



## Research Paper

# Urban greenway and compact land use development: A multilevel assessment in Seoul, South Korea

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## HIGHLIGHTS

- This study identifies the impacts of urban greenway on land use change in Seoul.
- We found land use change from residential to commercial close to the greenway.
- Other land use changes included commercial to mixed use and vice versa.
- The urban greenway generates higher-density residential and commercial development.

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## ABSTRACT

This study uses multilevel logit models to analyze the impact of urban greenway projects on land use in Seoul, Korea. Results derived from the use of land use change models confirm that the conversion of land from single-family residential use to commercial use is more likely to occur within 1.5 km of the Cheong Gye Cheon (CGC) greenway pedestrian entrances; conversions from single-family housing to mixed use appeared to a lesser extent within the same distance bands. However, land used for single-family housing could be converted to high-rises and dense housing (condominiums) within the band 3–4 km from the entrances. In addition, commercial land is more likely to be converted to mixed use land within 500 m of the CGC corridor entrances, while mixed use land tends to be converted into commercial land within the 1.5-km band and within 3.5–4 km of the pedestrian entrance along the urban greenway. These results suggest that urban greenway infrastructure can effectively encourage higher-density residential and commercial development. Furthermore, appealing amenities in the greenway attract people and firms and thus promote the demand for further property development. Finally, this study confirms that we need to keep a holistic view in linking the urban greenway, land use patterns, and transportation systems for sustainable and livable cities.

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## 1. Introduction

The paradigm of urban and transportation policy has shifted. Cities around the world face chronic traffic congestion, energy overuse, and severe environmental pollution, as well as subsequent global climate change. As a result, public transit and amenity-oriented infrastructure have become popular public investment alternatives toward ensuring sustainable and livable cities. Recent studies have shed light on the impacts of amenity and public transit-oriented urban projects on land use, the real estate market, travel behavior, and urban environments (Cervero & Kang, 2011;

Kang & Cervero, 2009). Many of them recognize and even emphasize that creating urban greenways is a promising and effective strategy for enhancing urban settings and landscapes, toward a sustainable future. Thus, it is reasonable for city leaders and citizens to be highly interested in building such greenways that offer esthetic, natural, and ecological improvements.

The relationship between urban greenways and land use conversion, therefore, is a fascinating issue that should be carefully considered. Some empirical studies discuss the association broadly—for example, by examining greenways and the urban spatial structure as urban green amenities (Brahmoh & Onishi, 2007; Cho, Poudyal, & Lambert, 2008). Moreover, *Landscape and Urban Planning* issued special editions on urban greenways in 1995 and 2006, in which it presents the results of detailed research. The journal has published key papers on the concept, strategy, users,

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and effects of these greenways, within both global and local contexts (Fabos & Ryan, 2006).

Within a design framework, and based on the suggested policy implications of previous studies, this study examines the relationships between urban greenways and land use changes in Seoul, South Korea (henceforth, “Korea”). The urban greenway project in Seoul is an example of a public amenity successfully built within the inner city, in the capital of Korea. The project converted an elevated freeway to an urban greenway, thus offering a pedestrian-friendly corridor along a stream.

First, this study explores the concept of urban greenways and their role in heavily urbanized areas. Second, the study addresses the key research question of how this greenway affected the conversion of land use in Seoul between 2001 and 2007. Therefore, this study hypothesizes that low-density residential, commercial, and mixed land use in the vicinity of the urban greenway was more likely to convert to high-rise residential, commercial, and mixed land use. Finally, this study provides policy implications for future relationships between urban greenways and land use change.

### 1.1. Key drivers of land use change

The built environment, constructed or natural amenities, and the socioeconomic environment are major drivers of land use changes in contemporary urban areas. First, components of the built environment—such as the public transportation system, highway corridors, and transit lines—shift land use. Better accessibility through the built environment attracts more people and increases land values. If these changes do not level out, they result in land use changes (Cervero & Kang, 2011; Cervero & Landis, 1997). Second, constructed and natural amenities, such as urban greenways and parks, influence land use changes. When new urban amenities increase adjacent land values, landowners and renters attempt to maximize their efficiency by changing the land use type (Brahmoh & Onishi, 2007; Furuseth & Altman, 1991; Vias & Carruthers, 2005). Finally, socioeconomic factors such as demographics, economic growth, and urban sprawl affect land use changes (Turner et al., 1995). Moreover, regulations and rules that manipulate socioeconomic factors—such as land management technologies and land use policies—must be considered (Veldkamp & Lambin, 2001).

Some papers discuss how neighborhood characteristics affect changes in land use. Specifically, conversions to commercial and high-rise residential use are more likely to emerge in the vicinity of transportation nodes and networks (Zhou & Kockelman, 2008). From a long-term perspective, urban amenities attract more people and firms, thus acting as guidance in active changes in land use from undeveloped land to the development of high-rise residential and commercial areas. Development patterns depend on the spatial range of the amenity’s impact, market preferences, and land use regulations.

Land price is a key driver of land use change (Du, Thill, Peiser, & Feng, 2014). Urban economic principles and empirical tests suggest that when there is a higher willingness-to-pay (WTP) higher rents, land use tends to occupy more accessible locations (DiPasquale & Wheaton, 1996). In particular, property cycle models imply that higher land prices based on accessibility and amenity value encourage land conversion to the highest and best use (Geltner, Miller, Clayton, & Eichholtz, 2006). Some key studies confirmed that land price appreciation expands urban areas—thus creating land use changes in agricultural areas—and that the overall profitability of land development determines land use conversion (Amin & Capozza, 1993; Capozza & Helsley, 1990). Land price and building density are connected, in that higher land prices and competition among firms tend to generate taller buildings (Helsley & Strange, 2008).

### 1.2. Studies on urban greenways

“Greenway” is a U.S. neologism that combines two words, “green” and “way.” The origin of the word is not clear, but it is widely used in many contexts. In simple terms, an urban greenway can be defined as a linear green space along either a natural corridor—such as a stream or river—or along a converted transportation corridor, such as railroads, that links together parks and other resources, as well as neighborhoods (Little, 1995). Additionally, the current study considers urban greenways’ characteristics, such as volume, goals, and local contexts (Ahern, 1995). Greenways have evolved into multipurpose green infrastructure elements that provide within urban areas natural preservation, ecological protection, cultural and esthetical value, and greater quality of life (Chiesura, 2004; Conine, Xiang, Young, & Whitley, 2004; Fabos, 2004; Searns, 1995). Urban planners and designers use urban greenways strategically to enhance urban amenities while considering socioeconomic features near the greenways (Lindsey, 1999). For example, an existing road is an ideal channel along which to build an urban greenway, to reduce the negative effects of a congested automobile network. This type of green amenity would be effective in managing air quality and landscape along road networks (Viles & Rosier, 2001).

In areas with fewer amenities and more traffic congestion, such as central business districts (CBDs), road networks can be converted into urban greenways, as in the case study presented below (Kang & Cervero, 2009). Furthermore, residential developments in inner cities need urban greenways to help protect green space from the overdevelopment of infill projects (Pauleit, Ennos, & Golding, 2005).

Urban greenways have gained increasing political and public support. In the U.S. state of North Carolina, the main visitors to urban greenways are educated, white, single females with a higher-than-average income (Furuseth & Altman, 1991). Planners and real estate developers consider greenways environmental components that attract residential developments, and local governments’ WTP for urban greenways is high. However, the WTP estimated from contingent valuations is too subjective to provide an accurate measure of these projects’ value (Lindsey & Knaap, 1999).

Urban greenway projects face various challenges. Many of these projects suffer from limited budgets, weak consensus among interest groups, and a lack of connection between land development and ecological systems (Searns, 1995). Thus, the projects often need to obtain strong political support and substantial financial resources before they can be launched.

It has been widely discussed that urban greenways influence urban forms, land use, and communities, because an urban greenway can alter natural areas as well as urban spatial patterns. This impact occurs at both the micro and macro levels of urban settings (Walmsley, 1995). Resident mobility, land use development, and amenity provision dynamically interact in a spatio-temporal process. For example, the spatial concentration of people and land development in suburban areas near the Rocky Mountains has resulted from residents’ mobility and their desire to enjoy green amenities (Vias & Carruthers, 2005). U.S. examples confirm that low-density residential development has its roots in people’s preferences for environmental amenities. Thus, people’s mobility to urban greenways has resulted in scattered development patterns and urban forms in suburban areas (Wu, 2001, 2006; Wu & Plantinga, 2003).

These findings reveal that green amenities play a critical role in attracting certain types of land use. Residential and non-residential areas respond differently to the presence of adjacent green spaces, given the heterogeneous nature of these types of land use (Brahmoh & Onishi, 2007). Urban greenways are one of the key factors to determine patterns of residential and community development. For example, in Cairo, Egypt, residents gained diverse benefits from greenways in terms of education, ecological conservation, and

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