper recycling. Average per capita paper consumption in North America in 1998 was six times the world average (UNDP, UNEP, World Bank, and WRI 2000). According to *The Living Planet Report 2000,* in 1996, North America's 'forest footprint' was 4.4 times that of the world average (WWF 2000).

North America also produces more municipal solid waste per person than any other region. Municipal solid waste generated in the United States continues to grow, but at a much slower rate than before 1970, as waste recovery increases and discards to land fills decrease (see Figure 59). Light-

**Solid Waste Disposal in the United States, 1970-1997**

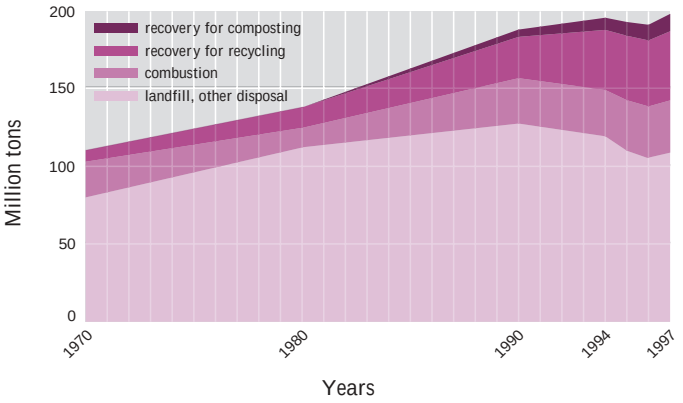



**Figure 59**
Solid waste disposal in the United States, 1970-1997.

*Source: Franklin Associates 1999*

weight but high-volume materials such as paper and plastic are replacing dense and heavy materials in the waste stream, however, increasing waste volumes (PCSD 1996a). The continued use of older technologies coupled with a consumer lifestyle based on the desire for mobility, convenience, and product disposability has limited the further advancement of resource efficiency and waste reduction (UN 2001).

The impacts of waste, experienced both locally and at great

distances from cities themselves, are a product both of urbanization (wastes concentrated in one place) and economic growth and industrialization. The wealthier the city, the more waste it produces. In addition, waste composition changes from

primarily biodegradable organic materials to plastics and other synthetic materials that take much longer to decompose (WRI, UNEP, UNDP, and World Bank 1996).

Clearly, North America's urban industrial society has an inequitable and unsustainable impact on the global environment. Agenda 21 identified unsustainable consumption and production, especially by industrialized countries, as the major cause of global environmental deterioration (UN 2001).

Since 1993, the issue of sustainable patterns of consumption and production has entered policy debate. Both federal governments promote ecoefficiency through a number of their programs. The US President's Council on Sustainable Development (PCSD) has recommended national goals for natural resources stewardship, population planning, and sustainable consumption (PCSD 1996a; PCSD 1996b). The US EPA has a number of programs to increase energy efficiency, including the Energy Star Building Program, the Green Lights Program and the Design for the Environment Program. Resource reduction efforts have led to the tripling of the proportion of waste recovered between 1970 and 1993 (UN 1997). In Canada waste minimization is also part of a variety of federal and provincial initiatives to promote more sustainable production and consumption. A 1992 target set by the National Packaging Protocol of reducing the amount of packaging sent for disposal by 20 percent was exceeded. And the federal government has developed energy efficiency programs, including greening its motor vehicle fleet and conducting research into bio-diesel fuels. Its Environmental Choice Program is designed to support the reduction of energy and materials consumption (UN 1997).

Industry is increasingly restructuring its processes and re-sourcing raw materials to reduce their environmental impact. Some are turning to the environmental goods and services sector to make the savings that often come with investing in eco-efficient operations. In 1995, the United States accounted for 40 percent of the current market in the pollution control industry and in Canada, business sales in environ-

mental goods and services rose 11 percent in 1997 from the previous year (Statistics Canada 1999). There is also a perceptible rise in the number of 'green' or socially and environmentally conscious consumers (Coop America 2000).

North America's urban industrial society simultaneously provides a quality of life envied by many of the world's developing countries and levels a disproportionate environmental impact on the planet. As shown above, dense settlement patterns that are planned to be compact and efficient can reduce pressures on the environment. Compared to dispersed settlement patterns, cities can provide environmental and economic savings from economies of scale—recycling initiatives and per capita energy use for heating, cooling, and mass transit, for example, all benefit from high population densities. High-density development can also reduce pressures to convert agricultural and wilderness areas to urban uses (WRI, UNEP, UNDP, and World Bank 1996). While North America's smart growth and sustainable city programs have the potential to help reduce its ecological footprint, more resources and political support are needed to make them a reality.

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