17.3: The Impacts of Urban Sprawl

Urban sprawl is the extension of low-density residential, commercial, and industrial development into areas beyond a city's boundaries that occurs in an unplanned or uncoordinated manner. It is generally characterized by:

- low-density development that is dispersed and situated on large lots (greater than one acre)
- geographic separation of essential places such as work, home, school, and shopping
- high dependence on automobiles for travel
- increased impervious surface area in watersheds
- habitat fragmentation and degradation

Urban sprawl combines low density (see Figure below) and fragmentation of the urban area (see Figure below), increases the average travel distances for daily trips, and hinders a shift toward less energy-intensive transportation modes.

The sprawling nature of cities is critically important because of the major impacts that are evident in increased energy, land and soil consumption. These impacts threaten both the natural and rural environments, raising greenhouse gas emissions that cause climate change, and elevated air and noise pollution levels which often exceed the agreed human safety limits. Thus, urban sprawl produces many adverse impacts that have direct effects on the quality of life.
Health

If communities are not walkable or bikeable, we need to drive to schools, shops, parks, entertainment, play dates, etc. Thus we become more sedentary. Residents of sprawling counties were likely to walk less during leisure time and weigh more than residents of compact counties. A sedentary lifestyle increases the risk of overall mortality, cardiovascular disease, and some types of cancer. The effect of low physical fitness is comparable to that of hypertension, high cholesterol and diabetes.

Consumption of Energy

A consequence of the increasing consumption of land and reductions in population densities as cities sprawl is the growing consumption of energy. Generally, compact urban developments with higher population densities are more energy efficient. Evidence from 17 cities around the world shows a consistent link between population density and energy consumption (Figure below), and in particular high energy consumption rates that are associated with lower population densities, characteristic of sprawling environments, dependent on lengthy distribution systems that undermine efficient energy use.

Figure (\(\PageIndex{2}\)): Left - Population density and energy consumption, selected World cities. Right - Population

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Density and CO2 emissions, selected European cities.

Transport related energy consumption in cities depends on a variety of factors including the nature of the rail and road networks, the extent of the development of mass transportation systems, and the modal split between public and private transport. Evidence shows that there is a significant increase in travel related energy consumption in cities as densities fall. Essentially, the sprawling city is dominated by relatively energy inefficient car use, as the car is frequently the only practical alternative to more energy efficient, but typically inadequate, relatively and increasingly expensive public transportation systems. Increased transport related energy consumption is in turn leading to an increase in the emission of CO2 to the atmosphere. Urban sprawl therefore poses significant threats to the commitments to reduce GHG gas emissions.

### Air pollution

Using fossil fuels also results in the emission of other gases and particulates that degrade air quality (note that commuters generate emissions of air pollution, which lowers the ambient quality of the air in areas they pass through and causes health problems for other people). Longer transportation distances intensify traffic congestion, resulting in lost productivity, and increase the need for more extensive infrastructure (such as more highways) that negatively impact the environment by increasing the amount of impervious cover and by requiring more natural resources. Finally, traffic congestion and air pollution from driving contribute to an estimated 900,000 fatalities per year worldwide.

![Figure 3: Sprawling area.](https://eng.libretexts.org/Bookshelves/Environmental_Engineering_(Sustainability_and_Conservation)/Book%3A_Essentials_...)

### Natural and Protected areas

The impacts of sprawl on natural areas are significant. The considerable impact of urban sprawl on natural and protected areas is exacerbated by the increased proximity and accessibility of urban activities to natural areas, imposing stress on ecosystems and species through noise and air pollution. Immediate impacts such as the loss of agricultural and natural land or the fragmentation of forests (Figure below), wetlands and other habitats are well known direct and irreversible impacts. Urban land fragmentation, with the disruption of migration corridors for wildlife species, isolates these populations and can reduce natural habitats to such an extent that the minimum area required for the viability of species populations is no longer maintained.
The environmental impacts of sprawl are evident in a number of ecologically sensitive areas located in coastal zones and mountain areas. The Mediterranean coast, one of the world's 34 biodiversity hotspots, is particularly affected, and the increased demand for water for urban use, competes with irrigation water for agricultural land. This problem has been exacerbated by the increased development of golf courses in Spain, where the over-extraction of groundwater has led to salt water intrusion into the groundwater. Increased transit and tourist traffic, particularly day tourism from the big cities, also adds to the exploitation of the mountain areas as a natural resource for 'urban consumption' by the lowland populations.

Rural Environments

The growth of European cities in recent years has primarily occurred on former agricultural land. Typically, urban development and agriculture are competing for the same land, as agricultural lands adjacent to existing urban areas are also ideal for urban expansion. The loss of agricultural land has major impacts on biodiversity with the loss of valuable biotopes for many animals, and particularly birds. Sprawling cities also threaten to consume the best agricultural lands, displacing agricultural activity to both less productive areas (requiring higher inputs of water and fertilisers) and more remote upland locations (with increased risk of soil erosion).

Soil

Urban sprawl and the development of urban land dramatically transform the properties of soil, reducing its capacity to perform its essential functions. These impacts are evident in the extent of compaction of soil leading to impairment of soil functions; loss of water permeability (soil sealing) which dramatically decreases; loss of soil biodiversity, and reductions of the capacity for the soil to act as a carbon sink. In Germany, for example, it is estimated that 52 % of the soil in built-up areas is sealed (or the equivalent of 15 m2 per second over a decade). In addition, rainwater which falls on sealed areas is heavily polluted by tire abrasion, dust and high concentrations of heavy metals, which when washed into rivers degrade the hydrological system.
Water Quality

Increasing numbers of roads and parking lots are needed to support an automobile transportation system, which lead to increased non-point source water pollution and contamination of water supplies (road runoff of oil/gas, metals, nutrients, organic waste, to name a few) with possible impacts on human health. Increased erosion and stream siltation causes environmental damage and may affect water treatment plants and thus affect water quality.

Socio-economic Impacts

From a social perspective urban sprawl generates greater segregation of residential development according to income. Consequently, it can exacerbate urban social and economic divisions. The socio-economic character of suburban and peripheral areas is typified by middle and upper income families with children, who have the necessary mobility and lifestyle to enable them to function effectively in these localities. However, the suburban experience for other groups, including the young and old, who lack mobility and resources can be very different and can reduce social interaction. Furthermore, large segments of urban society are excluded from living in such areas.

From an economic perspective urban sprawl is at the very least a more costly form of urban development due to:

- increased household spending on commuting from home to work over longer and longer distances;
- the cost to business of the congestion in sprawled urban areas with inefficient transportation systems;
- the additional costs of the extension of urban infrastructures including utilities and related services, across the urban region.

Urban sprawl inhibits the development of public transport and solutions based on the development of mass transportation systems, and the provision of alternative choices in transportation that are essential to ensure the efficient working of urban environments. These conclusions are reinforced by experience from both Munich and Stockholm where the efficient control of urban sprawl and resulting increase in population densities fosters the use of public transport and reduces the growth of car use.

Social Capital

On the social sustainability side, we can look at social capital otherwise defined as the “connectedness” of a group built through behaviors such as social networking and civic engagement, along with attitudes such as trust and reciprocity. Greater social capital has been associated with healthier behaviors, better self-rated health, and less negative results such as heart disease. However, social capital has been diminishing over time. Proposed causes include long commute times, observed in sprawling metropolitan areas. As of 2011, according to an article in the Chicago Tribune, Chicago commuting times are some of the worst – with Chicagoans spending 70 hours per year more on the road than they would if there was no congestion – up from 18 hours in 1982. They have an average commute time of 34 minutes each way. These drivers also use 52 more gallons per year per commuter.
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