THE EFFECT OF LOW-IMPACT-DEVELOPMENT ON PROPERTY VALUES

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ABSTRACT

Many reports and articles describe the potential benefits that low-impact development (LID) stormwater controls can provide—benefits that conventional controls can not offer. Very few studies, however, quantify these benefits, either in biophysical measures or in dollar amounts. In this study, we quantify one potential, but often overlooked, benefit of LID: the effect of LID on property values. A preliminary analysis of the effect of LID on property values in Seattle indicates that the introduction of LIDs increased property values by 3.5 – 5 percent. Compared to similar houses (e.g., in terms of square feet of living space, building quality, lot size, etc.) in the same zip-code, houses in Seattle's Street Edge Alterative (SEA), Broadview Green Grid, Pinehurst Green Grid, and High Point projects sold for 3.5 – 5 percent more during the period after the adjacent streets were converted to LID. This increase in value appears to be the result of the LID. Prior to the introduction of LID, the houses affected by these projects did not command a premium over their neighbors. These results suggest people are willing to pay for the combination of neighborhood amenities and environmental services provided by LID stormwater controls. The results of the study give policy makers a more complete picture of the economic benefits provided by LID, which they should recognize when considering stormwater control policies.

KEYWORDS

Low-Impact-Development, LID, Greenstreets, SEA Streets, Property Values, Hedonic Analysis

INTRODUCTION

Conventional stormwater controls collect stormwater from impervious surfaces, including roads, parking lots and rooftops, and transport the flow off site through buried pipes to treatment facilities or directly to receiving bodies of water. This approach efficiently collects and transports stormwater, but also can create high-velocity flows polluted with urban contaminants, including sediment, oil, fertilizers, heavy metals, and pet wastes. Such flows can erode stream banks and natural channels, and deposit pollutants that pose ecosystem and public health risks (Kloss and Calarusse 2006).

In contrast to conventional stormwater controls, low-impact development (LID) techniques emphasize on-site treatment and infiltration of stormwater. Since the early 1990s, many communities around the country have explored ways to integrate low-impact development

techniques into the urban environment to avoid many of the harmful effects of conventional stormwater management practices. LID techniques include bioswales, rain gardens, green streets, and pervious paving materials (U.S. EPA 2000).

Seattle's Natural Drainage Systems (NDS) are a low-impact approach to managing stormwater in an urban environment, by redesigning residential streets to minimize stormwater flows to conventional stormwater collection systems, by capturing the water on-site and allowing it to infiltrate into the ground.

The first NDS, called SEA Street (SEA stands for Street Edge Alternative), transformed a three-block section of a street in a residential neighborhood with bioswales, less pavement, and more vegetation to minimize the negative impacts of stormwater runoff. Seattle Public Utilities (SPU), the department charged with managing Seattle's drainage and sewer system, realigned and narrowed the street, reducing impervious surfaces by 11 percent compared to a traditional street. Bioswales were added along the edge of the street, filled with 100 new evergreen trees and over 1,000 new shrubs. SPU added a sidewalk to one side of the street, and replaced traditional curbs with gently sloping edges to encourage water to drain to the bioswales. SPU's monitoring results indicate that the NDS techniques reduced the total volume of stormwater leaving the street by 99 percent (Seattle Public Utilities 2008). The project cost $850,000, which is lower than the cost of retrofitting a traditional street with drainage improvements (City of Seattle No Date).

Since the SEA Street was completed in the spring of 2001, SPU embarked on installing Natural Drainage Systems throughout Seattle's neighborhoods. As of 2008, it has completed four additional projects, transforming approximately 30 city blocks and a large new infill development with natural drainage controls.

The projects have benefits beyond reducing the impacts of stormwater on local water bodies. The reconfigured street width and shape results in a narrower visual corridor and gently curving roadway that calms traffic. Bioswales provide more street-side landscaping, beautifying the neighborhood and providing habitat for wildlife. Property owners have generally been supportive of the projects and, according to the City of Seattle, "believe their streets are more interesting and look better than traditional neighborhood streets." (City of Seattle No Date, p. 8)

Evaluating the economic costs and benefits of low-impact development is an under-developed area of study (MacMullan and Reich 2007). Few researchers have extensively investigated the full range of economic effects of low-impact development, including the effect on property values. The authors know of only one other study that used rigorous analytical techniques to determine the effect of LID and LID-like development designs on property values. That study analyzed a sample home sales in Omaha, Nebraska between 2000 and 2006, to find the impact of LID subdivision designs on the sale prices of adjacent single-family homes, while accounting for other housing and neighborhood factors. However, no true LID subdivisions existed in the Omaha area, so the researchers evaluated existing subdivisions with characteristics that mimicked those found in LID subdivisions. The study found that buyers were willing to pay a price premium of 2.74 percent for homes in subdivisions that contained LID characteristics (Schultz and Schmitz 2008).

Although Seattle Public Utilities suspects that the NDS projects throughout the City positively affect nearby property values, until now, research has not formally confirmed this effect in Seattle (City of Seattle No Date, p. 8). This study conducts this research. We find that houses in Seattle's NDS projects sold for approximately 5.5% more than similar houses in the same neighborhood.

METHODOLOGY

We conduct our analysis using data from the King County Assessor's Property Information Files. These files contain extensive information on each of the properties in King County. The data are organized in to several different files. For our analysis, we use data from the parcel file, the residential building file, and the real property sales file. Included in the parcel file is information about the lot. This includes information about lot size, zoning, hazards, and amenities (e.g., the view from the lot and if it is adjacent to green space, a golf course, or water). The residential building file includes extensive details about all residential buildings. This file includes information on the square footage, number of bedrooms and bathrooms, the year the structure was built (or renovated), the quality and condition of the building, and information on the heating system and source. Finally, the real property sales file includes information on all sales transactions for the past several decades. This file includes information like the sale date, the sale price, and indications that the sale was not "arms length" (e.g., the sale was to friends or relatives).

These data are updated regularly. The data used in this analysis were downloaded on May 2, 2008. The files downloaded contain information on over 468,000 residential buildings and over 1.3 million sales transactions.

Our analyses only include a small subset of these residences and transactions. We limit both the properties and transactions examined in several ways. We only examine single-family homes in the four zip codes that contain NDS projects,[1] and we include only arms length sales of new or existing homes.[2] Finally, we examine only sales transactions that occurred after 1992. For most of our analyses, we further restrict the set of transactions examined to include only sales from 2005 to the present (when all of Seattle's NDS projects had been developed or where in the process of being developed). The final database includes 4,970 sales transactions from 2005 to the present (and 24,479 transactions from 1992 to the present). Of these, 121 represent sales within the NDS project areas after 2005 (there are 248 total sales within the NDS projects after 1992).

In order to identify the effect of the NDS projects on adjacent property values, we conduct an hedonic analysis. That is, we compare the sales prices of homes within the NDS projects to the

[1] The four included zip codes are 98125, 98126, 98133, and 98177. We identify a property as a singly family home if the property includes only one building, has only one living unit, and its principle use (as reported on their excise tax affidavit) was residential.

[2] We define an arms length transaction as a sale with no indicated sales warnings. Sales warnings indicate that the sale may not represent a regular market transaction (e.g., only a partial interest was sold, the property was sold to a friend or relative, etc.).

sales prices of similar homes outside the NDS project but within the same zip code. Specifically, we estimate equations with the following form using standard OLS regressions:

$$(1) \qquad \ln(salesprice_{izt}) = \alpha + \beta NDS_i + X_i'\delta + t + \phi_z + \varepsilon_{izt}$$

NDS is a dummy variable equal to one if the property is within one of the NDS projects, X is a vector of property characteristics, t is a time trend, and ϕ is a zip code fixed effect. The vector of property characteristics includes the natural log of both lot size and house size, the year the house was built, the share of the construction that is brick, the number of bedrooms and bathrooms, dummy variables for whether or not the property has a view, is located on a green belt or the waterfront, and indicator variables for the grade of the building, the condition of the building, the heat source, and the type of heating system.

RESULTS

The results of our analysis are presented in Table 1. Our results indicate that Seattle's NDS projects have positively affected property values. Column (1) presents indicates that, taken together, homes in the four NDS projects sold for 3.5 percent more than similar homes in the same zip codes. Columns (2) and (3) examine the SEA, Broadview, and Pinehurst projects separate from the High Point project. We examine these projects separately because the High Point project represents a large development of new homes, while the other projects changed the streets and drainage systems but did not involve building new homes. The results of these separate analyses are similar to the overall analysis. The homes in the SEA, Broadview, and Pinehurst projects sold for 4.3% more than similar homes in the same neighborhoods, but the effect is only marginally significant at standard levels. The homes in the High Point project sold for a more statistically robust 5.1% premium over other homes in the same neighborhood.

Table 1 – Effect of Seattle Natural Drainage System Projects on Property Values

	(1) All NDS Projects 2005-Present	(2) SEA, Broadview, Pinehurst Projects 2005-Present	(3) High Point Project 2005-Present	(4) SEA, Broadview, Pinehurst Projects 1992-2000
NDS	0.035	0.043	0.051	0.006
	(0.014)**	(0.022)*	(0.023)**	(0.021)
R^2	0.709	0.732	0.656	0.727
N	4970	3769	1201	10590

[1] Results of OLS regressions with robust standard errors clustered at the property level.
[2] *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Column (4) examines the sales of the existing homes in the SEA, Broadview, and Pinehurst projects from 1992-2000 before any of the projects had been completed.[3] The homes in the areas that would be included in NDS projects in later years sold for essentially the same price as similar homes in these neighborhoods during this period.

DISCUSSION

The results of simple cross-sectional regressions should always by interpreted with caution. It is possible that the NDS neighborhoods have some other desirable amenity that distinguishes the NDS neighborhoods from other neighborhoods in their zip code. The fact that prior to the development of the NDS projects these homes sold for the same amount as similar neighboring homes suggests that these concerns are unlikely to substantially impact our results.

Our results suggest that the low impact development can increase property values. As implemented in Seattle's natural drainage system projects, LIDs are a desirable amenity for home buyers. There are number of features provided by these projects that home buyers might find attractive. Some buyers might wish to purchase an environmentally friendly home. Others might simply find the developments more aesthetic than traditional development. Still others might like the narrow winding streets or the potentially enhanced sense of community.[4]

Our results do not identify precisely what home buyers find attractive about these projects, they merely suggest that LIDs have the potential to produce desirable housing market amenities. By allowing consumers to enjoy the benefits of these amenities, LIDs generate benefits for the economy. As such, these benefits should play a role in determining the desirability of LID policies.

While our results suggest that demand exists for the amenities associated with some LID projects, they do not indicate the extent of that demand. The Seattle projects are still relatively small. Thus it is not clear if the premium we estimate reflects a widespread willingness-to-pay for the specific amenities provided by the NDS projects, or if it reflects the preferences of a relatively small group of people. Thus, we do not know how long a premium would persist if Seattle significantly increased the number of LID properties. As such, more research is required to determine the shape of the demand curve for these benefits (and thus the true magnitude of the social benefits created by pursuing low impact development).

CONCLUSIONS

In this paper, we demonstrate that the implementation of Seattle Public Utilities' Natural Drainage System projects increased property values in the affected neighborhoods by 3.5% - 5%.

[3] We do not include the High Point project in this analysis since the homes in this project are new (and thus don't have sales recorded in the pre-NDS period).

[4] In other markets, LIDs might boost property values by reducing stormwater or drainage fees residents must pay. As we understand, Seattle's NDS projects do not reduce drainage fees paid by residents, but if they did, economists would expect home prices to reflect these benefits.

This increase in property values indicates that individuals value the amenities produced by these projects. As such, there may be significant social benefits associated with these projects. Policymakers may wish to account for these benefits when developing storm water management policies. Furthermore, these results suggest that developers may find it profitable to develop low impact subdivisions.

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