

GIS Indicator on New Urbanist Communities in Southeastern US

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Abstract

New urbanism is a school of urban development that combines residential, commercial, and civic land uses in a dense urban fabric of carefully prescribed form. Its advocates claim that New Urbanist developments are superior to prevailing urban development patterns on social and environmental sustainability. Its critics, however, argue that New Urbanism developments do not measure up to the social and environmental ideals and are, in some cases, just another form of urban sprawl. The goal of this study is to evaluate various criticisms of New Urbanist communities. This paper used empirical evidence to determine the performance of New Urbanist developments on the broader spatial and social context as opposed to the internal characteristics of the communities using GIS indicators. The results showed that the communities did not meet conventional criteria for New Urbanist ideals.

Keywords : New Urbanist Communities, New Urbanism, GIS Indicator

1. Introduction

Sustainability and Smart Growth have been on the rise in the United States in recent years, causing people around the country to question the prevailing development trends of suburban sprawl. At the forefront of the smart growth movement is the New Urbanism, which has greatly benefited from the rising interest in sustainable development. New Urbanism is believed by proponents to prevent sprawl and reduce auto-dependency through its design principles which include: infilling development, density, mixed-use, connectivity, and walkability. The number of New Urbanist projects developments each year has been consistently rising as the concept has become more accepted by local officials and planners, but not everyone is convinced of the effectiveness of New Urbanist principles. Critics charge that benefits may be geographically limited if projects do not connect well to regional transportation networks (Grant, 2006; Marshall, 2003). Many researchers have examined the internal characteristics and the social benefits of New Urbanism (Dill, 2006; Sim and Ziwitz, 2013; Talen 2002), but few studies (Sim and Ziewitz, 2013) have examined the sustainability of these developments based on external spatial characteristics. This paper used

empirical evidence to determine the performance of New Urbanist developments on the broader spatial and social context as opposed to the internal characteristics of the communities using GIS indicators. The following section of this paper briefly explains the background of New Urbanism. Next, the data and methods of the research are described, and then the results are presented. Finally, the discussion and the implications of the research are followed.

2. Background

New Urbanists believe that the developments of the late 20th century were designed for the automobile, causing a loss of civic virtue, and a sprawling, automobile-dependent landscape. The design principles of New Urbanism were developed to decrease auto-dependence, foster social interaction and sense of community, promote walking and cycling, and preserve open space and agricultural land. The basic design principles of New Urbanism are: compact design and high density housing, infill development, transit-oriented development (TOD), mixed use, walkability, historic preservation, open space and amenities, and mixed-income housing. In recent years, the New Urbanism has become associated with the ideas of “smart growth” and

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sustainable development, despite many criticisms and opposition from members of the academic and professional community.

New Urbanism began in 1980 with the development of the Seaside community in the Florida panhandle. Seaside is the oldest and most famous community designed with New Urbanist principles. The designer of the community, Andres Duany, went on to become one of the founders of the Congress for New Urbanism (CNU), the organizing body of the New Urbanism Movement. The CNU was founded in 1993 by Peter Calthorpe, Andrés Duany, Elizabeth Moule, Elizabeth Plater-Zyberk, Stefanos Polyzoides and Dan Solomon, and the first meeting was held later that year. About 100 people attended the first CNU meeting, an event that now draws over 1000 people annually.

Over the past thirty years, the New Urbanists have continued their work of revitalizing the urban landscape and have been largely successful. The New Urbanism has emerged as the leading movement in smart growth and sustainability. The movement has created an entire industry of designers, architects, and other professionals, as well as hundreds of New Urbanist communities around the world.

3. Study Site

The study required extensive data collection on new urbanist development. The data was collected during the first phase of the project (September 2011 – December, 2012). As of 2007, there were about 456 sites listed as new urbanist development (Steuteville, 2007). Of these 456 developments, 288 were implemented on the ground as of 2012 and 120 were chosen for the study in the Southeastern 12 states of the U.S. (Fig. 1).

The coordinates for each development were recorded in Microsoft Excel along with information on the size of the development, year of construction, development location, type of development (infill/greenfield), and the physical address of each development. These coordinates were then displayed in ArcGIS and used to observe spatial patterns in new urbanist development. They are shown in Table 1 and Fig. 1.

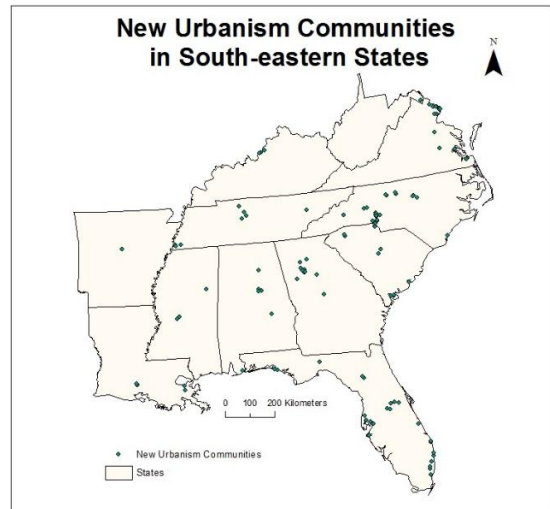


Figure 1. Locations of new urbanist communities in the Southeastern US.

Table 1. Number of New Urbanist Communities in the Southeastern States.

STATE NAME	# of New Urbanist Communities
Alabama	6
Arkansas	1
Florida	32
Georgia	14
Kentucky	3
Louisiana	5
Mississippi	3
North Carolina	22
South Carolina	10
Tennessee	8
Virginia	15
West Virginia	1

Source: Census 2000, Google Earth and Site Visit from 2009 to 2011

The Southeastern States contain some of the most famous new urbanist communities in the world. The state of Florida is home to Seaside, the first new urbanist development, and Celebration, massive community developed by the Walt Disney Company. These communities two of the most frequently cited examples of new urban design and are claimed the two most visited new urbanist communities in the country. Another factor in the dominance of the Southeastern region is the presence of Andrés Duany and Elizabeth Plater-Zyberk’s DPZ design firm in

Miami. DPZ was responsible for designing Seaside, Celebration, Kentlands, Lakelands, and many other new urbanist communities throughout the South Atlantic region. Adjacent regions benefit from proximity to influential new urbanist designers and architects.

New Urbanism in North Carolina began in 1999, when several new projects were constructed in the Charlotte area. North Carolina and the city of Charlotte in particular have since become “hot spots” for New Urbanism. The CNU recognizes the late Doug Boone as having introduced the concept of New Urbanism to the Charlotte area with his development, New Neighborhood in Old Davidson. Charlotte seems to be ideally suited for the movement since the city attracts both retirees and young families. Overall, the state of North Carolina is a very desirable location for new urbanist developments, as there are no significantly congested areas and socioeconomic conditions are favorable for continued support of these developments.

There are a few clusters of new urbanist developments in the Southeastern States (Fig. 2). Among the largest of these clusters are: Charlotte in North Carolina, Miami in Florida, Atlanta in Georgia and Arlington and Alexandria in Virginia. All of these “hot spots” are located within the states that the highest number of New Urbanist communities.

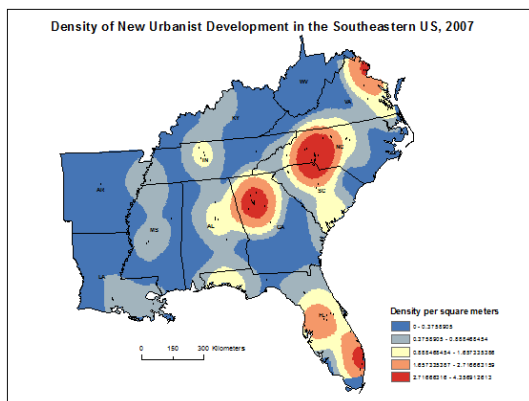


Figure 2. Density of new urbanist communities in Southeastern US.

4. Measures of New Urbanism Performance

The first phase of this study was the development of the sustainability rating system. The system used in this study was originally created by Sim and Ziewitz (2013), and only slightly modified for this study. This system includes seven sustainability measures separated into three different categories. These measures are shown in Table 2. The sustainability rating tool developed in this study was designed to measure communities based on three categories of sustainability: location, land use, and transportation. Communities received a maximum value of 1.0 for each measure, and the average of all measures within each category was added together to create a total sustainability score. The details of each measure is followed.

- **Greenfield vs. Infill:** The concept of infilling development is stated as a major component of New Urbanist development in the CNU Charter (CNU 2001). Infill is defined as development that is “seamlessly developed within an existing urban fabric, balancing, completing, and/or repairing surrounding sectors” (Aurbach 2005). In this study it is used as an indicator of how much undeveloped “greenfield” area is being consumed by New Urbanist development. Practicing infilling development preserves open space, and in many cases, involves the revitalization of previously developed area. A rating of 1 was given to communities classified as infill, and a rating of 0 was given to communities classified as greenfield.
- **Housing Density:** Density is another important concept in smart growth and New Urbanism. Housing density has been shown to be a better indicator of sprawl than population density because it more accurately describes the human presence on the landscape (Theobald, 2005). Higher density housing reduces the amount of greenfield land being consumed by development. In this study, communities were classified into one of four categories and assigned a rating; these categories (and ratings) were: urban(1),

Table 2. GIS measures for New Urbanist Community Performance.

Category	Measures	Rating (0=least sustainable, 1=most sustainable)
Location	Greenfield or Infill	0(greenfield), 1(infill)
	Urban, suburban, exurban or rural	rural (0), ex-urban (0.33), suburban(0.66), urban (1)
	Distance to nearest urban center	< 2 miles = 1, 2-4.99 miles = 0.66, 5- 10 miles = 0.33, > 10 miles = 0
Land Use	Degree of mixed land use	Ratio of commercial/educational/institutional use to housing units
Transportation	Availability of Mass Transit	0 = no mass transit, 1= mass transit
	Number of transit and external road connection	Numbers of intersections per 1 km on perimeter (> 3 = 1, 2-3=0.66, 1-2 = 0.33, <1 = 0)

suburban(.66), exurban(.33), and rural(0). These density categories were defined by the number of acres per unit of housing, and were measured using a nationwide housing density dataset.

- Distance to Nearest Urban Center: Distance to the nearest urban center shows the connectivity between the new community and the existing urban center. This shows the proximity of the community to job centers, transportation networks, and civic venues. Distance to the nearest urban center is measured as a straight-line distance between the New Urbanism community and the nearest major city (city points obtained from the US Census). Cut-off distances, 2, 5 and 10 miles are selected as optimal biking, optimal driving and most tolerant driving distance respectively.
- Degree of Mixed Land Use: Mixed-use is one of the most important concepts in New Urbanism, but it is also one of the concepts that are most difficult to implement in actual communities. In this study, mixed land use was measured as a ratio of residential units to units of other land use within a one-mile buffer of the community; communities with a higher degree of mixed-use received higher scores in this category.
- Availability of Mass Transit: Availability of mass transit is an indicator of sustainability because it offers residents an alternative to personal automobile transportation. This measure was determined using Google Earth Transportation layer to check if mass transit was available within .25 miles (easy walking distance) of the

community boundaries. Availability of mass transit earned a score of 1, and unavailability earned a 0.

- External Road Connections: External road connections is a measure of the connectivity of a community to its surroundings. In this study, this was measured by comparing the number of external connections to the perimeter of the community; perimeter was measured in kilometers. Communities with more than 3 external road connections per kilometer of perimeter earned a 1, 2-3 earned a .66, 1-2 earned a .33, and less than 1 earned a 0.

5. Analysis and Results

The results show that most New Urbanism communities in Alabama State was below 1 out of 3. While, overall, New Urbanism did not perform very well in this sustainability evaluation, Metropolitan Gardens did perform very well. The major reason for communities receiving a low rating in location category was poor connection to an established urban core. Communities were located too far away from their respective urban cores, and many were built on greenfield development sites (Table 3). 50 % of all New Urbanist communities were not located in urban areas. Housing density was one of the most important factors that caused communities to receive low scores for location. In fact, location proved to be the determining factor in the performance of New Urbanist communities; location has a strong relationship with all of the other sustainability categories (Table 4).

Table 3. Site results of new urbanism communities (greenfield vs. infill)

Infill/Greenfield	Count	Percentage
Greenfield	68	56.7%
Infill	52	443.3%
Totals	120	100.0%

Table 4. Housing Density of New Urbanism Communities

Housing Density	Count	Percentage
Rural	14	11.6%
Exurban	15	12.5%
Suburban	32	26.7%
Urban	59	49.2%
Totals	120	100.0%

Land use (Mixed use) was another category in which New Urbanism communities in the Southeastern States performed poorly (Table 5). As mentioned in the previous section, location has a huge effect on the amount of mixed-use that a community can support. Transportation rating was determined by external road connections and availability of mass transit (Table 6 and 7). Overall, 66% of all communities in this study did not have access to mass. Communities performed poorly in the measure of external road connections; the average number of connections per kilometer of perimeter was 2.3 (Table 7).

As a result, location proved to be the determining factor in the performance of New Urbanism communities; location has a strong relationship with

Table 5. Mixed Use (on average)

Non Residential Use	Housing Unit	Ratio
89	970	0.26

Table 6. Availability of Mass Transit

Mass Transit	Count	Percentage
Yes	41	34.2%
No	79	65.8%
Totals:	288	100.0%

Table 7. External Road Connections

Measure	Average
External Connection (exit per kilometer)	2.3

Table 8. Overall Sustainability Score of New Urbanist Communities in the Southeastern States

State Name	Location	Mixed Land Use	Transportation	Total
Alabama	0.24	0.22	0.14	0.60
Arkansas	0.89	0.66	0.33	1.88
Florida	0.45	0.19	0.31	0.94
Georgia	0.66	0.43	0.50	1.59
Kentucky	0.63	0.33	0.72	1.68
Louisiana	0.55	0.26	0.37	1.18
Mississippi	0.44	0.44	0.28	1.16
North Carolina	0.55	0.50	0.49	1.54
South Carolina	0.46	0.55	0.35	1.36
Tennessee	0.53	0.54	0.44	1.51
Virginia	0.60	0.50	0.65	1.75
West Virginia	0.33	0.00	0.00	0.33

all of the other categories. For example, a community located too far away from the urban core will most likely not have access to mass transit and is less likely to have a high degree of mixed-use. An analysis of housing density for both the highest and lowest scoring communities shows the importance of location. The highly performed communities were shown to be located near the center of major urban areas, while the poorly performed communities were all located in exurban or rural areas far removed from any urban area. While, overall, New Urbanist communities did not perform very well in this sustainability evaluation, many communities did perform very well. Five communities received a score of 0 in this sustainability rating (Table 9a). Others, however, performed very well; three communities actually received a perfect score (Table 9b).

6. Discussion

This paper aimed at evaluating the performance of New Urbanist developments on the broader spatial and social context as opposed to the internal characteristics of the communities using GIS. The results of this study reveal that the design principles of New Urbanism are not being fully realized in real-world communities. The major observations are followed: 1) The connection to existing urban areas is poor; 2) The mixture of land use is not diverse. The percentage of commercial and industrial use is

Table 9a. Best performed New Urbanism Communities

ID	Community	City	State	Acres/sq Km	Site	Dist. (Km)	Commercial	Housing Units	External Road Connection	Mass Transit	Location	Land Use	Transportation	Total
1	Mizner Park	Boca Raton	FL	29/0.12	Infill	2.09	100	272	10	Yes	1.00	1.00	1.00	3.00
2	Liberty Green	Louisville	KY	2/0.008	Infill	2.56	300	898	10	Yes	1.00	1.00	1.00	3.00
3	First Ward	Charlotte	NC	40/0.16	Infill	2.20	150	391	9	Yes	1.00	1.00	1.00	3.00
4	Lyman Village	Lantana	FL	4/0.016	Infill	6.12	25	60	2	Yes	0.89	1.00	1.00	2.89
5	Lemoyne Gardens	Memphis	TN	40/0.16	Infill	5.84	150	300	7	Yes	0.89	1.00	1.00	2.89
6	Westbury	Portsmouth	VA	41/0.17	Infill	3.28	160	365	13	Yes	0.89	1.00	1.00	2.89
7	Old Palm Grove	East Delray	FL	5/0.02	Infill	3.05	40	50	2	Yes	1.00	1.00	0.83	2.83
8	Evans Farm	McLean	VA	24/0.10	Infill	9.25	95	144	5	Yes	0.78	1.00	1.00	2.78
9	Inman Park Village	Atlanta	GA	48/0.19	Infill	3.96	120	378	4	Yes	0.89	1.00	0.83	2.72
10	Potomac yard	Alexandria	VA	350/1.42	Infill	2.69	300	900	15	Yes	0.89	1.00	0.83	2.72

Table 9b. Worst performed New Urbanism Communities

ID	Community	City	State	Acres/sq. Km	Site	Dist. (Km)	Commercial	Housing Units	External Road Connection	Mass Transit	Location	Land Use	Transportation	Total
1	Norton Commons	Louisville	KY	600/2.43	Greenfield	19.15	60	2880	4	No	0.00	0.00	0.17	0.17
2	Harborside	Pontiac	SC	120/0.48	Greenfield	21.08	15	350	5	No	0.00	0.00	0.17	0.17
3	Pointe West	Vero Beach	FL	603/2.44	Greenfield	41.52	35	1200	4	No	0.11	0.00	0.00	0.11
4	Southwood	Tallahassee	FL	3273/13.25	Greenfield	8.21	50	4250	4	No	0.11	0.00	0.00	0.11
5	Serenbe	Palmetto	GA	1000/4.05	Greenfield	40.33	15	200	3	No	0.11	0.00	0.00	0.11
6	Mt. Laurel	Birmingham	AL	442/1.79	Greenfield	20.49	18	600	4	No	0.00	0.00	0.00	0.00
7	The Waters	Pike Road	AL	200/0.81	Greenfield	25.49	3	2500	4	No	0.00	0.00	0.00	0.00
8	Avalon Park	Orlando	FL	1860/7.53	Greenfield	21.57	40	4000	2	No	0.00	0.00	0.00	0.00
9	Lost Rabbit	Madison	MS	259/1.05	Greenfield	20.79	10	660	1	No	0.00	0.00	0.00	0.00
10	Westhaven	Franklin	TN	1540/6.23	Greenfield	39.69	30	2500	6	No	0.00	0.00	0.00	0.00

low; and 3) The mode of transportation to external communities is not diverse. Location proved to be the determining factor in sustainability of New Urbanism communities, but communities also underperformed in land use and transportation categories. There is a big gap between claimed new urbanist principles and ground reality. The findings indicate the economic and logistical advantages of developing in greenfield sites and location choices for new urbanist communities are driven by the same factors as location choices for conventional development. Overall, the measures developed in this study provide a good framework for remotely measuring sustainability with geo-spatial technology. The results provide insight into the actual performance of the New Urbanism which has been a topic of debate in the academic and professional community since the beginning of the New Urbanism movement.

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