

# Quantified Comparison of Landscape Urbanism and New Urbanism: Applying Mean Depth and Connectivity Measures in Space Syntax to Two Toronto Case Studies

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**ABSTRACT:** Landscape Urbanism and New Urbanism are two of the most recent and most relevant paradigms in contemporary urbanism. The two offer some major differences (such as density and approach towards urban sprawl, transportation mode choice, urban block size and arrangement, etc.) as well as some similarities (such as ecological sensibility, natural resource preservation, and connectivity of the urban fabric), causing them to become interested in similar urban contexts (such as post-industrial and brownfield sites), and making them comparable. Recently, there has been a lot of discussion around the conceived ideological, theoretical, and physical differences of these two paradigms, where proponents of each have brought forth arguments aimed at proving the superiority of their side and refuting the other. Despite the extent of these arguments, no quantitative comparison has been offered. To this date, the majority of these discussions have remained quite superficial. This paper proposes the use of Space Syntax as a methodology that can help fill this literature gap for meaningful quantitative comparison between the two paradigms. For the purpose of this study, a comparable Landscape Urbanist and a New Urbanist project were selected. The Lower Don Lands (Landscape Urbanist) and the West Don Lands (New Urbanist) projects are both located in downtown Toronto, Canada. They are both very recent projects and are of comparable sizes.

A common claim between Landscape Urbanism and New Urbanism, and a relevant issue in contemporary urbanism, is the connectivity of the urban fabric. This characteristic was selected to be quantitatively compared between the two case studies through measures of the Space Syntax methodology. As such, the two case studies were compared using “connectivity” and “mean depth” measures. Results were then assessed to determine which project performed more successfully in making a connection between its site and the surrounding urban fabric.

**KEYWORDS:** Landscape Urbanism, New Urbanism, Space Syntax, Integration, Mean Depth

## INTRODUCTION

This study seeks to provide a quantitative method through Landscape Urbanist and New Urbanist projects can be compared and contrasted. To achieve this goal, first a methodological study of the two paradigms was performed where key claims of each were highlighted and further demonstrated and strengthened through case studies. Then, two urban cases were selected, one from each of the two paradigms. Then, according to the physical and quantifiable characteristics representing certain claims studied previously, Space Syntax was selected as the method through which those claims would quantifiably be put to the test and compared. Bafna offers holistic description of Space Syntax in his 2003 article:

Space syntax is best described as a research program that investigates the relationship between human societies and space from the perspective of a general theory of the structure of inhabited space in all its diverse forms: buildings, settlements, cities, or even landscapes. (Bafna 2003)

As such, the cases were compared using “connectivity” and “mean depth” measures from the Space Syntax methodology. The intent of this study is to fill the gap in the existing literature, where comparison between Landscape Urbanism and New Urbanism lacked quantifiable evidence.

## 1.0 BACKGROUND

Landscape Urbanism and New Urbanism remain two of the most relevant urbanism paradigms in contemporary urbanism. Without a detailed study and to the untrained ear, most of what each of these two opposing sides in the world of urbanism claim to be after sounds logical and beneficial solutions to the maladies and issues of contemporary cities. Looking more closely, one can detect both stark differences, and obvious similarities as there are aspects where both paradigms correctly, albeit through different approaches, detect urban issues.

Extensively discussed throughout existing literature, from one perspective, Landscape Urbanism and New Urbanism's fundamentally different approach to the medium responsible for ordering of urban spaces appears to be primarily responsible for ensuing differences between the two. The subject of much heated debate is that Landscape Urbanism takes "landscape" as its medium, whereas New Urbanism takes the "building". One of the most famous quotes upon which Landscape Urbanism bases this choice is that of Stan Allen:

landscape has traditionally been defined as the art of organizing horizontal surfaces... by paying close attention to these surface conditions – not only configuration, but also materiality and performance – designers can activate space and produce urban effects without the weighty apparatus of traditional space making. (Allen 2001)

This also boils down to the classic question of whether architects or landscape architects should be the dominating profession in urban design. On this issue, Waldheim calls for "architecture as a tool of instrumentality, not autonomy." (Waldheim 2016) For Landscape Urbanists, as Waldheim discusses, their pick of landscape as the major medium of urbanism sees its roots built on the canon of regional environmental planning such as Patrick Geddes, Benton McKay, Lewis Mumford, and even Ian McHarg. Waldheim also strengthens his stance on picking landscape as the Landscape Urbanist's medium of urbanism by stating that, landscape is a medium uniquely capable of... temporal change... adaptation... [and] contemporary processes of urbanization... [It] is suited to open-endedness, indeterminacy, [and] change. (Waldheim 2016)

These are some of the major keywords appearing in any Landscape Urbanist discussion. This divergence between Landscape Urbanism and New Urbanism also extends into the discussion of the importance of streets and space definition through edge conditions, both of which are essential to New Urbanists as components of good urbanism. Douglas Kelbaugh explains this distinction between Landscape Urbanism and New Urbanism and the importance of the treatment of the street and space definition through buildings best:

What [Landscape Urbanism] doesn't agree about is the "street," especially the "room-like plaza," or street wall of buildings, which is bed rock to New Urbanism. (Duany and Talen 2013)

This leads us to one of the more widely known differences between Landscape Urbanism and New Urbanism, namely the former's not only tolerance, but in some sense, encouragement of pseudo-suburban and low density urban conditions, and the latter's despise for such setups. Landscape Urbanism is an admirer of horizontality, and of surfaces, whereas New Urbanism advocates verticality and higher density. In the Charter of the New Urbanism, New Urbanists decry sprawl and the suburbia by stating that New Urbanism is disinterested in "[the] spread of placeless sprawl... [we] stand for... [the] reconfiguration of sprawling suburb." (Talen 2013) They even go as far as to declare New Urbanism's mission as "the reform of suburban sprawl." (Talen 2013) However, Waldheim believes that urban conditions such as low-density suburbia are part of the urban reality that we must deal with. On this subject, he asserts that,

New Urbanism is unable to deal with the automobile-based horizontal character of contemporary urbanism. (Waldheim 2016)

Landscape Urbanism takes the "systems approach" rather than a "design guided by intention" approach as its method. Landscape Urbanists base many of their design concepts on ideas such as dynamic processes, temporal change, adaptation, indeterminacy, and flux, and deploy processes and systems through which constant change and morphogenesis is directed towards achieving such goals as ecological performance and wildlife habitat improvement. One of the projects where we can see such process design is the Lower Don Lands project in Toronto, Canada, which, as seen later, is one of the subjects of study in this paper. Waldheim describes the project as one that is after

opening of the site to... the vicissitudes of tide and time... [and] activating dormant or redundant ecologies. (Waldheim 2016)

He declares that,

Stoss's proposal begins with... opening of hydraulic processes... [in this proposal], emergent, submergent, and submerged habitat are multiplied. Stoss's project proposes a five-fold increase in surface area and watercourses devoted to open-ended and self-regulating fluvial processes. (Waldheim 2016)

On New Urbanism's side of the story, probably the following quote from the Charter of New Urbanism suffices to explain their take on the issue: "We are not relativists." For New Urbanists, it is all about a determined end product—Duany and Talen clarify and elaborate the idea professing that,

New Urbanism is limited and pre-occupied. It is about certainty and a determined state versus Landscape Urbanism which is about indeterminacy, flux, and open-endedness. (Duany and Talen 2013)

All that being said, Landscape Urbanism and New Urbanism showcase some remarkable similarities as well as stark differences discussed above. One such commonality is both theories' claim on aiming for providing urbanism with optimal ecological performance and environmental friendliness. However, each of the two employ different methods and techniques to achieve this goal. Landscape urbanism, largely concerns itself with the issues of natural and ecological processes, watersheds, storm water and flood management, and wildlife habitats. New Urbanism, approaches the issue by building compact, which preserves as much land and natural resources as possible, as well as parks that provide fresh and clean air.

Another major common issue of concern claimed by both Landscape Urbanism and New Urbanism is the connectivity of the urban fabric. We can see numerous examples in the form of urban infill projects all over the world such the Hellinikon airport redevelopment project in Athens, Greece on the Landscape Urbanism

side. On the importance of what this project, as a means to stitch back the urban fabric, sets out to achieve, Waldheim states that the winning scheme for the project "...[reconnects] the higher elevation neighborhoods above with the coast below." (Waldheim 2016) Another example, this time on the New Urbanists' side is the Georgetown Safeway in Washington, D.C, a project which is described by Daniel Solomon as one which "...[mends] the hole in the neighborhood's urban fabric" (Charter 2013) Although the common theme in reaching the goal of connectivity seems to be the street network, it must be noted that Landscape Urbanism and New Urbanism, because of their inherent formal characteristics, have vastly different looks to streets. Andres Duany and Emily Talen explain that,

New Urbanism focuses on importance of streets defined by disciplined frontages... believing them to be an essential component of walkability... Landscape Urbanism is more concerned with maintaining a high profile of green space, irrelevant of its effect on street life. (Duany and Talen 2013)

Therefore, as Both Landscape Urbanism and New Urbanism claim to preserve and enhance urban networks, developing an approach to analyzing these claims is a central concern of this paper. This characteristic, as explained in more detail in the "Method" section of this paper is the urbanism theme explored quantitatively in this study.

Despite no lack of comparative literature considering the relatively young debate, there is an obvious absence of considerable literature regarding quantified studies. As such, and considering the quantitative analysis capabilities provided by Space Syntax, this study deals with quantifying Landscape Urbanism and New Urbanism in two case studies in downtown Toronto, Canada to assess how each of these projects perform regarding their success in creating connectivity and the stitching of the urban fabric.

## 2.0 METHOD

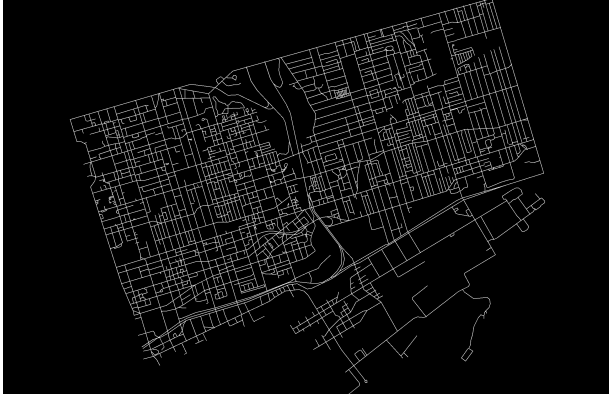
The Landscape Urbanist "Lower Don Lands", located in Toronto, and the New Urbanist "West Don Lands", located also in Toronto, just north of the Lower Don Lands project, were selected for the purposes of this study. These projects were studied and analyzed within an urban context three times as large as their cumulative sizes on each planar dimension.



**Figure 1:** Lower Don Lands. Source: (Google Earth)



**Figure 2:** West Don Lands. Source: (Google Earth)



**Figure 3:** Lower and West Don Lands within context (Axial map)

The Lower Don Lands is an infrastructure waterfront project designed by the Landscape Urbanist firm, Stoss LU in 2007. The site consists of 121 hectares of land on the Toronto waterfront, formerly and majorly consisting of, as per Stoss LU's statement,

a tangle of transportation infrastructure, a channelized and deadened river, and large territories of underutilized brownfields and former industrial port lands.

Stoss LU's proposal seeks to revive the Don river by paying special attention to both flood protection as well as the river's ecology and hydrology through its restoration as a wildlife habitat. Stoss LU describes another major goal of the project as

[establishing] a comprehensive urban design framework that integrates new development, bold and image-able transportation infrastructures, dynamic new open spaces, and robust, multi-modal circulation networks (Stoss LU website).

Just north of the Lower Don Lands project and few years earlier in 2004, Urban Design Associates in collaboration with DTAH designed the West Don Lands project, a 32-hectare piece of formerly brownfield lands east of downtown Toronto, now reimagined as "6000 residential units and a wide range of live/work, commercial, retail, and employment space". This project includes the design of a major park with flood control devices which also, like the Lower Don Lands project, considers itself to be a "critical component of the restoration of the Don River".

As stated above, the question tackled in this study is, how can one make meaningful and analytical comparison of Landscape Urbanism and New Urbanism using a quantitative method? To answer this question, one must first look for a proven systematic method that equips researchers with measures that can successfully relate to variables that describes issues of study in a case. In this case, Space Syntax provides us with measures such as "mean depth" and "connectivity" that, in a quantified manner, provide a description of integration and connectivity of the urban fabric. There are numerous publications verifying Space Syntax and its capability for assessing integration of the urban fabric. As with the relationship between the street network and block structure being integral, Lim et al. (2015) that the question of how block patterns and street patterns relate is one often asked in the context of Space Syntax. Also, from a morphological standpoint, their assessment that,

enriching the interface between classic Space Syntax measures and other morphological descriptors of urban form is a research aim which is being pursued with renewed intensity by many scholars in different centers of Space Syntax research (Lim et al. 2015)

seems right on cue and relevant to the question at hand in this study. The use of this method is further verified by Bafna, where he describes the aim of Space Syntax to be

to develop strategies of description for configured, inhabited spaces (of buildings, settlements, or built complexes) in such a way that their underlying social logic can be enunciated. (Bafna 2003)

Bafna also offers definitions and descriptions of different measures of Space Syntax such as connectivity and mean depth, the two measures used for the purpose of this study.

One local property that is often used is called connectivity. It is also defined for each spatial unit and is the number of spatial units directly connected to it. (Bafna 2003)

Bafna's description of depth and its relationship with integration and therefore connectivity of the urban fabric is also of note:

integration represents the average depth of the spatial unit from all other spatial units within a given system, and hence its value is affected by the entire spatial configuration. (Bafna 2003)

These descriptions help justify their use in the current study. As such, a comparison of the two aforementioned Space Syntax measures in each of the two projects mentioned above should provide us with a means to compare how each project performs regarding this characteristic which is one claimed by both Landscape Urbanism and New Urbanism.

### 3.0 RESULTS AND DISCUSSION

Apart from “mean depth” and “connectivity” measures in Space Syntax, there are several more measures and tools that might help describe and better understand the two Don Lands projects, especially regarding their perceived characteristics that are associated with the specific urbanism paradigm each of them are born from. What with the nature of this study having to do with street networks, all aspects of urbanism pertaining to street networks may prove relevant. For example, total street length per area represents the street density, a simple measure showing whether New Urbanism, with its much stronger emphasis on the importance of streets, holds true to its promise. This measure is 138.14 meters per hectare for the Lower Don Lands project and 308.57 meters per hectare for the West Don Lands project. With the New Urbanist measure turning out to be over twice as much as its Landscape Urbanist counterpart, we can conclude that the preliminary assertion regarding higher street density for New Urbanism holds true.

**Table 1:** Quantified Measures

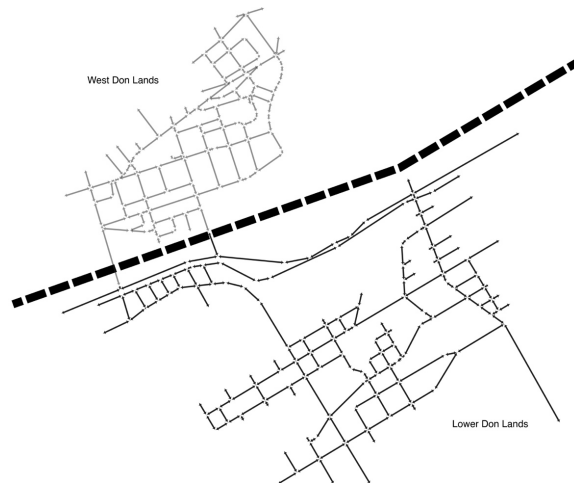
	Lower Don Lands	West Don Lands	Urban Context
Total Street Length/Area	138.14 m/ha	308.57 m/ha	-
Average Block Area	2.52 ha	1.22 ha	-
Number of Blocks/Area	0.4 /ha	0.82 /ha	-
Average Connectivity	3.18	3.99	2.55
Average Depth	8.12	7.47	7.06
Average Integration	1.05	1.17	1.1

Another couple of measures identify with blocks, their number per area, and their average area. Here, it is imperative to provide a valid definition of blocks, as the Lower Don Lands project being a waterfront project, thus proving to be somewhat of an anomaly for the regular block definition. Jennifer Dill offers a fitting definition.

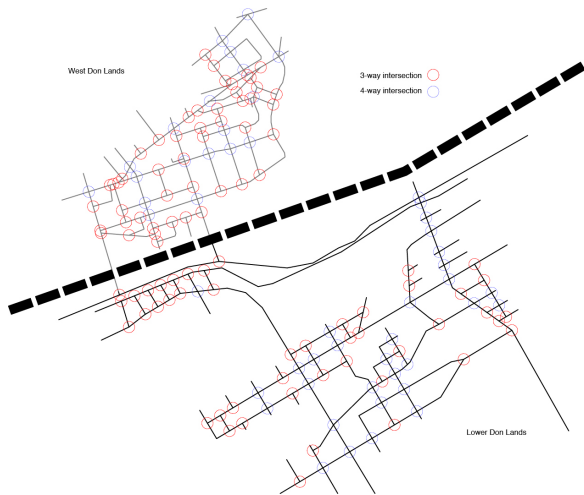
[Census] blocks are typically defined as the smallest fully enclosed polygon bounded by features such as roads or streams on all sides. (Dill 2004)

Based on this definition, Lower Don Lands has 48 blocks and West Don Lands has 27 blocks, which, according to their respective areas, yields 2.52 and 1.22 hectares as their average block area measures. This could be looked at as another fortifying point for the New Urbanist project as its value of less than half as much as that of the Landscape Urbanist one can be interpreted as more easily handled blocks that have more street frontages. It is also worth noting that nearly all West Don Lands blocks were reasonably close to the average block size of their corresponding project, whereas this number for the Landscape Urbanist project varied significantly more. This can be read as a proof of New Urbanism’s tendency towards more regulated block network system and its conservative nature versus Landscape Urbanism’s more free and rebellious approach in this regard.

Another measured compared regarding blocks was the number of blocks per area. For the Lower Don Lands project, this measure turned out to be 0.4 per hectare and for the West Don Lands project, it was 0.82. Again, the significance difference bears meaningful interpretation. Number of blocks per area can represent number of street segments and subsequently be an account of intersection density which increases choice and speed of access to destinations.



**Figure 4:** Line Segments



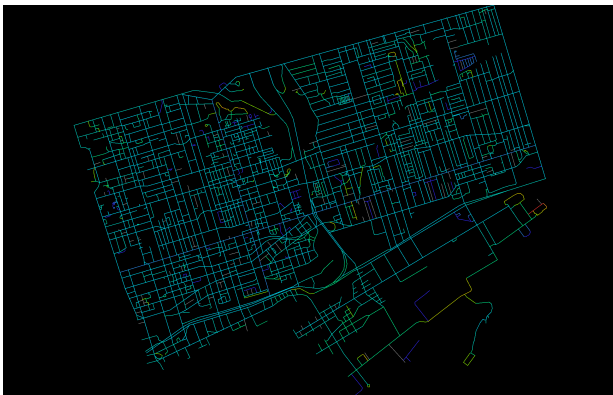
**Figure 5:** Intersections

To extract the “connectivity” and “mean depth” measures for Space Syntax analysis, the axial map of the context was used to input into the software “DepthmapX-0.50”. Each measure was extracted for the Landscape Urbanist project, the New Urbanist project, and the whole context, and then compared.

It is first appropriate to describe the meaning and significance of each of the two measures in question. Bafna (2003) accurately provides all definitions and applications needed in this study. According to him,

Depth of one space from another can be directly measured by counting the intervening number of spaces between two spaces. (Bafna 2003)

Based on this definition and considering the purpose of studying our two syntactic measures, the lower the depth, the more an urban condition is successful stitching itself to the surrounding context and achieving connectivity of the urban fabric. That is to say that the lower the depth, there will be less intervening spaces between two spaces, which leads to depth providing a measure that interprets into indirect visibility. According to Table 1, the average depth for the axial line segments representing streets in the Lower Don Lands project is 8.12 and for the West Don Lands project, this number is 7.47, which is a little smaller than the Landscape Urbanist Project, but not so much to meaningfully make a difference. Compared to the whole urban context (7.06), both the Landscape Urbanist and the New Urbanist project offer a higher average depth, which, if taken to mean anything, it means that they possess less connectivity. However, one must consider other parameters such as the fact that a large portion of that urban context on the west side is comprised of downtown Toronto, where there is higher density of intersections and street density. However, if that can directly be translated into intelligibility in terms of way finding is quite a different story.

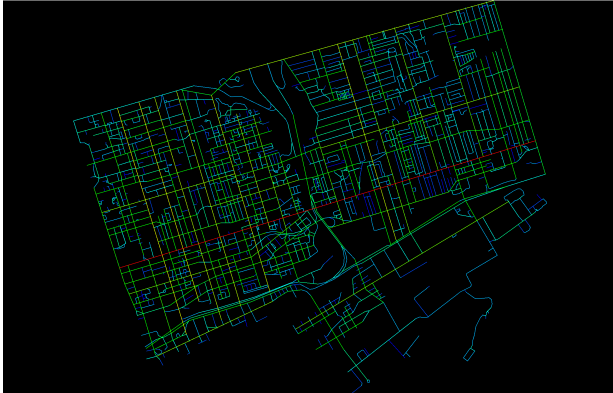


**Figure 6:** Mean Depth (Axial Map)

Bafna describes the local property of “connectivity” thus:

[connectivity is] defined for each spatial unit and is the number of spatial units directly connected to it (which is simply the number of convex spaces directly accessible from a given convex space or the number of axial lines intersecting an axial line). (Bafna 2003)

This means that, contrary to the case with the connectivity measure, the depth value translates to direct visibility, and as such, makes an urban condition more connected to its context, the higher its average depth value. According to Table 1, the average connectivity of the Lower Don Lands project is 3.18 and that of the West Don Lands is 3.99. Again, this is not a large margin of difference, but judging solely on the numbers, one can say that also in this regard, the New Urbanist project is more successful at connecting the urban fabric.



**Figure 7:** Connectivity (Axial Map)

On the relationship between connectivity, integration, and intelligibility, Bafna asserts that,

The degree of correlation between connectivity and integration values can be used as a measure of the predictability built into the entire environment and therefore of its intelligibility. (Bafna 2003)

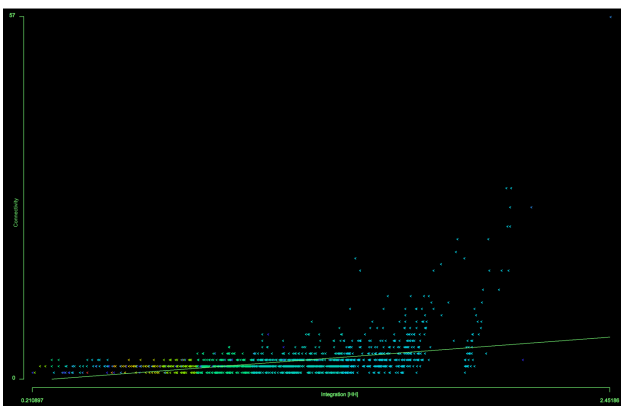
He states that,

[intelligibility] predicts that a small town whose street network is arranged such that streets that have a high degree of integration connect to more streets on an average, and those streets that are globally segregated connect to fewer streets directly, will be an intelligible town on the whole. (Bafna 2003)

According to Bafna, intelligibility is defined as

the property of the space that allows a situated or immersed observer to understand it in such a way as to be able to find his or her way around in it, (Bafna 2003)

therefore making it directly related to wayfinding, which is an important cognitive factor of the connectivity of urban fabrics. By looking at the correlation between integration and connectivity in our area of study, one can deduce that overall, this is an intelligible urban condition:



**Figure 8:** Correlation between Integration and Connectivity

Also, based on Table 1 and considering the integration values of Lower Don Lands and West Don Lands (1.05 and 1.17 respectively) individually in correlation with their corresponding connectivity values yield s almost similar results in terms of intelligibility, with not much of a meaningful difference for the purpose of comparison.

#### 4.0 CONCLUSION

There is still a long way to go to successfully and meaningfully compare Landscape Urbanism and New Urbanism quantitatively. This study aims to try only one of many ways this gap in existing literature can be

started to fill and as such, is simply here presented to be an experimentation of the application of one available method – with a quantitative definition of connectivity and integration as one of the many urban themes inherent to the two paradigms- to a comparative analysis of Landscape Urbanism and New Urbanism. Admittedly, there are several shortcomings and limitations to the Space Syntax Method as well as the conditions under which this study has been performed. One such limitation is the individual context under which each of the two projects in this study fall under. When considering connectivity of street networks, it is crucial to have as much of a similar street network context for both projects as possible. The Lower Don Lands project falls under an entirely different urban network context, what with the project sharing boundaries with water on the south and west, a major highway on the north, and not much urbanism on the east. The described condition makes this project an extremely isolated site and therefore more difficult than its New Urbanist counterpart to establish reviving connections with its surrounding context. Further, it should be noted that comparing two broad urbanism agendas like Landscape Urbanism and New Urbanism could never be called comprehensive and definitive by simply comparing two projects representing principles of each, as none of these projects fully represent their respective paradigms.

Another issue that limits the viability and validity of such studies is the lack of available built Landscape Urbanist projects, as this is still a young urbanism paradigm. Also, Landscape Urbanism's nature and purpose significantly differs from that of New Urbanist projects that are more geared towards the built environment and higher density.

As the current literature also suggests, there are serious limitations to the Space Syntax method as well. For example, Vinicius Netto (2016) points to limits of this method regarding the relationship between society and space, which is an inherent and underlying theme to everything that has to do with urbanism. Space Syntax, as with many other methods, also falls prey to heavy reductionism on many fronts, thus making it not comprehensive, and not reliable as a singular method, when drawing conclusions regarding multi-layered, far-reaching themes such as integration and connectivity. Mihai Racu (2016) also points out several inconsistencies within the Space Syntax Methodology that prevent it from being an effective and reliable means for meaningful assessment of urban issues. One issue that has to do with the actual application of the method has to do with the representation of the axial map, which was also used in this study. According to Racu,

[the representation] process is based on drawing the map using the longest lines and the smallest number of lines, [and] this possibly [leads] to arbitrary results." (Racu 2016)

Therefore, although numbers might suggest that overall, the New Urbanist project is more successful at connecting the urban fabric, the fact that there is not much of a meaningful margin of difference between the numbers that yielded such a conclusion means that the said conclusion must be taken with a grain of salt. The above limitations are all elements that need to be carefully considered when drawing conclusions based on numbers that normally do not have the ability to take these adverse conditions into account.

However, none of this is to say that these types of studies are failed attempts. Quite to the contrary, it is to say that more studies and analyses are to be performed to find the right conditions, measures, and methods to make meaningful comparisons between Landscape Urbanism and New Urbanism and draw valid conclusions.

## BIBLIOGRAPHY

- Allen, S. (2001). Mat Urbanism: The Thick 2-D. In H. Sarkis (Ed.), *CASE: Le Corbusier's Venice Hospital* (p. 124). Munich: Prestel.
- Bafna, S. (2003). Space Syntax: A Brief Introduction to Its Logic and Analytical Techniques. *Environment and Behavior*, 35(1), 17-29.
- Dill, J. (2004). Measuring network connectivity for bicycling and walking. *83rd Annual Meeting of the Transportation Research Board, Washington, DC*, 11-15.
- Duany, A., and Talen, E., eds. *Landscape urbanism and its discontents: dissimulating the sustainable city*. Gabriola Island, BC: New Society Publishers, 2013. Print.
- Lim, L., Yang, T., Feng, C., & Peponis, J. (2015). Urban morphology and syntactic structure: A discussion of the relationship of block size to street integration in some settlements in the Provence. *The Journal of Space Syntax*, 6(1), 142-169.
- Netto, V. M. (2016). 'What is space syntax not?' Reflections on space syntax as sociospatial theory. *URBAN DESIGN International*, 21(1), 25-40.
- Racu, M. (2016). *Limitations, Critiques, and Inconsistencies of the Space Syntax Methodology*.
- Talen, E. (2013). *Charter of the new urbanism* (2nd ed.). New York, NY: McGraw-Hill Education.
- Waldheim, C. (2016). *Landscape as Urbanism: A General Theory*. Princeton, NJ: Princeton U Press.
- Waldheim, C. (2006). *The Landscape Urbanism Reader*. New York: Princeton Architectural Press.