SMART GROWTH POLICIES CONSERVE ENERGY AND REDUCE EMISSIONS

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There is extensive research showing that *land use* (also called *built environment*) factors affect travel activity, energy consumption and pollution emissions. This implies that smart growth land use policies can help achieve various planning objectives including energy conservation and emission reductions.

Plenty of good research indicates that land use factors (regional accessibility, density, mix, street connectivity, walkability, public transit proximity, and efficient parking management) do significantly affect vehicle travel, fuel use and emissions. Table 1 summarizes these impacts.

Table 1: Land Use Impacts on Travel[13]

Factor	Definition	Travel Impacts
Density	People or jobs per unit of land area (acre or hectare).	Increased density tends to reduce per capita vehicle travel. Each 10% increase in urban densities typically reduces per capita VMT by 2-3%.
Mix	Degree that related land uses (housing, commercial, institutional) are mixed	Increased land use mix tends to reduce per capita vehicle travel, and increases use of alternative modes, particularly walking for errands. Neighborhoods with good land use mix typically have 5-15% lower vehicle-miles.
Regional Accessibility	Location of development relative to regional urban center.	Improved accessibility reduces per capita vehicle mileage. Residents of more central neighborhoods typically drive 10-30% fewer vehicle-miles than residents of more dispersed, urban fringe locations.
Centeredness	Portion of commercial, employment, and other activities in major activity centers.	Increased centeredness increases use of alternative commute modes. Typically 20-50% of commuters to major commercial centers drive alone, compared with 80-90% of commuters to dispersed locations.
Connectivity	Degree that walkways and roads are connected and allow direct travel between destinations.	Improved roadway connectivity can reduce vehicle mileage, and improved walkway connectivity tends to increase walking and cycling.
Roadway design and management	Scale, design and management of streets.	More multi-modal street design and management increases use of alternative modes. Traffic calming tends to reduce driving and increase walking and cycling.
Walking and Cycling conditions	Quantity and quality of sidewalks, crosswalks, paths and bike lanes, and the level of pedestrian security.	Improved walking and cycling conditions increases nonmotorized travel and can reduce automobile travel, particularly if implemented with land use mix, transit improvements, and incentives to reduce driving.
Transit quality and accessibility	Quality of transit service and degree to which destinations are transit accessible.	Improved transit service quality increases transit ridership and can reduce automobile trips, particularly for urban commuting.
Parking supply and management	Number of parking spaces per building unit or acre, and how parking is managed.	Reduced parking supply, increased parking pricing and other parking management strategies can significantly reduce per capita vehicle travel. Cost-recovery parking pricing (users pay directly for parking facilities) typically reduces automobile trips by 10-30%.
Site design	The layout and design of buildings and parking facilities.	More multi-modal site design can reduce automobile trips, particularly if implemented with improved transit services.
Efficient transport pricing	More marginal-cost pricing for congestion, roads, parking facilities and vehicle insurance.	Affected travel typically declines 10-30%, depending on circumstances.

That land use factors besides density significantly affect vehicle travel can be considered good news because it expands the menu of policies that can help achieve planning objectives. For example, smart growth can be applied in rural and suburban locations where high densities are inappropriate by improving land use mix, roadway connectivity, and walkability to create walkable villages.

CUMULATIVE IMPACTS

Smart growth can provide large cumulative impacts. In automobile-dependent, sprawled locations virtually every adult resident owns an automobile and uses it for most travel, and average trip lengths are relatively long. In multi-modal, smart growth locations residents tend to own fewer vehicles, drive fewer annual miles, and rely more on alternative modes. Even greater vehicle travel reductions occur where smart growth is implemented with efficient road, parking and fuel pricing. Such pricing reforms tend to be more effective (price elasticities increase) at reducing vehicle travel if travelers have viable alternatives.

A U.S. Environmental Protection Agency (EPA) study identified substantial energy conservation and emission reductions if development shifts from the urban fringe to infill. The study found that individual households that shift from urban fringe to infill locations typically reduce VMT and emissions by 30-60%, and in typical U.S. cities, shifting 7-22% of residential and employment growth into existing urban areas could reduce total regional VMT, congestion and pollution emissions by 2-7%.

Another EPA study calculated both transportation and building energy savings from smart growth land use policies.19 Travel to a building often uses as much energy as is consumed in the building. Residents reduce total building and transportation energy consumption 64% by living in an attached energy efficient (green) home in an urban location, and by 75% by living in a multifamily energy efficient home, compared with the same household living in a typical detached single-family house in an auto-dependent suburb, as indicated in Figure 2. Housing location and type have greater impacts on total energy use than do vehicle or home energy efficiency, as indicated in Figure 3.

Figure 2: Residents Transport and Home Energy Consumption[21]

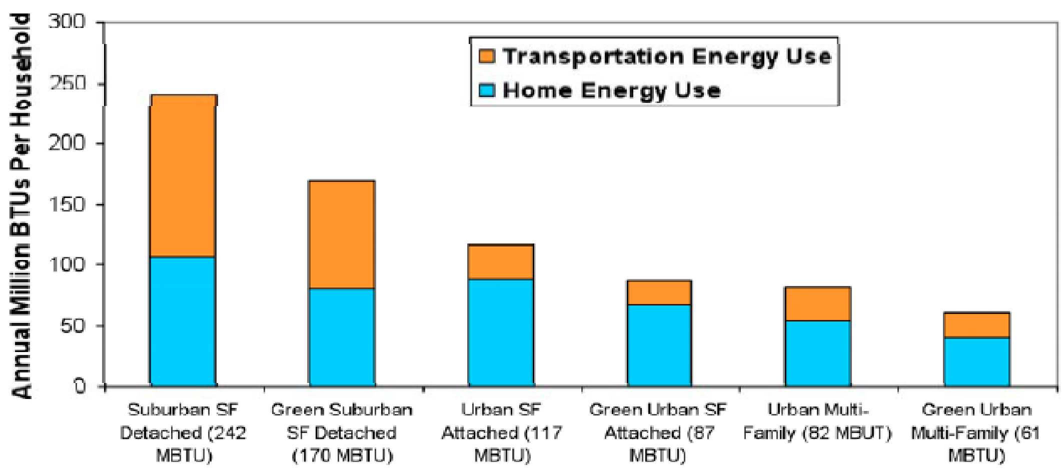
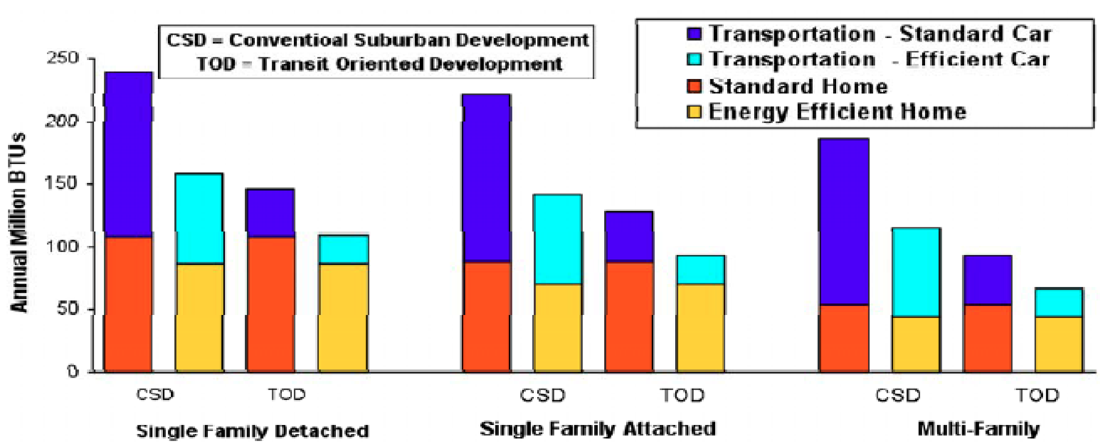


Figure 3: Residents Transport and Home Energy Consumption[22]



COMPREHENSIVE BENEFIT ANALYSIS

Smart growth tends to provide various economic, social and environmental benefits, as summarized in Table 2.

Table 2: Smart Growth Benefits[23, 24]

Economic	Social	Environmental
Reduced development costs	Improved transport options and mobility, particularly for non-drivers	Greenspace & habitat preservation
Reduced public service costs	Improved housing options	Energy savings
Reduced transportation costs	Community cohesion	Air pollution reductions
Economies of agglomeration	Preserves unique cultural resources (historic sites, older neighborhoods, etc.)	Water pollution reductions
Supports industries that depend on high quality environments (tourism, farming, etc.)	Increased physical exercise and health	Reduced "heat island" effect.

As a result, smart growth policies that create more accessible, multi-modal communities (better walking, cycling and public transit) tend to provide more total benefits than most other energy conservation and emission reduction strategies, as illustrated in Table 3.

Table 3: Smart Growth Benefits[25]

Planning Objective	Energy Efficient Buildings	Fuel Efficient Vehicles	Smart Growth
Congestion reduction			✓
Road and parking cost savings			✓
Consumer cost savings			✓/×
Improved traffic safety			✓
Improved mobility options			✓
Energy conservation	✓	✓	✓
Pollution reduction	✓	✓	✓
Land use objectives			✓
Physical fitness & health			✓

(✓ = supports objective × = contradicts objectives)

Suburban living and automobile travel will not end. Even with aggressive smart growth policies, most North Americans will continue to live in single-family homes and rely primarily on automobile travel. However, the current stock of large-lot, single-family, suburban houses is predicted to satisfy market demand for the foreseeable future, while the market for smaller-lot and attached housing in accessible, multi-modal communities will grow. It therefore makes sense to implement smart growth policy reforms that help satisfy these demands, such as allowing more compact and mixed development, reducing zoning code parking requirements, and improving walking and cycling conditions and public transit service quality.

Smart growth policies in general, and increased density in particular, reduce automobile travel and encourage use of alternative modes. Increased land use density increases the portion of destinations within walking and cycling distances, and increases the cost efficiency of alternative mode improvements (sidewalks and transit services) by increasing potential users per area. Potential impacts on mode choice are even greater when other smart growth policies are considered, such as increased land use mix, improved road and pathway connectivity, and complete streets roadway policies.

Higher densities do reduce vehicle travel. More connected street systems do significantly reduce automobile travel. Researchers have found that roadway connectivity has the second greatest impact on travel activity, after regional accessibility, of all land use factors analyzed.

There is little doubt that policies that increase density tend to reduce vehicle travel and emissions. Compact neighborhoods typically generate 20-40% less vehicle travel per capita than conventional, lower-density neighborhoods. These reductions result partly from density itself and partly from associated factors such as increased regional accessibility, land use mix and transport diversity (better walking and public transit options). To the degree they are interrelated, policies that increase density will reduce vehicle travel and emissions. For example, encouraging more compact, urban infill instead of lower-density urban-fringe development will almost certainly reduce per capita vehicle travel because it increases density, accessibility, mix and transport diversity.

Density is just one of several land use factors that affect travel activity. Integrated smart growth policies can significantly reduce vehicle travel, energy use and emissions. Most studies do show a statistically significant relationship between density (isolated from other factors) and vehicle travel.

Energy conservation and emission reductions are just two of many smart growth benefits. Other benefits include reduced costs of providing public services, household transportation cost savings, improved accessibility for non-drivers, reduced traffic fatality rates, improved public fitness and health, open-space preservation, and reduced stormwater management costs.

The development and real estate industries can benefit financially overall from smart growth. Households often make tradeoffs between housing and transportation expenditures, so policies that create more accessible development, where consumer transportation costs are lower, can increase total real estate investments. For example, real estate in transit oriented areas are typically worth 10-20% more than they would be in more automobile-oriented locations, reflecting transportation cost savings capitalized into property values. Real estate foreclosure rates tend to be lower in smart growth locations.

Current demographic and economic trends are increasing demand for smart growth location.26 Although market surveys indicate that most North American households prefer single-family homes, they also indicate growing consumer preference for smart growth features such as accessibility and modal options (reflected as short commutes and convenient walkability to local services). Twenty years ago less than a third of households preferred smart growth home locations, but this is projected to increase to two thirds of households within two decades.

Growing demand for more compact development, particularly if public policies provide support and incentives, such as more flexible zoning regulations, increased investment in alternative modes, and financial rewards for more compact infill development that reflect public service cost savings.

Land use policies can significantly affect transportation options and costs, and therefore travel activity. People who live and work in automobile-dependent locations tend to drive more annual miles, consume more fuel and produce more pollution than they would in more accessible, multi-modal communities. As a result, smart growth reforms can provide various economic, social and environmental benefits.

Existing land use development policies and planning practices tend to favor sprawl and automobile dependency. Smart growth requires policy reforms that allow more compact and mixed development, support alternative modes, and reduce existing subsidies to automobile such as generous minimum parking requirements. These reforms tend to face institutional inertia and political opposition. It is therefore important to have accurate information on the full potential impacts and benefits of smart growth policy reforms. When all impacts are considered, smart growth policies are often a cost effective way to achieve planning objectives.