Land Use Density and Clustering

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TDM Encyclopedia

Victoria Transport Policy Institute

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This chapter describes how increased density (number of people or employees located in an area) and clustering (locating related activities close together) tend to reduce travel distances and improve travel options. Density and clustering support and are supported by many TDM strategies.

Description

Density refers to the number of people or jobs in a given area. *Clustering* (also called *Compact Development*) refers to Land Use patterns in which related activities are located close together, usually within convenient walking distance. Clustering improves Accessibility by reducing travel distances and improving Transportation Options. It is an important part of land use management strategies including Access Management, Location Efficient Development, New Urbanism, Smart Growth and Transit Oriented Development.

Table 1 **Typical Densities**

Definition	Population Density	Typical Housing
Rural	Less than 0.5 residents per acre.	Houses on large lots (>5 acres)
Low-Density – Suburban	0.5-5 residents per acre.	Houses on lots 0.5 to 5 acres
Mid-Density – Suburban Cluster or Urban	5-12 residents per acre.	Houses on lots 0.2 to 0.5 acres (2-5 houses per acre)
Compact – Urban	More than 12 residents per acre.	Various combinations of detached houses on small lots, duplexes, townhouses, and low-rise (under 4 story) apartments and condominiums.
High-density	More than 20 residents per acre	Low- and high-rise (more than 4 story) apartments and condominiums.

Density and *Clustering* are somewhat different concepts. *Density* refers to the number of people or jobs per unit of land (acre, hectare, square kilometer or square mile), while *Clustering* to the location and mix of activities in an area. For example, simply increasing population densities in a residential-only area may do less to improve accessibility than clustering destinations such as schools and shops in the center of the development. Rural and suburban areas have low densities, but common destinations such as schools, shops and other public services can be clustered in villages and towns. This increases accessibility by making it easier to run several errands at the same time, increases opportunities to interact with neighbors, and creates transportation nodes (rideshare stops, bus stops, etc.).

Density alone has modest impacts on vehicle travel and mode share; for example, the Los Angeles region is dense but automobile-dependent (Eidlin 2010). Clustering is more effective at reducing automobile use if it includes other TDM strategies. For example, automobile commuting tends to decline if employment centers are clustered with shops, restaurants and daycare centers (destinations that employees want to visit during their breaks), and if such areas have Pedestrian Improvements, a Rideshare program, Transit Improvements and Commute Trip Reduction programs. Put another way, other Commute Trip Reduction strategies tend to be more effective if worksites are clustered.

Density and Clustering can occur at various scales and in many different ways. Office buildings, campuses, shopping malls, commercial districts, towns and cities are examples of clustering. Density and Clustering at a neighborhood level (areas of less than a mile in diameter) with good pedestrian conditions creates *multi-modal centers* (also called *urban villages*, *transit villages* or *walkable centers*), which are suitable for walking and transit.

Clustering is illustrated in Figure 1.

A. This shows a conventional suburban development with buildings surrounded by parking and isolated from each other. There are often no paths connecting the buildings or sidewalks along the streets. Only automobile transportation can effectively serve such destinations.

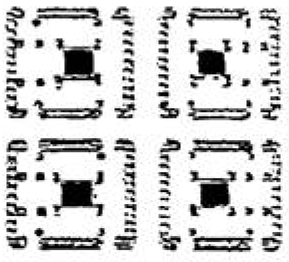
B. This shows the same buildings sited so they are clustered together and oriented toward the street, with main entranceways that connect directly to the sidewalk rather than being located behind parking. This creates convenient pedestrian access between them, for example, making it easier for an employee in an office to visit an adjacent building with a childcare center or shop, and for employees from two different buildings to rideshare.

   This type of clustering also facilitates Shared Parking, particularly if the buildings have different types of land uses with different peak demands. For example, if two of the buildings are offices with peak parking demand during weekdays, another is a restaurant with peak demand during the evenings, and the fourth is a church with peak demands weekend mornings, they can share parking and reduce total parking requirements, which allows even greater clustering.

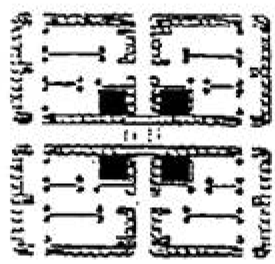
C. This shows eight buildings clustered around a park. As the cluster increases in size the efficiency of pedestrian improvements, rideshare and public transit service and other TDM strategies also increase, due to economies of scale.

D. This shows the eight-office building integrated into a park or campus, creating more convenient and attractive pedestrian connections between the buildings, further improving access and supporting transportation alternatives. It also creates a more enjoyable environment for employees and visitors compared with isolated buildings surrounded by parking.

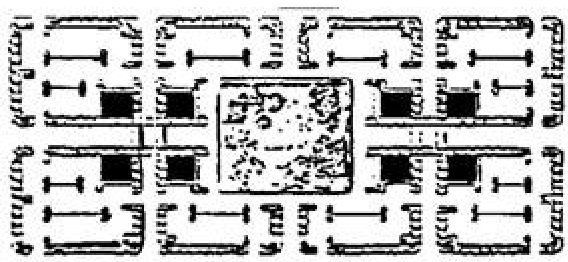
Figure 1 **Clustering At the Building or Block Scale**



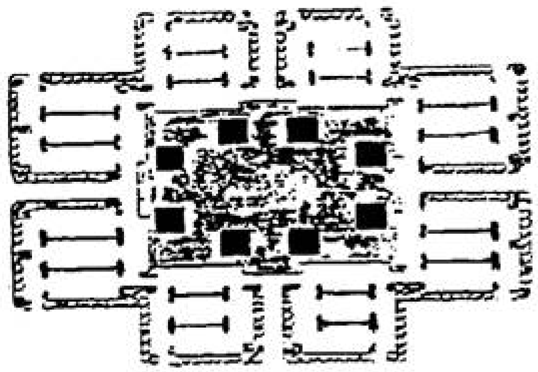
A. Every Office an Island



B. Clustered Offices



C. Two Offices Clustered Around Recreational Open Space



D. Eight Office Cluster

Clustering can be implemented in urban, suburban or rural conditions, either incrementally or as part of a master-planned development. Clusters can range from just a few small buildings (for example, a restaurant, a medical office and a single retail store) to a large commercial center with hundreds of businesses.

Measuring Density (Kolko 2011)

Conventional density is measured as the number of people, housing units or workers per unit of area (acre, hectare, square kilometer or square mile). But metropolitan areas and states often include undeveloped or sparsely developed land, so conventional density measures can understate the density of the settled areas where people actually live and work.

Weighted density helps to account for this. Weighted density measures the number of people, or housing units or workers in the areas where people actually live or work and therefore better reflect the land use patterns experienced by a typical person or worker.

Weighted density for a metropolitan area is the weighted average of Census tract population density weighted by the tract's share of metropolitan population. Tracts without population receive a weight of zero and therefore do not affect the weighted density of the metropolitan area. In effect, the weighted-density measure equals the tract density for the average person within a metropolitan area; we use the same method to calculate housing and employment density.

Because tracts with more population (or housing or employment) tend to have higher density, tract-weighted density measures for metropolitan areas tend to be higher than unweighted density measures. An alternative method for excluding undeveloped land is "net density": population (or employment) divided by land area excluding farmland, public lands, and other undeveloped areas. Net density requires detailed data on land uses in order to identify and exclude undeveloped land, whereas weighted density requires only on tract population (or employment) and land area.

To understand how weighted density measures work, consider two hypothetical cities, *Sparseville* and *Densetown*. Each has a population of 1,000 residents and consists of two one-square mile Census tracts. In Sparseville, 500 people live in each tract, whereas in Densetown, all 1,000 residents live in one tract and the other is undeveloped. Both Sparseville and Densetown have a conventional density of 500 people per square mile (1,000 residents divided by 2 square miles). But the weighted density measure is 500 people per square mile in Sparseville, since the average person lives in a tract with 500 people per square mile, while the weighted density measure in Densetown is 1,000 people per square mile, since the average person (in fact, all people) lives in a tract with 1,000 people per square mile.

Examples of Density

Here are some examples to provide a feel for various types of densities.

A typical apartment has 800 to 1,500 square feet of floor area. If a three-story apartment building has twelve units averaging 1,200 square feet each, its footprint (the area of land the building actually covers) is about 5,000 square feet (4 x 1,200, plus a little extra for hallways). Apartments typically have 1.0 to 3.0 occupants, depending on the number of bedrooms.

A typical modern house has 2,000 to 3,000 square feet of floor area. If a 2,500 square foot house is two stories, it will have a 1,250 square foot footprint. Houses typically have 2.0 to 4.0 occupants, depending on the number of bedrooms.

In addition to the building (apartment or house) itself, a development may also include sidewalks, driveways, parking lots or garages, porches, decks, outbuildings and greenspace (lawns and gardens). The portion of a site of land that is covered with pavement or buildings (together called *impervious surface*) is called the *coverage*, measured as a percent of the total land area.

A typical city lot is 50 feet wide by 100 feet deep, totalling 5,000 square feet, or about one-eighth of an acre. If such a lot contains 2,500 square foot single-story house, a 500 square foot two-car garage, a 40-foot driveway, a 5-foot sidewalk, the coverage will total 3,570 square feet, or 71% of the land area, leaving just 1,430 square feet for greenspace.

However, if the same size house is built in two stories, and the garage is incorporated into the house or accessed from a back alley, minimizing the driveway length, the lot coverage declines to 2,250 square feet, leaving about half of the lot as greenspace. With single-family housing, a setback of 5 to 8 feet is needed between each house and the lot line. Sharing walls (building a duplex or townhouse) eliminates the need for setbacks, allowing the narrower lots.

With 3.0 average occupants per house, density averages 24 residents per acre for 5,000 square foot lots, about 33 residents per acre in duplexes on 4,000 square foot lots, and 43 residents per acre in townhouses on 3,000 square foot lots. Density in single-family housing can be increased by adding *secondary suites* (also called *granny flats*), that is, a small rental unit incorporated into the house or in an outbuilding.

A four-story, low-rise apartment or condominium with 16 total units has a footprint of about 4,500 square feet. If located on a double lot (100' x 100'), half the parcel may be used for a combination of surface parking and greenspace. These will typically have 1.2 occupants per unit, about 20 total occupants per building or 80 residents per acre.

These represent net densities. Gross densities over the entire area are lower to account for land devoted to non-residential uses such as commercial and industrial facilities, schools, parks and recreational facilities, and undeveloped land.

As a general rule of thumb, 4-7 dwelling units per acre are required to create demand for "basic" bus transit service (20-40 buses per day), 6-15 units per acre are required to create demand for "frequent" bus transit service, 9 units per acre are needed to create demand for light rail transit, and 12 units per acre are needed to create demand for rapid transit (Transit Evaluation). However, these density requirements vary depending on additional factors, including the size of the Downtown and other commercial areas served by transit, Parking Management practices (such as whether parking is priced), and whether there are Commute Trip Reduction programs at worksites.

New Urbanism and Transit Oriented Development involve clustering developments into walkable neighborhoods of 0.5 to 1.0 mile in diameter (a typical walking catchment area for commercial centers and transit stations), an area of 125 to 500 acres. Ideally, this includes a mixture of higher-density multi-family and small-lot single-family. For example, if a transit village has 200 total acres, of which 150 are devoted to residential, 25 acres are 4-story apartments, 25 acres are townhouses, and 100 acres are single-family houses on 5,000 square foot lots. The table below summarizes the total residents in such a community.

Table 2 **Total Residents Within A Walkable Area**

Type	Units Per Acre	Occupants Per Unit	Occupants Per Acre	Acres	Total
Multi-Family	80	1.2	96	25	2,400
Townhouses	43	2.0	86	25	2,150
Single-Family	8	3.0	24	100	2,400
					6,950

Criticism of Density and Clustering

Some people have a negative attitude about density and clustering. They believe that it is harmful to individuals and society, and that consumers always prefer lower-density development patterns (Moretti, 1999). However, many consumers value clustered development if it is well designed, affordable, increases accessibility, and incorporates other valued amenities such as personal security and good schools. One survey (NHBA, 1999) found that 83% of consumers prefer suburban housing, but the features respondents value most are neighborhood security, quality schools and neighborhood quality. This suggests that some households would choose higher density, multi-modal locations if they had such amenities.

Demand for New Urbanist communities, loft apartments and urban infill is strong, provided that they offer personal security, school quality and prestige comparable to suburbs. A study by Eppli and Tu (2000) found that homes in New Urbanist communities sold for an average of $20,189 more than otherwise comparable homes in more conventional communities, an 11% increase in value. One survey found that 43% of homebuyers who currently choose rural and suburban locations are good candidates for higher density, traditional neighborhood developments (Heart and Biringer, 2000). Similarly, a survey of the Puget Sound region housing market found that although the majority of respondents prefer a detached home, most care more about the quality of their neighborhood and owning their own home than about housing type, and more than 90% would willingly trade low-density housing for a medium- or high-density home if it had other desirable features (Decisions Data, 1994).

Many families already choose relatively higher-density housing, but it is not clustered with other common destinations and so does not increase accessibility. For example Moudon and Hess (2000) found that 40% of residents in suburban areas of Puget Sound live in medium- to high-density, multi-family housing. Yet, these developments often lack pedestrian access to nearby retail and public services, forcing residents to drive rather than walk for errands. Better integration between land use and transportation can significantly reduce automobile use without changing housing type or density.

How It Is Implemented

Clustering is usually implemented by local governments and developers. Clustering often requires changes to development policies and practices that allow and encourage higher densities and more flexible parking requirements.

Special effort is often required to increase density and clustering. Incremental increases can be achieved by expanding existing buildings, for example, by adding rooms and secondary suites. Urban redevelopment, such as conversion of commercial buildings to residential, or redevelopment of old industrial areas, can be an opportunity to increase density and land use mix.

Because existing residents often oppose density increases, special care may be required to provide address concerns and provide incentives. For example, developers may be required to help fund community amenities, and Residential Parking Permits may be applied to insure that existing residents have access to onstreet parking spaces. Many of the objections to increased density can be addressed through good design and mitigation (New Urbanism).

Travel Impacts

Density and clustering tend to reduce per capita automobile travel (Land Use Impacts on Transportation) by reducing travel distances to common destinations and by improving transportation Options, particularly walking, ridesharing and public transit by increasing the demand for such services (Kuzmyak and Pratt, 2003; Turcotte, 2008).

In an extensive review of studies Ewing (1997) concludes, “that doubling urban densities results in a 25-30% reduction in VMT, or a slightly smaller reduction when the effects of other variables are controlled.” Even greater travel reductions are possible if clustering is implemented with other TDM strategies, including Pedestrian Improvements, Parking Management, Commute Trip Reduction programs, Ridesharing, Transit Improvements and Traffic Calming. The *This View of Density Calculator* produced by the San Francisco League of Conservation Voters (www.sflcv.org/density) predicts the effects of clustering on land consumption and travel behavior. Campoli and MacLean (2002) provide information and illustrations that can help decision-makers better understand different densities and development patterns.

Density at both origins and destinations affect travel behavior. Work trips and shopping trips are affected by population and employment densities. One study found that increasing urban residential population density to 40 people per acre increased transit use from about 2% to 7%, while increasing densities in commercial centers to 100 employees per acre resulted in an additional 4% increase in transit use, to an 11% total mode share (Frank and Pivo, 1995). Barnes and Davis (2001) also found that densities at employment centers are particularly important for encouraging transit and ridesharing. Glaeser and Kahn (2008) found that per capita vehicle travel, energy consumption and pollution emissions tend to be lower in denser city centers than in suburbs.

Aesthetically-pleasing urban character and amenities at worksites, such as shops and restaurants within walking distance, can reduce errand trips and increase transit and rideshare use, because without these, employees may feel the need to have a car to run errands during breaks (Cambridge Systematics, 1994). One study found that the presence of worksite amenities such as banking services, on-site childcare, a cafeteria, a gym, and postal services could reduce average weekday car travel by 14%, due to a combination of reduced errand trips and increased ridesharing (Davidson, 1994).

Table 3 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	3	Reduces travel distances and supports alternative modes.
Reduces peak period traffic.	3	"
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Supports alternative modes.
Improves access, reduces the need for travel.	3	
Increased ridesharing.	2	
Increased public transit.	3	
Increased cycling.	2	
Increased walking.	3	
Increased Telework.	0	
Reduced freight traffic.	2	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Benefits and Costs

Density and clustering can provide a variety of economic, social and environmental benefits (Forman, et al, 2003, p. 332; Litman, 2004).

Density and clustering improve Accessibility (by reducing the average distance between common destinations) and Transportation Options (walking improvements and transit services are tend to be most feasible and cost effective with clustered land use), encourage use of alternative modes, and reduce per capita automobile costs and impervious surface. Clustering reduces the costs of providing public infrastructure and services such as roads, utility lines, policing and schools (Land Use Evaluation). This can help reduce regional traffic congestion, road and parking facility costs, consumer transportation costs, crashes, energy consumption, pollution emissions and urban sprawl. It protects greenspace (NEW, 2004). These benefits tend to be greatest if complementary land uses are mixed and supported by other TDM and land use management strategies, such as Smart Growth.

Density and clustering tend to provide agglomeration benefits, which consist of the accessibility and network effects that increase economic efficiency and productivity (Coffey and Shearmur, 1997). Published research indicates that doubling urban population density produces approximately 6% increase in productivity (Haughwout, 2000; Harris and Ioannides, 2000). This explains why cities and commercial centers develop and are so important for economic development: clustering of common destinations reduces the costs of activities that require frequent interactions. These benefits can be very large, as indicated by the much higher land values that occur in major commercial centers.

Clustering can increase Livability if it is implemented in conjunction with pedestrian and cycling improvements, traffic calming and other Streetscape enhancements. It can increase opportunities for neighborhood interaction and community cohesion. However, clustering can also increase exposure to noise and air pollution.

Density and clustering increase some costs, including some types of infrastructure costs (such as some utility costs), local traffic congestion, although regional traffic and pollution emissions tend to decline if clustering reduces total vehicle use. Although clustering may increase local traffic congestion, and therefore reduce average vehicle travel speeds, it tends to bring common destinations closer together, so total travel costs are reduced. Reduced automobile use and improved opportunities for Parking Management can reduce road and parking facility costs.

Do Clustering and Density Cause Social Problems?

Many higher-density urban neighborhoods have higher rates of social problems (crime and poverty) than lower-density suburban neighborhoods. Some people assume that this indicates that clustering and density *cause* social problems. But, although studies find an association between *crowding* (density measured in residents per residential room, an indication of poverty) and social problems, there is no such association with *density* measured in residents per acre (1000 Friends of Oregon, 1999). For example, there are also high crime rates in some rural areas with low densities but high poverty, and therefore crowding.

This indicates that the association between density and social problems reflects the tendency of distressed households to concentrate in higher-density, urban neighborhoods, not that higher-density development causes social problems. This suggests that clustering does not increase social problems, and urban infill could reduce such problems if distressed households become less segregated (Litman, 2001).

Density and clustering tend to reduce the amount of greenspace in a particular area, although they can increase total regional greenspace by reducing per capita road, parking and building area requirements. Most of these negative impacts can be reduced with appropriate design features (such as noise insulation and carefully located parks), but these mitigation activities may also involve additional costs.

Table 4 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	1	Can increase local congestion but reduces regional congestion.
Road & Parking Savings	2	Reduces road and parking requirements.
Consumer Savings	2	
Transport Choice	3	
Road Safety	2	
Environmental Protection	2	
Efficient Land Use	3	
Community Livability	1	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Density and clustering can have a variety of equity impacts. Changes to development policies and practices may benefit some people and disadvantage others. In particular, it can add value to urban land values and keep urban fringe land from appreciating in value as quickly as would occur otherwise. Policies that support clustering often involve reducing cross-subsidies for low-density, urban-fringe development (Litman, 1999). Policies that reduce residential parking requirements and improve transportation choice can be progressive (Location Efficient Development). Clustering can be particularly beneficial to people who are transportation disadvantaged, and improve Basic Mobility.

Table 5 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	0	
Individuals bear the costs they impose.	1	
Progressive with respect to income.	1	
Benefits transportation disadvantaged.	3	

Improves basic mobility.	3	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Density and clustering can be applied under most geographic conditions, although design, scale and magnitude may differ. For example, a rural cluster may be quite different than a suburban or urban cluster. Federal and state governments can encourage clustering in their own facilities and transportation investments. Regional and municipal governments can encourage clustering with supportive transportation and land use policies. Developers, businesses and campuses can implement clustering directly.

Table 6 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	3	Municipal/local government.	3
Low-density, rural.	2	Business Associations/TMA.	3
Commercial center.	3	Individual business.	2
Residential neighborhood.	3	Developer.	3
Resort/recreation area.	3	Neighborhood association.	2
College/university communities.	3	Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Category

Clustering is a Land Use Management strategy.

Relationships With Other TDM Strategies

Density and clustering support and are supported by Transportation Demand Management. They are an important component of Access Management, Location Efficient Development, New Urbanism and Smart Growth. Clustering tends to facilitate Pedestrian Improvements, and since most transit trips include walking links, it is important for efficient Transit. If located near transit stations or corridors it results in Transit Oriented Development. Clustering becomes more feasibility with Parking Management, particularly Shared Parking, to reduce the amount of land needed for parking facilities around buildings. The efficiency of Transportation Management Associations, Ridesharing and other Commute Trip Reduction strategies increases if worksites are clustered together.

Stakeholders

Major stakeholders for implementing clustered development include local officials, developers, existing nearby residents, future residents and employees and transit agencies.

Barriers To Implementation

Existing development policies and practices often favor lower-density, dispersed development. Transportation planning practices often favor road and parking facility investments which lead to lower-density, automobile-oriented land use patterns, over pedestrian and transit investments that lead to more clustered land use.

Best Practices

- Public agencies should encourage clustering in their land use and transportation policies, including the location and design of their own facilities.
- Existing policies that discourage land use clustering (such as single-use zoning, excessive building setbacks and parking requirements) should be eliminated or made more flexible.
- Clusters should include an appropriate mix of activities. For example, employment centers should also include shops and services that workers frequent during their breaks, and residential centers should include schools, shops and public services.
- Special care should be taken to create convenient and attractive walking conditions, and clusters should include bicycle, ridesharing and transit improvements as appropriate.
- Clustering should be implemented as part of overall land use management strategies such as
- Clustering should be implemented with other TDM strategies that encourage vehicle travel reductions and shifts to alternative modes.

Wit and Humor Thanks to their many miles of super highways, gas stations and drive through restaurants, the modern suburb is a wonderful place to drive – as long as you don't what to stop.

Examples and Case Studies

Talking Points On Compact Development (NHBA, 2005; www.nahb.org)
An important part of Smart Growth is using land more efficiently and preserving those lands that are most environmentally sensitive. By building in a more compact way, these goals can be achieved. Compact development also reduces development costs through more efficient use of infrastructure, which in turn makes housing more affordable.
Compact development can encompass the following:

Cluster development produces very attractive and marketable communities and makes it easier for developers to preserve environmentally sensitive lands such as wetlands and forests by allowing lots to be grouped on certain portions of a site, rather than spread uniformly across a site, so that other areas of the site may remain undisturbed as open space. Yet many localities make it difficult or impossible to develop in this manner.

Higher density development uses land more wisely by building more homes on the land. Higher density housing could include single-family homes on smaller lots, or it could include attached homes or apartment buildings. Many people enjoy the affordability and ease of maintenance of higher density housing. Higher densities also create cost-savings through greater efficiencies in infrastructure. Zoning codes that prohibit this type of development should be changed.

Mixed-use development can produce diverse and convenient communities that can have the added benefit of reducing traffic. By integrating different uses such as residences, offices, and shopping, many daily vehicle trips can be eliminated or reduced in length. Zoning was established to separate different uses that created nuisances, such as separating factories from residences. But today most workplaces are clean and quiet and can be built closer to homes without adverse effects. Many employers also find that locating workplaces near shops, banks, dry cleaners, and restaurants can save their employees time. Zoning needs to address our modern condition and make these kind of developments possible.

Traditional Neighborhood Developments are a type of community that mixes uses and housing types to create a form more like the towns of the past than the automobile dominated suburbs we have come to know. These new communities are built for walking, and ideally allow residents to walk to shops, schools, places of worship, parks, and eventually transit stops. There are now over 200 traditional neighborhood projects under way or in the planning stages. Examples include Celebration, near Orlando, Florida; Harbor Town in Memphis; and Kentlands, in Gaithersburg, Maryland. Again, zoning often prohibits this type of development, but some communities are adopting new zoning codes to permit it.

What Needs To Be Done

Change your development ordinances.
If these types of development are to be built, your community's laws must permit them to occur. It may be necessary to adopt new ordinance language that permits and encourages cluster development, higher densities, and mixed uses. Narrower street widths, varied yard setbacks, alternative stormwater and wastewater systems, and altered approaches to utility installation may all need to be considered to make compact development possible and successful. If each developer must go through a complex and costly process of obtaining special waivers and approvals, special use permits, or planned unit development approval to achieve compact development, the developer will probably find it makes more business sense to keep building conventional large-lot subdivisions.

Provide more certainty in the approval process.
The second thing that must be done is to assure the developer of more certainty in the development approval process. Too often, even when a community's comprehensive plan or zoning ordinance calls for compact development, a developer is thwarted by opposing citizens or an uncooperative government. If your community decides through its democratic process to support compact development—whatever they have agreed this term means in terms of lot sizes and allowable densities--measures should be taken to ensure that these plans are carried out. Community discussions about the appropriateness of cluster development, higher densities, or mixed uses should take place during the comprehensive planning process, not on a project-by-project basis.

To streamline the development approval process and give developers more certainty in building compact development, the following suggestions are made:

- *Presumption of approval.* If zoning and development standards are met, there should be a presumption of approval. Applicants should not be forced routinely into case-by-case reviews such as the special exception, conditional use, or planned unit development process.
- *One stop permitting and cross-training of staff.* All requirements and permits for land developments should be initiated from a single central location. Cross-training of staff reduces specialization and enhances staff understanding of how different development standards and requirements relate to each other; this improves coordination and helps expedite the approval process.
- *Specify time limits for reviews and approvals.* Ordinances should specify when decisions will be made, such as within 30 or 45 days of the acceptance of the application or the holding of the public hearing.
- *Eliminate multiple public meetings and hearings.* If several commissions or boards want to review the development proposal, a single hearing can be jointly held.
- *Simplify and reduce the number of zoning districts.* In many jurisdictions, zoning districts are so narrowly defined that any change in a developer's plans requires a rezoning. Over-specificity of zoning districts also makes mixed uses almost impossible. Reducing the number of zoning districts can allow a greater range of uses and densities in each zone and reduce the need for rezonings.

Plan for compact development.
To permit and promote compact communities, citizens, planners, and public officials must be willing to challenge the conventional wisdom of the past and accept that new goals may require new tools. But allowing compact development and helping it get approved are not enough. Communities need to help pave the way by planning for and helping provide the necessary infrastructure to support compact development — be that streets and highways, or water and wastewater systems. Developers and communities need to work in partnership to make compact communities a reality and achieve Smart Growth.

Austin, Texas Smart Growth Matrix (www.ci.austin.tx.us/smartgrowth)
The *Smart Growth Matrix* is a tool to assist the Austin City Council in analyzing development proposals within the Desired Development Zone. It is designed to measure how well a development project meets the City's Smart Growth goals such as: 1) the location of development; 2) proximity to mass transit; 3) urban design characteristics; 4) compliance with nearby neighborhood plans; 5) increases in tax base, and other policy priorities.

If a development project, as measured by the matrix, significantly advances the City's goals, financial incentives may be available to help offset the high cost of developing in urban areas. These incentives may include waiver of development fees and public investment in new or improved infrastructure such as water and sewer lines, streets or streetscape improvements, or similar facilities. These incentives require City Council review and approval.

Applying Decision Support Tools For Eco-Industrial Park Planning (http://www.smartgrowth.org/casestudies/casestudy_index.html)
Burlington, Vermont proposed to develop an eco-industrial park (EIP) on a 10 acre site, adjacent to which are already located a wood-burning co-generation power plant, a waste-wood depot, a community garden, and a compost facility. This brochure describes application of a suite of tools (Designing Industrial Ecosystems Tool, Facility Synergy Tool, and Reality Check) in a case study of Burlington. The case study illustrates how the screening models allow stakeholders to explore decisions, issues and tradeoffs in an interactive and flexible analytical framework. In addition to the information the tools provide (i.e., potential linkages, rough estimates of benefits, regulatory constraints), much of their value comes from the collaborative decision-making process they help to facilitate. As part of this incremental and collaborative process, in later stages of EIP planning, more detailed issues lying outside the three screening tools must be addressed, e.g., covenants, working relationships, engineering design specifications.

Vancouver EcoDensity Program (www.vancouver-ecodensity.ca)
The city of Vancouver's EcoDensity will create greater density throughout the city in order to reduce environmental impacts, ensure necessary physical and social amenities, and supports new and different housing types as a way to promote more affordability.

EcoDensity supports increasing density in a variety of contexts (i.e. in lower density areas; along transit routes and nodes, neighbourhood centres,). The key will be to support density that is high quality, attractive, more energy efficient, and respects neighbourhood character, while lowering our footprint. This requires reforming some existing policies, bylaws, incentives and zoning to reduce barriers and promote ideas that will create communities that are sustainable, livable and affordable.

EcoDensity involves an extensive research, planning and public consultation process. Some of the related issues are summarized below:

- Do people want the city to allow more flexibility in our bylaws to promote sustainable building practices such as: use alternative energy sources (e.g., solar and geo-thermal energy systems); green roofs; use recycled rain water; recycled building materials?
- Should the city make it easier for residents in single-family zoned areas to build a secondary suite above their garage, or convert their garage to a coach house?
- How does the city encourage the creation of more secondary suites? Should we require that any new single family home rough in a secondary suite?
- Do people want the city take more advantage of streets and nodes well served by transit or areas located around transit stations by increasing density significantly in those areas?
- What aspects of our bylaws need to be changed in order to better accommodate or promote sustainable building practices such as energy-saving systems, recycling of grey water and rain water, green roofs, etc.
- Should the city reduce its parking requirements on new developments, and if so, which type of developments? Should we require spaces for car sharing, or electric plugs in new underground garages to promote the use of electric vehicles? Should the city establish car free neighbourhoods?
- How can the city help ensure that the necessary community amenities are included in areas where only smaller, incremental developments are built.
- How could the city promote a greater range of types, sizes, locations and tenures of housing?

Westside MAX Light Rail Project Transit Oriented Development Program (www.members.home.net/todadvocate/pdxcasestudy.htm)
Westside Station Area Development -- About 7,000 dwellings and more than $505 million of residential and non-residential development have been built, permitted or proposed since 1990 within one-half mile of west side

light rail stations. About 3,600 of the dwellings were completed in 1998. Over 3,000 of them are located in two station areas. One developer is building about 2,000 of these units in three station areas with backing from a pension fund.

Westside Station Area Planning -- A four year intergovernmental effort to update comprehensive plans, development regulations and capital improvement programs for areas within one-half mile of westside light rail stations. Hillsboro, Portland and Washington County adopted interim development regulations early in the process to minimize parking, increase density, prohibit inappropriate land uses, and require pedestrian oriented design. By 1998, new plans and development regulations had been adopted for almost all of the light rail station areas.

Sunset Transit Center -- Detailed design standards were adopted in October 1997 by Washington County for an area including 190 acres under a single ownership. This was a major milestone in a debate that has lasted more than a decade on the best use of this property. The new plan and code was based on intensive discussions between adjacent neighborhoods, the property owner and county staff as well as urban design, market analysis and transportation consultants. A mixed use center is planned adjacent to the station and more than 2000 housing units in the balance of the area.

Beaverton Central Mixed Use Project -- One day the "The Round" will be the "jewel" of Westside Light Rail. Ground breaking was in October 1997 for this $100 million mixed-use project. The light rail station is in the middle of the site. The project includes a civic plaza with amphitheater, 154 for-sale dwellings, 152,000 square foot of class A office, 70,000 square foot of retail/office flex space, sister cities garden, 109 unit hotel, 10 screen movie theater, and 810 space parking garage. City staff are managing the project; regional technical and financial assistance is being provided. It took five years from the first study to ground breaking.

Murray West Master Plan -- A preliminary public/private master plan for a 120-acre area around the Beaverton Creek light rail station was completed in 1995. Trammell Crow Residential (TCR) completed construction of 830 dwelling units in 1998. Tri-Met's park & ride was relocated, redesigned and coordinated with TCR's project to create a pedestrian friendly environment. Nike plans to expand its world headquarters campus on 75 acres north of the station. City plan and code amendments for the 120-acre area were adopted in December 1997. Tri-Met managed the master plan effort. The City of Beaverton was lead on the plan/code amendments.

Hillsboro Light Rail Station Area Urban Design -- In 1993, this project dealt with issues that were not resolved during preliminary engineering and the draft EIS. There was concern that intergovernmental consensus would be difficult to achieve. In a five-week intensive effort, agreement was reached to remove two stations and redesign or relocate four others to reduce costs, improve access, and preserve opportunities for station area development. This was a joint effort with Metro, the City of Hillsboro and Washington County. Tri-Met was the lead agency. This is an excellent example of an interagency, interdisciplinary team approach with the right people with the right assignment at the right time.

Orenco/PacTrust Master Plan -- In January 1999, the National Home Builders selected "Orenco Station" out of nearly 1,000 entries for their "Master Planned Community of the Year" gold award. In 1998, it won the Governor's Livability Award. See www.orencostation.com for more information. More than 2,000 dwellings, a mixed use center, parks, and a sub-regional retail "power" center are planned, permitted or under construction between the light rail station and the new $2 billion Intel facility. The City of Hillsboro was the lead agency. Six-hundred apartments and the small lot single family home models were completed in 1997.

Downtown Hillsboro LID -- The City Council approved the Hillsboro Downtown Business Association petition for creation of a local improvement district (LID) in August 1996. The project implements the vision of the downtown (TOD) plan and began construction in summer 1997. The design for new sidewalks, curbs, decorative paving, street lamps, and greenery are complementary to light rail street improvements.

Portland TOD Property Tax Exemption Ordinance - It provides for a ten-year exemption for high density housing and mixed use projects. The City of Portland adopted an ordinance in October 1996 based on state legislation passed in 1995. Washington County and Tri-Met sought passage of the new state law; Tri-Met prepared a model ordinance.

Joint Development Projects -- Tri-Met has four projects in the Goose Hollow station area just west of downtown Portland. Arbor Vista ("Tree House" site) and Stadium Station Apartments ("Civic Stadium") are done; the project at Collins Circle is under construction; and the Butler Block project is in process. These projects pioneered the FTA waiver to the common grant rule for joint development; now all USA transit agencies can take advantage of these opportunities to increase ridership through TOD based on new regulations adopted in spring 1997 by FTA.

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