

Destinations: A Key Factor for Sustainable Urban Development

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Abstract

The location and density of “destination” land uses and their relation to a region’s transit system is of particular importance in achieving the objectives of transit-oriented development and sustainability. Destination uses include employment, retail, services, entertainment, and other uses that attract significant numbers of person trips, as distinguished from residential uses and non-residential uses that attract fewer people. Due to the preponderance of linked trips, the proximity and transit accessibility of “secondary destinations” also affects the use of transit and walking. The concept of destination uses is explained and an argument is presented for their importance in planning for sustainable development at the urban regional scale.

1 Destinations & Sustainable Development

Sustainability requires attention to a range of issues at multiple scales, from the micro scale of building materials to the macro scale of entire metropolitan areas. This paper focuses on the question of sustainable urban development patterns. In particular, I will argue that locating *destinations* in walkable clusters linked by high quality public transport in of particular importance.

Sustainable development seeks three transportation-related objectives:

- 1) reduce the number and percent of trips made by car and vehicle miles traveled,
- 2) increase the percentage of trips made by walking and cycling, and
- 3) increase the percentage of trips made by public transit.

Three approaches to urban development, developed in recent decades, have recently converged with the sustainable development movement to achieve these objectives: the centers concept, new urbanism, and transit-oriented development. The centers concept was developed by Victor Gruen (1973 & 1975) as an approach to replacing suburban sprawl with more structured urban development. The centers concept focuses development in walkable centers of various types and sizes.

New urbanism applies a set of architecture and urban design principles to improve the design of neighborhoods primarily by making them more pedestrian friendly (Kelbaugh, Calthorpe, et. al. 1989; Duany & Plater-Zyberk 1991; Calthorpe 1993). The principles of new urbanism have been applied increasingly to larger commercial areas. Transit-oriented development (TOD), which integrates principles of new urbanism with the advantages of regional transit, grew from a renewed interest in the role that mass transit could play to make cities that more sustainable ecologically and economically (Cervero 1986 & 1989; Bernick & Cervero 1997, Cervero 1998, Calthorpe & Fulton 2001; Ditmar & Ohland 2004).

Within the exploration of transit-oriented development, some U.S. studies have suggested that focusing attention on residential densities in station areas provides more immediate

benefits than locating non-residential (destination) uses in station areas (Bernick & Cervero 1997 p. 80), while other studies have acknowledged a role for destinations in dense secondary subcenters (PBQD 1996 pp. 4-25).

While increased residential development in station areas already linked by transit to a large central business district (CBD) provides immediate benefits, this paper argues that in the longer term we should locate as many of a region's *destinations* in locations accessible by priority transit if we are to achieve the broader goals of green urbanism.

Four concepts are central to this discussion: priority transit, centers, destination uses, and transit-supportive uses.

Priority transit operates on an exclusive or semi-exclusive right-of-way and generally provides service in both directions throughout the day and evening to serve various trip purposes. Priority transit may include light rail, metro, regional rail, and bus rapid transit.

Centers are medium to high density concentrations of mixed uses of a size and configuration where movement by foot is practical between all points. These are distinct from loose clusters of development where walking is not practical or attractive. Centers may be of various types, sizes, and densities but should have a pedestrian-friendly character. A center developed around a transit station is "transit-oriented." In general, a center would not be more than 800 to 1,600 m (½ to 1 mile) across, though some larger centers can be effective if the development and pedestrian facilities are continuous.

Destination uses are land uses that attract significant numbers of person trips, as distinguished from residential uses, which comprise the *origin* of most daily travel. A "**primary destination**" typically comprises the main purpose trips while "**secondary destinations**" are places that are typically visited as an adjunct to primary destinations. Appendix 1 presents some examples of primary and secondary destinations.

Transit-supportive uses are those that generate or attract significant numbers of person trips per hectare and are not inherently car- or truck-oriented. Uses that are non-transit supportive are those that produce few person trips or are inherently car or truck oriented. While the bounds between these are blurred and depend on context, an illustrative classification of land uses is also shown in Appendix 1.

2 The Importance of Destinations

This section presents an argument for the importance of destinations, the role of secondary destinations, and the benefits of a network of mixed-use centers linked by priority transit. Simplified schematic diagrams distinguish fundamental aspects of urban structure and the associated consequences for transportation.

When both origins and destinations are dispersed in a city, as represented by Figure 1, almost all trips must be by private transportation, mainly automobile. There is no critical mass of origins or destinations to support public transit; even low frequency bus or jitney services are challenging under these circumstances, and faster, higher capacity transit is impractical. Under some conditions bicycles may be used for many trips, but their range and speed are limited. Even car-pooling, park-and-ride, and high-occupancy vehicle (HOV) facilities are ineffective for most people under these conditions, since people are unlikely to live close to someone going to the same destination. Walking is also impractical for most trips in such a setting.

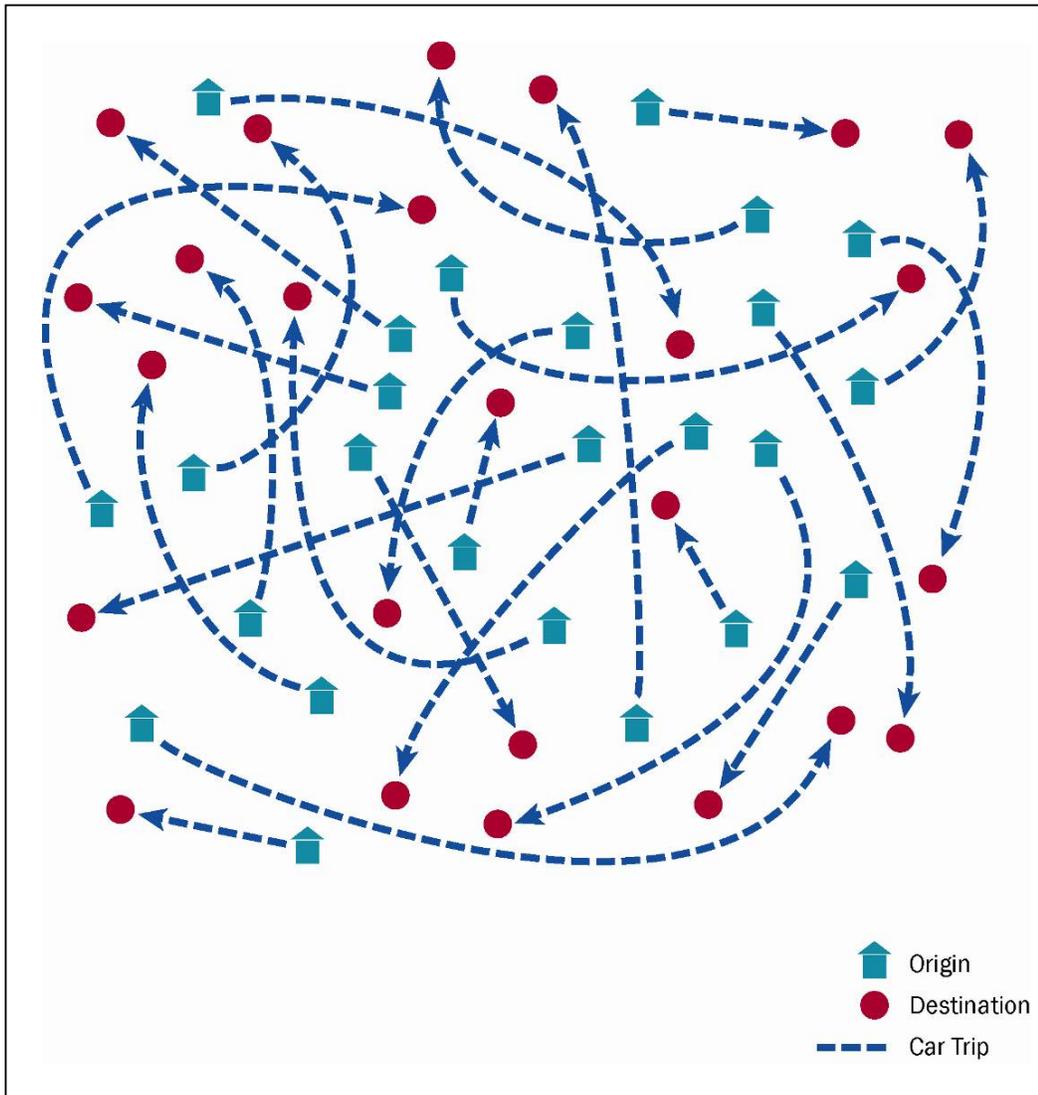


Figure 1: Scattered origins and destinations

If residences are clustered but destinations are scattered as illustrated in Figure 2, most trips will still be by car. While there would be concentrations of people for public transit to pick up, the destinations are scattered making transit largely ineffective. Except for visiting friends in one's neighborhood or going to school, the potential for walking is also limited under these conditions. Thus, concentrating only residences results in little opportunity for efficient transit.

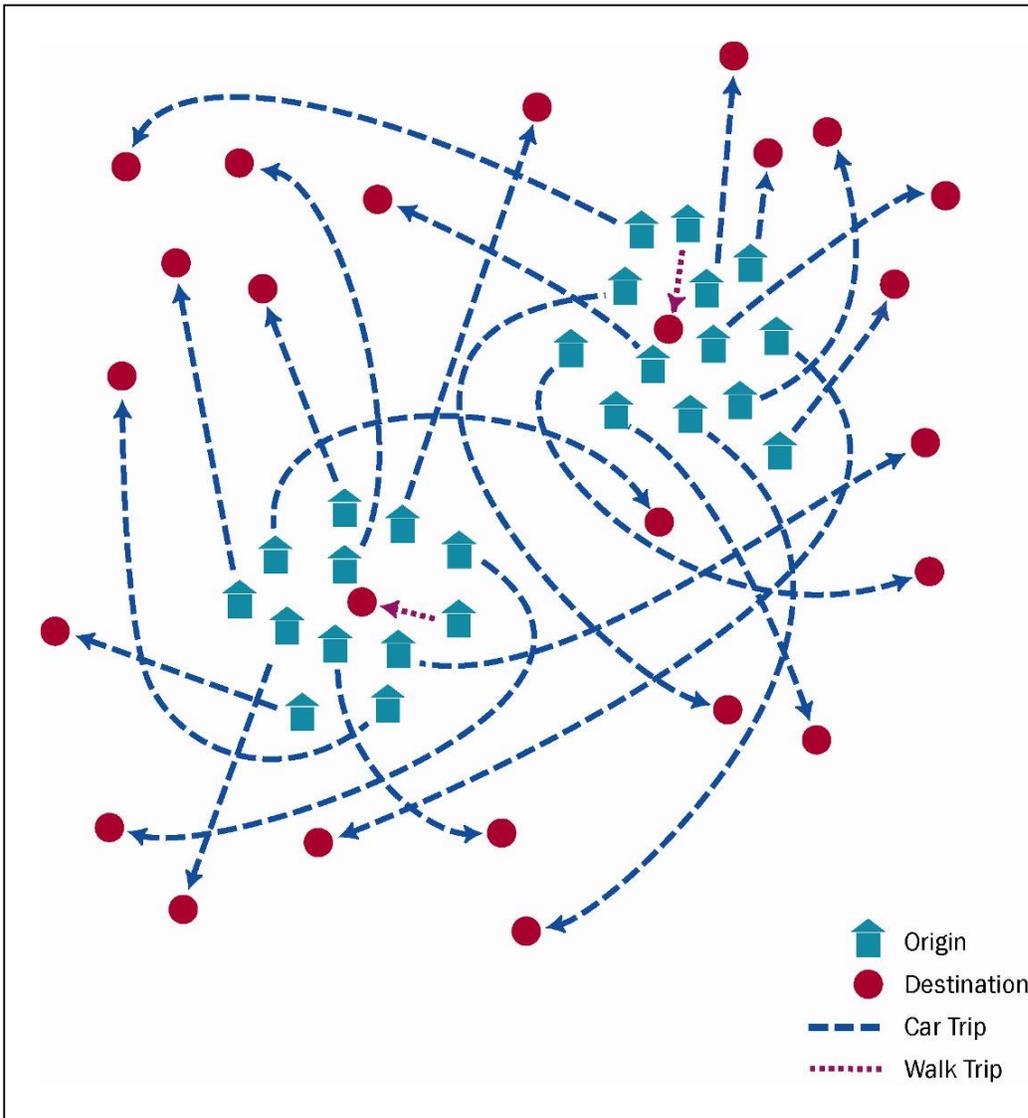


Figure 2: Clustered origins and scattered destinations

If residences are scattered but destinations are clustered as illustrated in Figure 3, various forms of ride sharing and public transit become feasible. This condition is representative of cities with low density residential development around a sizable CBD. Local bus services can attain the volumes necessary by picking up passengers along routes toward the destination clusters. Car-pooling, park-and-ride, and express buses can attract a critical mass of trips to the CBD or other clusters if people drive from their residences to park-and-ride facilities. When clusters are sufficiently dense, walking between destinations in the clusters is also feasible.

The distinction between clustering residences (Figure 2) and clustering destinations (Figure 3) is significant. As shown, clustering residences does not by itself create a structure that facilitates public transit or walking. On the other hand, clustering destinations, even without clustering residences, creates potential for public transit and walking. The extent that transit is used depends on other factors, but without concentrations of destinations, attractive transit is infeasible.

However, this condition still poses significant limitations visible in many cities. If people need to visit destinations in multiple centers, and these centers are not linked by priority

transit, they are likely to make all of their travel by car in order to have the car available for all trips. Providing off-peak transit services in the reverse direction is challenging due to dispersal of residences and lack of destination clusters in those areas.

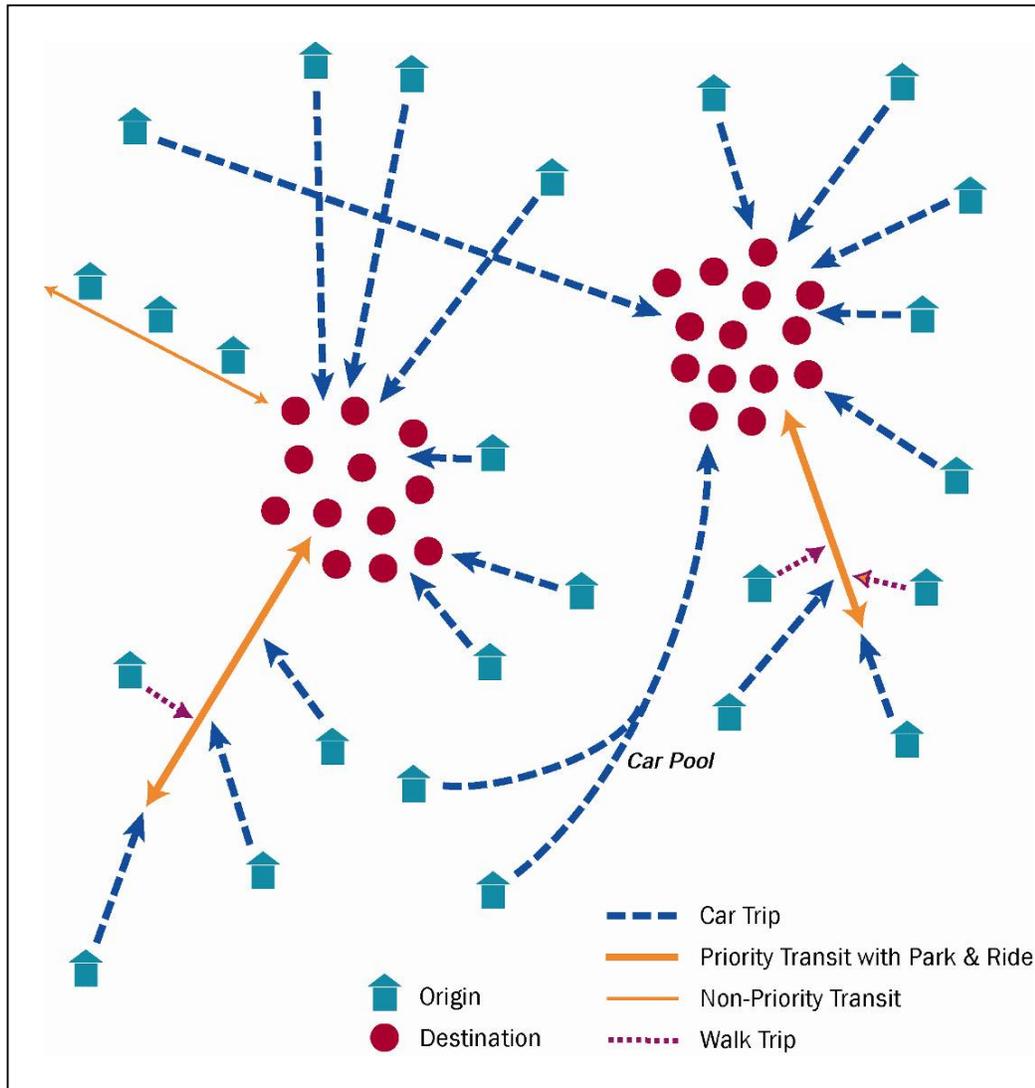


Figure 3: Scattered origins and clustered destinations

If both origins and destinations are clustered, as illustrated in Figure 4, the full range of public transportation is facilitated by the mass of people who would be moving between common points. Walking in both neighborhood and destination centers is also facilitated. The need for travel by car is significantly reduced if most daily needs are met in centers linked by attractive priority transit. Origins and destinations in separate clusters, as shown in Figure 4, need not be the case, of course; mixing the two increases the potential for walk or bicycle trips while maintaining the potential for priority transit to serve the trips beyond each cluster.

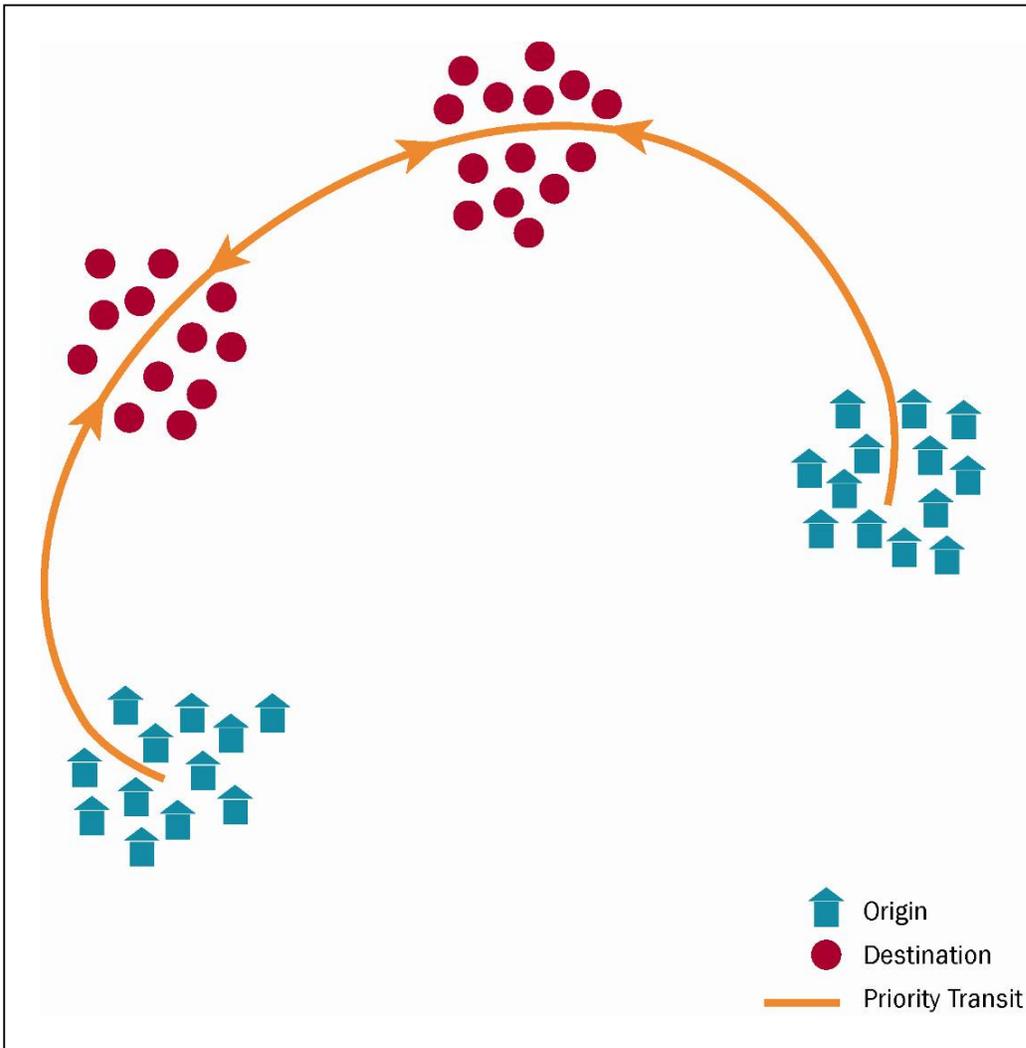


Figure 4: Clustered origins and clustered destinations

The analysis thus far has not distinguished between primary and secondary destinations. However, primary and secondary destinations play distinct roles in determining travel choices, and the location of secondary destinations is also important. As shown on the left side of Figure 5, if secondary destinations are not close to either the trip origin or primary destination, then travel by transit is discouraged or impractical, even where good transit is available between the residential origin and primary destination. As a result, all travel in this instance will likely be by car.

As shown on the right side of Figure 5, clustering common secondary destinations around primary destinations or transit stations in residential areas where they are accessible on foot facilitates travel by transit or walking for all trips. In some cases locating secondary uses at intermediate stops along transit routes can also be beneficial but there is an inherent preference to seek services around the origin or primary destination.

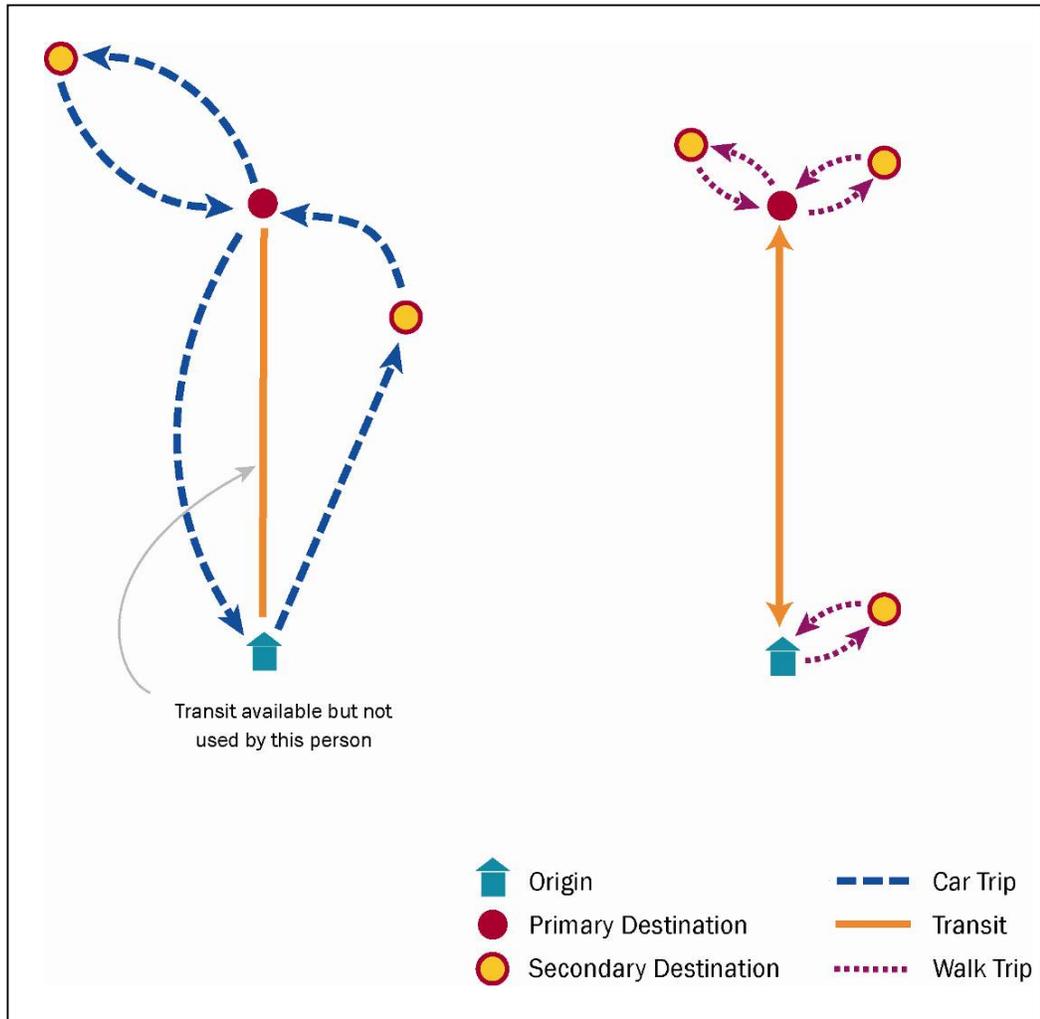


Figure 5: The role of secondary destinations

Figure 6 extends the principles illustrated in the previous figures. Primary and secondary destinations in mixed-use clusters linked by a network of priority transit facilitate transit use and walking no matter what combination of destinations one might visit. In addition to common daily destinations such as workplaces and shopping, locating other key destinations such as airport terminals and stadiums so they are accessible by a priority transit network insures not only that people can reach these destinations by transit from home, but also that they can be reached by transit from other destinations. Locating typical secondary destinations such as restaurants, variety stores, and daycare in station areas further reinforces the effectiveness of transit and walking.

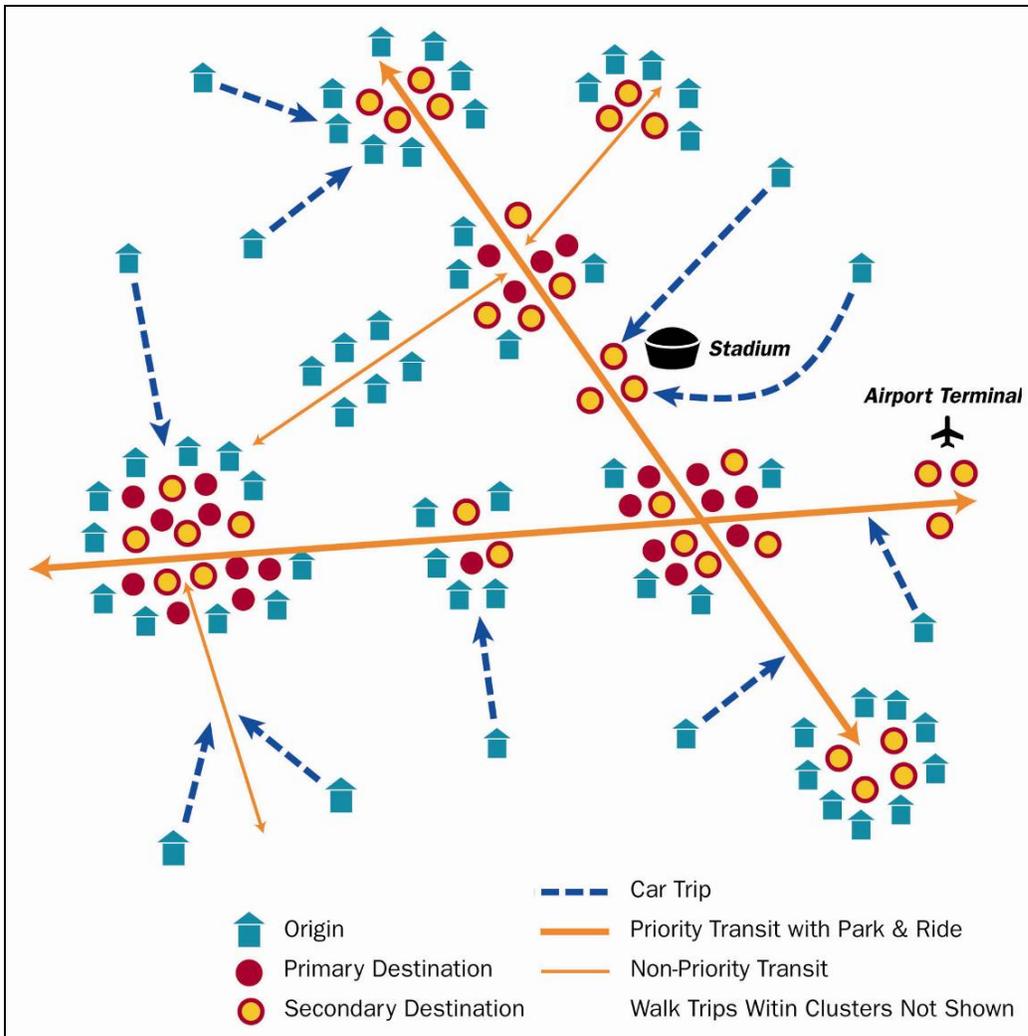


Figure 6: Primary and secondary destinations in clusters linked by priority transit

3 Measuring the Benefits

While it is difficult for quantitative analysis to measure the full benefits of an urban structure which does not exist in its idealized form anywhere, a number of studies have considered the transportation and environmental benefits of transit-oriented development at the micro or regional scale. The specific results of such analyses are inevitably grounded in the social, physical, and economic setting of the city(s) where they are undertaken. In the United States this means a milieu that is dominated by dependence on automobiles.

A significant early effort to measure the benefits of a transit-oriented development at the subregional scale was the Land Use Transportation Air Quality (LUTRAQ) study conducted by 1000 Friends of Oregon for the Portland metropolitan area in the early 1990s. The study used a state-of-the-art travel demand forecasting model to analyze alternate transportation and land use scenarios for the west side of the Portland metropolitan area. The study demonstrated that with coordinated development of a light rail line, appropriate transit-oriented development, and development controls, future growth in automobile travel could be reduced sufficiently to forego construction of a planned circumferential freeway. Most of the suburban transit-oriented development, and to a lesser extent the study, is focused on

residential uses, however, rather than emphasizing destinations (other than the Portland CBD).

Also since 1990, a number of studies have quantified the transportation characteristics of both residential and non-residential transit-oriented development. Many of these have been conducted by Robert Cervero and students of the University of California at Berkeley and UC Davis, and as a result, focus particularly on communities in the San Francisco Bay Area (see for example Bernick & Cervero, 1997; Parsons Brinckerhoff, 1996).

In a recent study, Cervero examined the transit travel characteristics of suburban office workers, comparing office workers near rail transit stations and workers elsewhere in the suburbs and considering the influence of other factors on rail commuting (Cervero 2006). The findings demonstrate the potential for commuting by transit (rail or bus) to suburban offices located in dense transit-oriented settings. In particular, he noted that increased trip chaining (when many of the secondary destinations are not transit accessible) and a frequent lack of sufficient choices in restaurants and other services around suburban offices—even near transit stations—were found to discourage commuting by transit (p. 47 & 50).

4 Conclusion & Recommendations

Specific application of the principles discussed will vary between countries and cities and within each metropolitan area, but the basic principles are applicable to cities of all sizes and in all economic settings. Some broad recommendations include:

- Plan and implement a comprehensive priority transit network using technologies and features most suitable to each city's size, inherent physical characteristics, and socio-economic conditions.
- Plan transit facilities to serve existing and future destinations, but favor more efficient straighter transit services over transit that bends and turns to reach multiple destinations—bring the destinations to a well planned transit network rather than building winding transit lines to reach dispersed destinations.
- Encourage development particularly of destination uses primarily in locations that are accessible to and from stations on a priority transit network. The uses and character of development most suited to each station area is based on the position of the station in the transit network and its accessibility to other points on the network.
- Locate medium and higher density residential development in areas around stations on the transit network.
- Plan mixed uses around each station that are mutually supportive to facilitate walking trips for many daily needs.
- Actively discourage inappropriate development in areas that are not transit accessible. Locate only uses that offer less transit potential in these areas.
- Develop pedestrian and bicycle networks that radiate out from transit stations.
- Coordinate planning, infrastructure, land use, and design at the site, neighborhood, corridor, and regional levels.
- Communicate with the public and policymakers the economic and environmental benefits of transit-oriented regional development.

Locating destination uses in walkable centers of various types and sizes linked by a priority transit network facilitates travel both on foot and by public transportation. Transformation of our cities to such an urban structure will help achieve both the economic and ecological goals of sustainable Green Urbanism.

5 Appendix 1: Illustrative Classification of Destination Uses

The following classifications are intended to be illustrative. Actual trip generation characteristics depend on context and specific character of the properties or businesses.

Generally Transit Supportive	Generally Non-Transit Supportive
Residential Uses (Origins)	Residential Uses (Origins)
Medium-high density residential	Low density residential
Ambulatory homes for the elderly	
Primary Destination Uses	Non-Residential Uses
Medium & high density employment (especially offices)	Low density employment
Shopping malls / department stores	Retail selling large volumes and large items (but can be somewhat transit supportive)
Arenas, stadiums, amusements	Gas stations & car repair ^{45*}
Movie theaters	Car dealers
Airport terminals (for employees & passengers)	Airport areas away from terminals
Intercity bus and train terminals	Utility sites
Passenger seaports	Cargo seaports
Manufacturing with high employee densities	Manufacturing with low employee densities
Hospitals	Warehousing / freight terminals
Hotels	Motels (but may support some transit)
Junior high & high schools	Elementary schools
Secondary Destination Uses	
Restaurants & fast food	Industrial & maintenance supplies & services.
Public squares & small parks with intense use	Freeways
Most retail, especially selling smaller volumes of carryable items.	Parking lots & garages
Business supplies & services	Transportation facilities (except passenger terminals)
Retail Services (e.g. cleaners)	Large waterways & lakes
Services (e.g. banks, tax prep.)	Parks & open space with low density use
Doctors & dentists offices	

⁴⁵ Locating car repair near park-and-ride facilities can be beneficial so that commuters can leave cars for repair during the day. However, locating car repair near pedestrian-oriented stations is unproductive and generally disruptive to the pedestrian environment.

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