RESIDENTS' PERCEPTION OF ENVIRONMENTAL PERFORMANCE IN NEW URBANIST LANDSCAPES IN NORTH TEXAS: LEARNING FROM ADDISION CIRCLE, AUSTIN RANCH AND HOMETOWN

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Abstract

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New Urbanism movement has been shaping the cities and suburbs in increasing numbers in the US for more than three decades. The Congress for New Urbanism is promoting compact, mixed-use, interconnected, and walkable models for sustainable development. In recent years, the environmental implications of New Urbanism have not been sufficiently addressed in the literature (Spirn, 2000; Waldheim, 2010). However, the Charter of New Urbanism (Talen, 2013) highlights the importance and relevance of environmental factors. Overall, the literature lacks sufficient evidence about the environmental performance of the New Urbanist landscapes, specifically in the Dallas-Fort Worth (DFW) region.

The purpose of this research is to examine end users' perceptions of environmental performance factors in three New Urbanist Communities in the DFW region. The study assesses the value given to environmental factors in landscapes of communities that are planned, designed and built primarily with New Urbanist principles

in North Texas. The research also aims to understand the gap between the theoretical underpinnings of New Urbanism, and findings from its built projects.

This research primarily uses qualitative methods to assess environmental performance of New Urbanist communities in the DFW region (Taylor & Bogdan, 1998). The environmental performance factors studied in this research are extracted from the systematic literature review of various sources (LAF, 2017; LEED-ND, 2017; Modi et.al, 2014; SITES, 2017). Residents' perceptions are assessed through in depth interviews in three New Urbanist developments in the DFW region, including Austin Ranch, Hometown, and Addison Circle. The study also utilized archival and secondary data as well as passive observations (Francis, 1999). Data collected through multiple techniques are analyzed to generate themes and extract findings (Sommer & Sommer, 1991) regarding the environmental performance of landscape in New Urbanist communities.

This research revealed that there are varying levels of attention given to environmental factors (i.e., vegetation, habitat creation, air quality, or stormwater management) in each New Urbanist community assessed. Although a majority of the residents highlighted some key environmental benefits for the landscapes of New Urbanist communities, there seems to be consensus on promoting greater environmental sensibility from conception to implementation of New Urbanist communities studied in DFW region. Thus, results suggest that there is a need for stronger consideration of environmental factors in the assessed New Urbanist projects, through its ideology, its designs and development in order to provide a better environment for residents.

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Chapter 1
Introduction

1.1 Introduction

This study investigates environmental performance of New Urbanist landscapes through the analysis of resident's perceptions in three North Texas communities of DFW region, including Austin Ranch, Addison Circle, and Hometown. New Urbanism intends to attain social, economic and environmental sustainability through a pattern of community planning that focuses on high density compact residential, mixed-use and pedestrian-friendly styles of community planning, and is inspired from neo-traditional towns (Katz & Scully, 1994). This chapter outlines the research undertaken to understand environmental performance of New Urbanist landscapes. After discussing the background, problem and purpose, this chapter reviews research questions. This chapter also defines special terms, and describes research methods, significance, and limitations.

1.2 Background and Problem Statement

The global population is rising in the 21st century and cities are accommodating growth. By 2050, 66 percent of the world's population is projected to be living in cities (UN, 2014). As a result of population growth and spread of vast urban areas major studies demonstrate "the next few decades of significant land degradation, water shortage, fertile soil erosion and biodiversity loss" (Dramstad et. al., 1996, p.9).

Sustainable development models (such as New Urbanism) promotes "force for change in the way we develop our cities and suburbs"(Durack, 2001, para.1), and implies on addressing the public concern for the environmental issues of environmental protection, land preservation, urban sprawl, air and water quality, energy conservation and transportation issues (Durack, 2001). New Urbanism is a movement in urban

development that works to solve issues of urban sprawl by promoting neo-traditional inspirations. The movement focuses on walkable and mixed -use compact community, as an alternative to automobile-centric ways of living (Katz & Scully, 1994). New Urbanism draws inspiration from neo-traditional and pre-automobile era towns. These inspirations feed into ten fundamental principles, which embody community building and ecological performance (CNU, 2016). This popular urban development movement is growing and influencing in the municipal and city levels in the policy-making. In recent years the US department of Housing and Urban Development has funded the HOPE VI project largely based on New Urbanism philosophies (Duany, 2013).

Congress for the New Urbanism (CNU) in its charter identified global climate change as of critical concern. As a response to concerns over environmental issues, CNU specified that sustainable design must grow out of regional ecology and local culture (Talen, 2013). New Urbanism's fundamental value is defined by its environmental visions and goals (Krier, 2013). CNU's collaborated with USGBC (US Green Building Council) to develop LEED® (Leadership in Energy and Environmental Design) for Neighborhood Design (LEED-ND). LEED -ND further strengthened New Urbanism's environmental underpinnings (Duany, 2013).However, critics state that New urbanism is "overstating, the environmental and social benefits of urban density while acknowledging the relative autonomy of architectural form" (Waldheim, 2010, para.6).

New Urbanism is globally significant as numerous documents are translated and spread throughout the globe. The New Urbanism principles are recognized by many as the principles of Urban Design, so it is important to analyze its foundation closely (Waldheim, 2010). "Without empirical data, there are enough incongruities between the idea of the village (the New Urbanist pre-automobile-era inspiration) and the concept of

sustainability to warrant a more cautious review of the progress we are making towards defining sustainable development patterns" (Durack, 2001, para.6).

"Landscape Architecture's declarations of stewardship distinguish us as a profession and are proportionate to the magnitude of the ecological crisis" (Weller, 2015, p.87). One of the critical responsibilities of landscape architecture is planning and managing natural resources for human well-being. Some non-profit organizations, like Landscape Architecture Foundation (LAF), LEED® -ND, the Sustainable SITES Initiative® etc. are working to address and adapt environmental performance issues in the field of landscape architecture and urban design. Programs like LAF's Case Study Investigation (CSI) and Urban Land Institute (ULI) case studies document, review, and publish numerous exemplary case studies annually. Rating systems like LEED-ND and SITES evaluate and give performance ratings to built projects. This research studies the evaluation systems developed by various organizations to generate a framework for this perception study.

1.3 Research Purpose and Objectives

The purpose of this research is to study end users' perceptions of environmental performance of landscapes in New Urbanist communities in the DFW region. This research reviews and lists the environmental factors used to measure environmental performance of landscapes in three selected New Urbanist communities in DFW region (Austin Ranch, Addison Circle and Hometown). The environmental performance factors are identified by reviewing evaluation metrics, that are used in various landscape performance and rating systems, such as Landscape Performance Series (LPS) conducted by LPS, LEED-ND, and SITES and other performance rating systems.

This study documents and reviews perception of New Urbanist residents to environmental performance categories that coincide with the literature. Thus, the research assesses the significance of environmental performance factors in landscapes of communities that are planned, designed, and built primarily based on New Urbanist principles, in North Texas. The research also explores landscape performance measures to evaluate the environmental performance of New Urbanist outdoors/ landscapes. Residents' perceptions are collected through in-depth interviews with open ended questions. The interview involves end users from three New Urbanism projects in the DFW metroplex, including Austin Ranch, Addison Circle, and Hometown. This study also aims to understand the gap between the ideologies of New Urbanism and findings from New Urbanist communities, in terms of environmental implications.

1.4 Research Questions

1. What are residents' perceptions about environmental performance of landscapes in North Texas New Urbanist communities?

2. What environmental performance factors affect resident perceptions of landscapes in North Texas New Urbanist communities?

3. How significant is environmental performance in communities that are planned, designed and built primarily based on New Urbanist principles?

1.5 Definition of Terms

Built Environment: A space where human activities take place, including the "landscape where it has specifically been shaped by human design or influence" (Wall & Waterman, 2010, p.168).

Community: A settlement with a group of people with mutual interests, partially because of geographic proximity (Wall & Waterman, 2010).

Dallas Fort Worth (DFW) region: This region comprising up of 12 counties is the city area in North Texas (NCTCOG, 2017). DFW region is also commonly called DFW metroplex.

Ecology: Study that focuses on relationships between abiotic and biotic components in the surrounding environment (Wall &Waterman, 2010).

Environment: Abiotic and biotic components of natural origin in the natural surroundings, such as soil, air, water, plants, animals, valleys, deserts etc. (Marsh, 1998). The setting or overall system of land, water, vegetation, wildlife, etc. for the life on earth (Wall & Waterman, 2010, p.168).

Environmental Performance Indicators: Indicators of environmental issues/factors that denote the change in the value of the environmental factor (LAF, 2017)

Green Infrastructure: The network of green spaces and water spaces required to support biodiversity, mitigate and adapt to climate change, and create salubrious habitat within urban development (Wall &Waterman, 2010, p.168).

Neighborhood: Geographic area or spatial district with distinctive characteristics, such as local community or an ethnic neighborhood (Lynch, 1960). An area within town or city with distinct physical and social characteristics (Wall & Waterman, 2010).

New Urbanism: New Urbanism is an urban design approach with planning principles inspired from pedestrian friendly, mixed -use, and compactly planned pre-automobile era

towns. New Urbanism design principles are applicable to various scales pertaining to Urban Design (i.e., streetscape, urban infill, sub-urban area to entire region; CNU, 2016). CNU also intends for reconfiguration of sprawling suburbs and conservation of natural environments (Duany, 2013).

North Texas: The region in Texas that includes DFW and other rural counties (NCTCOG, 2017).

Performance: The measure of efficiency by which landscape architecture projects attains its environmental, social, and economic goals to achieve complete sustainability, and fulfill its intended purpose and goals (LAF, 2017).

Qualitative Methods: Understanding achieved through descriptive data, such as participant observation, in-depth interviewing, etc. (Taylor & Bogdan, 1998).

Stormwater Management: Stormwater Management in urban areas is to manage rainwater runoff by re-establishing natural processes, like the use of retention basins, infiltration swales etc. (SSWM, 2017).

Suburban: A low density residential area in the outline of cities, usually dependent on the city (Wall & Waterman, 2010).

Sustainability: Based on the principle, “everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment; and to pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations.” (EPA, 2017, para.1)

Urban Design: A practice that deals with shaping towns, villages, and cities, and includes many inter disciplinary professions, such as landscape architecture, civil engineering, urban planning, architectures etc. Urban design brings together many

aspects of place making dealing with environmental, social and economic sustainability (Assche et al., 2012).

1.6 Research Methods

Qualitative research techniques (Deming & Swaffield, 2011) were used to assess residents' perceptions of environmental performance of landscapes. In-depth interviews were conducted with the residents of New Urban communities of Austin Ranch, Addison Circle, and Hometown. Some respondents were randomly selected in public spaces in these communities, while others were selected through snowballing technique (Goodman, 1961). Passive observation was used to document additional information regarding environmental performance of the sites. This research also utilized archival and secondary data to understand environmental factors in these New Urbanist communities. The methodology also includes a comprehensive review of literature to determine environmental performance indicators in New Urbanist communities and landscapes. Data were collected through multiple techniques and analyzed to generate themes and extract findings (Sommer & Sommer, 1991). Findings and conclusions reported responses to each research question posed earlier in this chapter.

1.7 Significance and Limitations

Population growth and dependence on the environment is inevitable. With the advent of various urban development strategies accommodating the growing population, performance evaluation for these types of development has become increasingly significant. New Urbanism has been advocating its sustainable strategies for more than three decades. This research aims to understand the gap between New Urbanism ideologies and its environmental implications in North Texas communities. This study

also emphasizes which environmental performance factors seem to be considered and prevalent in New Urbanist communities of North Texas.

Due to the scope and duration of the study, there were limitations to this research. This study limits itself to only the environmental aspect of the performance evaluation for an in-depth review, even though environmental, social and economic factors are typically studied in interrelation in landscape performance case studies (see such as Ozdil, et.al, 2015). Another limitation of this study is that the study analyzes perception of residents, who have been living in the New Urbanist neighborhoods. It does not include perspectives of stakeholders, such as business owners, developers, and designers. Instead the research focuses on the perception of end users. Finally, the three study sites chosen may not provide a comprehensive understanding of the New Urbanist communities in North Texas. But, these sites are found to be the prime examples of New Urbanist ideology and implementation in the region. The three sites selected offer an understanding of the natural environment as they were built before 2010. Thus, they contain full grown trees and vegetation, and offered a wider range of natural habitat for fauna. The sites differed from each other and provided variation in context, physical, and social structure.

1.8 Chapter Summary

The primary objective of this research is to evaluate end users' perceptions of environmental factors in landscapes in three New Urbanist communities. Using qualitative research methods, the study understands the gap between New Urbanist ideologies and its environmental implications of the built landscape found in Addison Circle in Addison, Austin Ranch in The Colony, and Hometown in North Richland Hills. The structure for this study is organized into five major sections: 1) Introduction, 2)

Literature review, 3) Research methodology, 4) Analysis and findings, and 5) Conclusion. Chapter 1 is an introduction defining the problem, research questions, procedures, and significance of the study. Chapter 2 is a literature review of the theory and practice of New Urbanism, environmental concepts in urban development, environmental performance indicators, and perception studies in landscape architecture. Chapter 3 discusses the research methods utilized in this study. Chapter 4 provides a detailed analysis the interviews, observation, and secondary data and retrieves common themes. Chapter 5 summarizes findings, discusses research objectives, significance to the profession, and suggestions for future research.

Chapter 2
Literature Review

2.1 Introduction

This chapter provides a brief history of New Urbanism and defines the major principles that drive the movement. This chapter also incorporates the critics' points of view about New Urbanism and its impact on the environment. The review focuses on understanding and measuring landscape performance, specifically environmental performance. The narrative then describes themes pertaining to environmental performance indicators, and examines the environmental performance factors that relate to New Urbanism developments. These environment performance factors and indicators become the study's qualitative measures through which residents' perceptions of environmental performances of New Urbanist landscapes were assessed. Finally, this chapter discusses perception studies in landscape architecture.

2.2 New Urbanism and the Environment

2.2.1 Introduction and Background

New Urbanism emerged as a movement in the fields of architecture, urban planning, and landscape architecture in the 1970s and 1980s. It arose in response to increases in sprawling development patterns across the American urban landscape (White & Ellis, 2007). New Urbanism design objectives focus on creating a pre-automobile way of life; that is, designing communities in which residents have lessened dependence upon cars to commute to work, take children to school, and run errands (Katz & Scully, 1994). Under New Urbanism, housing, shopping, and public spaces are intended to exist in convenient proximity to one another (CNU, 2016).

Urbanization patterns in the US since 1820 have shown growth in both population and urban footprints of metropolitan areas (Hayden, 2003). These trends are expected to continue, and future projections show that 66 percent of the world's population will live in the cities and their suburbs by 2050 (UN, 2014). On a daily basis, the American suburban household depends upon the automobile and extensive highway networks to travel to and from work and school, and to acquire food and other daily needs. New Urbanism has sought to distinguish itself as the better development solution, claiming to avoid the destructive growth strategy of suburban sprawl (Calthrope, 1994). Since its inception, New Urbanism has influenced many aspects of urban planning, real estate development, and regional and municipal land-use strategies. New Urbanism has enjoyed widespread acceptance in large part due to marketing strategies that offer a sense of small-town nostalgia to the individual resident and homeowner (Hayden, 2003).

2.2.2 The Congress for the New Urbanism

The Congress for the New Urbanism (CNU) is the leading international organization promoting its New Urbanist design principles. With thousands of members worldwide, CNU holds an annual congress in various cities in the U.S. (The Town Paper, 2017). New Urbanism is a prominent sustainable development model in the urban design and planning field. CNU developed HOPE VI (Housing Opportunities for People Everywhere) standards for the US Department of Housing and Urban Development (HUD). Many HOPE VI projects are funded by US government and are designed according to New Urbanism principles. Duany further states that after formulating HOPE VI standards, the CNU has influenced major portion of regional planning in the country (Duany, 2013).

The ten basic design principles formulated by CNU (such as transit oriented development and traditional neighborhood structure) can be grouped into concepts of community building and sustainable practices (CNU, 2016). Community building principles include the walkable community, an interconnected street grid, mixed housing, and a mix of diverse land use types for diversity, compact planning for high residential density and focus on quality of life. The ecological practice principles include increased density in the community center, green transportation modes serving transit oriented development, pedestrian friendly design, energy efficiency through design, and reduced environmental impact of development (CNU, 2016). The CNU further states that these design principles can be applied on a spectrum varying from a single building to large cities.

Academic researcher Richard Florida stated that walkable places “not only raise housing prices but reduce crime, improve health, spur creativity, and encourage more civic engagement in our communities” (Florida,2014, para.15). The Congress for the New Urbanism’s basic concept is to have villages, towns, and cities consisting of neighborhoods designed around a five-minute walk from the center of the development to its edges. However, critics have expressed disapproval of New Urbanism for dependence in motor vehicles, as many of their projects are isolated from the urban fabric (Spirn, 2000; Hayden, 2003).

2.2.3 Significance of New Urbanism Studies

New Urbanism is a popular urban development movement that is exerting influence at the municipal and city levels. New Urbanists have developed the Form Based Code System, which is an alternative system for zoning land uses. These regulations determine the built results through physical form rather than segregating use

based zones (Form Based Code Institute, 2016). Many American cities and municipalities have adopted these codes as law despite New Urbanism critics' disapproval of the design approach of governing based on physical form.

New Urbanism has been influencing the field of urban design and development for so long and some, like author William Fulton, suggests that it is no longer a movement. Fulton stated New Urbanism cannot be thought of as a separate movement at this stage because New Urbanism ideas have become 'mainstream' and 'ubiquitous', and New Urbanism is very much established in American societies and cities (Fulton, 2017, para.4). However, CNU author Robert Steuteville disagrees, and highlights that New Urbanism is still progressing in terms of sprawl mediation and climate change concerns (Steuteville, 2017).

In recent decades, the Congress for the New Urbanism (CNU) has been engaging in the field of environmental sustainability by publishing literature and actively participating in the Smart Growth Network; and alliance with organizations that includes the EPA, the Urban Land Institute (ULI), the American Farmland Trust etc. (White& Ellis, 2007). However, some critics have disagreed with their design principles for insufficient consideration of natural processes. Many New Urbanist greenfield developments are dependent on automobiles, because many New Urbanist projects are isolated from the urban fabric. The fundamental concept of New Urbanism highlights high density, mixed-use, compact planning, and interconnected streets with open space network and reduced automobile traffic. These indicators are often associated with increase in impervious surfaces (Gordon & Tamminga, 2002). With New Urbanism's affiliation with environmental sustainability in practice and academics, it is now necessary for New Urbanism to offer improved solutions relating to its environmental impact.

2.2.4 Environment in the New Urbanism

As a response to concern over environmental issues in recent decades, the CNU updated its charter to reflect global issues of climate change and environmental sustainability in 2013. The CNU Charter called out the impacts on community-building of climate change, environment deterioration, and loss of agricultural lands and wilderness (Talen, 2013). In the 2013 Charter, the magnitude of these issues was noted as such that a global level response was needed. According to Leon Krier, the CNU Charter remains the only a coherent formulation of the global ecological development mode, and its core value lies in its broad environmental vision and ambitions (Krier, 2013). Krier further stated that, "the CNU's body of knowledge is the technology for settling the planet in ecological, aesthetic, and ethical ways" (Krier, 2013, p.261). The US Green Building Council (USGBC®) has partnered with the CNU to develop Leadership in Energy Design – Neighborhood (LEED®-ND) standards for neighborhood design. Nothing this, CNU co-founder Andres Duany states "LEED-ND initiative has hardwired New Urbanism to this environmental agenda" (Duany, 2013, p.13). CNU co-founder Peter Calthrope further states that New Urbanism balances environmental conservation and cultural vitality of urban spaces (Calthrope, 2013a). He further explains the effectiveness of New Urbanism as "a well-designed region with a broad range of urban places combined with aggressive conservation strategies, extensive transit systems, and new green technologies, can offer many types of sustainable lifestyles" (Calthrope, 2013, p.255).

With its involvement in organizations like the Smart Growth Network, an alliance of organizations including the EPA, the Urban Land Institute, and the American Farmland Trust, CNU is extending its affiliation with environmental sustainability in both practice and academics (White &Ellis, 2007). Despite these advances, White & Ellis (2007) have noted that there is currently no inventory of New Urbanism projects' environmental

impacts. Some critics noted that New Urbanists have neglected to make environmentally sensitive design a significant part of their projects (Till, 2001; Spirn 2000).

New Urbanism critics have accused practitioners of overstating the environmental and social benefits of urban density and marketing the nostalgic values of neo-traditionalism (Waldheim, 2010; Durack, 2001). The process of urbanization which may also be associated with New Urbanist developments' increased density, include deforestation, introduced stormwater drainage systems, and increased impermeable surfaces (White & Ellis, 2007). This, in turn creates increased runoff speed, volume and erosion; thus, this reduces watershed health and fragments natural corridors. These factors affect the population and richness of flora and fauna, reduce biodiversity, and reduce air quality (Dramstad et. al., 1996).

Another area of criticism of New Urbanism is the traditional village prototype that is confined to limits and is isolated from other communities. This model is being adopted for sustainable development in metropolitan areas where isolation does not exist (Durack, 2001). Durack states that New Urbanism's claim to environmental sustainability is questionable as New Urbanism principles have only coverage regarding environmental protection, energy conservation, agricultural preservation, urban sprawl, roadside aesthetics, and highway gridlock (Durack, 2001).

Empirical data is scarce regarding how New Urbanists are pursuing sustainable ideologies, but criticism abounds. Author Ann Spirn described how New Urbanism benefits are achieved at the expense of negative impacts on water quality as she emphasizes the importance of focusing on natural processes rather than the natural features (Spirn, 2001). Spirn further explains natural processes shape the whole region, not accounting to the dynamic changes in natural environment results in failure and "...

burying a stream in sewer and filling in the floodplain does not eliminate many of the floodplain's characteristic qualities" (Spirn, 2001, p.44-45).

However, in 2013, the CNU identified various environmental benchmarks for New Urbanism in terms of design and its relationship to the environment. The 2013 CNU charter proposed the additional principles including:

- The relationship between the built and natural environment should be preserved for food, clean air, water, habitat, and biodiversity conservation. Sensitive ecology and native habitats are to be preserved and fostered.
- The finite boundaries of the region should be recognized by geographic and bioregional factors, and urbanized land is preferable to site new development.
- The canons of sustainable New Urbanism also demonstrate concerns about water quality and use. The canons state that precipitation captured in or around a site should be cleaned, stored, and reused and allowed to percolate to aquifers. Water conservation strategies should be used within structures and landscapes, and green street strategies are to be used for sustainable drainage. (Talen, 2013, p. 269-271)

The CNU asserted the importance of parks and open spaces, and preservation and conservation of natural processes. New Urbanism author Thomas Comitta stated that good neighborhoods or towns should be defined by their integrated network of parks and public spaces (Comitta, 2013). He further proposes that community spaces like parks, plazas, and squares should be within walking distance from residential area. In addition, a minimum of 15 to 25 percent of land should be reserved for environmental conservation and human recreation (Comitta, 2013).

This section about New Urbanism and environment firstly introduced New Urbanism, and secondly reviewed the principles formulated by the CNU. Finally, this

section reviewed relevance of environment in the new urbanism. the following sections discuss performance studies in landscape architecture and about human perception studies in landscape architecture.

2.3 Performance Studies in Landscape Architecture

Environment is crucial aspect in landscape architecture. Components of natural origin, such as air, water, soil, rocks, plant materials, animals, and topography are referred to as environmental components (Marsh, 2010). Environment is also consequential to other aspects in landscape performance. Health of an ecosystem is significant for the well-being of inhabitants, because ecosystems affect social and economic aspects of landscape performance (LAF, 2017). The 2016 Landscape Architecture Declaration, published by Landscape Architecture Foundation (LAF), emphasized the importance of the Landscape Architecture discipline by stating that "…Humanity's common ground is the landscape…"(LAF, 2016 para.1). The landscape architecture profession plays a primary role in promoting coordination and harmony between nature and the man-made environment (LAF, 2016). Thus, it is positioned to help ameliorate the adverse effects of population growth and urbanization on natural processes, such as "… extreme climate change marked by rising seas, resource depletion, desertification and unprecedented rates of species extinction…" (LAF, 2016 para.2).

Performance studies in Landscape Architecture and related fields have worked to evaluate the impact of completed projects and their "contribution to sustainability" (LAF 2017; ASLA, 2017). In achieving overall sustainability built projects should coordinate between nature and culture in environmental, social and economic aspects (LAF, 2017). The case studies and performance studies document the overall performance and

benefits of landscapes. These studies provide evidence, demonstrating the significance of landscapes. As a result, this encourages the stakeholders to elevate the quality of landscapes (Luo, 2014).

Various performance and rating systems in landscape architecture and allied fields are reviewed in this chapter in order to better understand how environmental implications of projects are documented in literature. Research studies in design-related professions have conducted post-project performance evaluations on buildings, transportation, planning, and landscape in increasing numbers (Luo, 2014). In landscape design, case studies promote evidence-based (collection of data through observation and experiment) practice, evaluating the finished projects informs academics and practice (Francis, 1999; Ozdil et.al., 2015). Performance and evaluation studies promote evidence based research. These studies are evaluated through credible methods and metrics from existing built projects (Luo, 2014). LAF further emphasizes the importance of evidence based performance studies by noting the following:

> "[We] see the value as going beyond the fabulous photographs taken the day after it was opened, where the focus is on say the graphic design component of the landscape. So actually, putting those things to the test and saying: How do they function the day after the opening ceremony? How have they functioned five years later?" - Ted Wolff, ASLA, (LAF, 2010).

Performance studies in landscape architecture, such as *Landscape Performance Series* initiated by Landscape Architecture Foundation (LAF) evaluate the performance of landscape architecture built projects by recognizing the environmental, social, and economic aspects of sustainability (LPS, 2017). Performance rating systems such as LEED-ND, SITES, LID, and other research frameworks assess primarily the environmental and social performance outcomes of built projects.

Performance of landscape projects is multi-dimensional, thus the overall impact is achieved by focusing the environmental, social, and economic dimensions (LAF, 2013; Ozdil et.al. 2015). Health of an ecosystem is consequential to the well-being of its inhabitants, and in turn affects the social and economic aspects of landscape performance (LAF, 2017). Thus, evaluation of environmental benefits provided by built projects is very significant to landscape performance studies. Following sections briefly review environmental factors that are considered to be critical in the understanding and assessment of landscapes.

2.3.1 Landscape Architecture Foundation

Landscape Architecture Foundation (LAF), a non-profit landscape architecture organization, was founded in 1966. A group of landscape architects with common concerns about environmental quality came together to establish a *The New Landscape Declaration* (LAF, 2016). The 1966 document *A Declaration of Concern* was updated as *The New Landscape Declaration* in 2016 to include global concerns for the environment. The main objective of this non-profit organization is the search for solutions to environmental degradation, and to improve environment stewardship through by education and research (LAF, 2017). LAF has published case studies under its Case Study Briefs program since 2010, with 108 exemplary studies published to date (LPS, 2017). The Landscape Performance Series program provides resources for performance evaluation in landscape projects. Among LAF's programs, the landscape performance series and case study investigations support education and practice in the field of landscape architecture by documenting and measuring the performance of the built projects (LAF, 2017).

The discipline of landscape performance evaluation focuses on the study of environmental, economic, and social factors to evaluate overall sustainability of the projects (LAF, 2017). The mission statement of the LAF emphasizes “preservation, improvement, and enhancement of the environment for sustainability” and highlights the importance of addressing and resolving the environmental crisis in 21st century (LAF, 2013, p.1).The present thesis focuses on environmental performance factors in landscape performance and reviews the environmental landscape performance measures and indicators used by LAF.

2.3.2 The Leadership in Energy and Environmental Design, LEED®

LEED® has formulated a performance rating system that rates environmental performance of the design and construction of buildings and neighborhoods (LEED-ND, 2017). LEED for Neighborhood Design (LEED-ND), a branch of the LEED rating system was developed through partnership of USGBC, CNU, and National Resources Defense Council (NRDC). The LEED-ND certification applies to projects that are more than one building in size to projects smaller than 320 acres. The LEED-ND rating system evaluates that built project’s performance in attaining sustainability (LEED-ND, 2017).This rating system concentrates primarily on the environmental performance indicators. LEED-ND rating categories are organized according to physical design patterns, including location, neighborhood design and green infrastructure, and buildings.

2.3.3 The Sustainable Sites Initiative®

While the focus of LEED and LEED-ND is vertical construction, the Sustainable Sites Initiative (SITES) is a performance rating program for sustainable design and development of landscape. SITES was developed through partnership of the US Botanic

Garden, the Ladybird Johnson Wildflower Center at the University of Texas at Austin, and the American Society of Landscape Architects. This rating system recognizes the environmental criteria and parts of social aspects of sustainability in its performance checklist. SITES "provides guidance and incentives that can transform land development and management practices towards regenerative design" (SITES, 2017). This rating system assesses the overall development process of the project, including site selection, pre-design, design, construction, and operation (Luo, 2014).

2.3.4 Other Literature

National Complete Street Coalition (NCSC), a program of Smart Growth America; partnered with the American Association of Retired Persons (AARP) Foundation, to publish a guide book, titled *Evaluating Complete Streets Projects: A Guide for Practitioners* (2015). This resource provides metrics for evaluation of built projects. Measures are categorized under goals support achievement of sustainability through environment, economy, access, place, safety, equity, and public health. Recommended measures focus on air quality, providing and preserving habitat for native species, storm runoff, sustainable construction materials etc. Similarly, in *Sustainability, the Environment and New Urbanism* (2007), White and Ellis proposed an evaluative framework for environmental measures in rating development projects. Environmental impact criteria according to the framework are categorized as air quality, energy use, habitat /open space, water quality, and water use.

Additionally, the Master thesis work titled *Perspectives on Environmental Landscape Performance Indicators: Learning from LAF's Case Studies Investigation Program* (Modi, 2014) also reviewed the literature involving environmental performance factors. The indicators concerning environment in landscape performance factors are analyzed in this research. This research presents a comprehensive list of environmental

landscape performance indicators and methods. The research through literature review and in-depth interviews provides information for application in Landscape Architecture projects (Modi, 2014).

2.3.5 Environmental Performance Factors and Variables

This section reviews various environmental performance factors used in landscape architecture literature as well as rating systems reviewed above. The built projects performance rating systems and programs and the factors utilized, such as Landscape Performance Series, LEED-ND, SITES and other research frameworks were reviewed to determine the environmental performance system they use. In short, LAF and Complete Street's measures pertain to overall sustainability of a built project, which are environmental, economic, and social evaluation measures. LEED-ND, SITES, and other researches reviewed here focus primarily on the environmental aspects and some of the social aspects for performance valuation and rating purposes. Reviewing these programs and studying the measuring categories and indicators gives fuller understanding of how environmental performance evaluation is applied.

Table 2.1 has been designed to summarize research conducted for this thesis to describe the various systems of environmental indicators and measures. These are shown in Table 2.1 pertaining to built projects or to assessments of sustainability (in the Table columns).The Table rows describe the various environmental measurement categories and the measures themselves whereas the columns in this table illustrate the different sources (i.e. LAF, LEED-ND, and SITES) captured in this research. Thus, the purpose of the matrix created here is to create a common set of understanding to summarize baseline factors that can be used in measuring residents' perceptions in this research (See Table 2.1).

Table 2. 1 Environmental performance factors and measures matrix

Categories/ Measures	**Measures to assess environmental performance of built projects – As used by LAF's Landscape Performance Series (LPS)** (LPS, 2017)	**Measures to assess and rate sustainability –As used by SITES® rating system** (SITES, 2017)	**Measures to assess and rate sustainability –As used by LEED®-ND**(LEED-ND, 2017)	**Measures from other literature environmental performance assessing and rating frameworks** (NCSC, 2015; White & Ellis, 2017)	**Review of LAF Case Study Briefs from CSI 2011 to CSI 2013 for environmental Landscape Performance Indicators and Methods** (Modi, 2014)
Air Quality	▪ Reduce airborne pollutant	▪ Protect air quality during construction ▪ Protect air quality during landscape maintenance	▪ Encourage use of environmentally preferable transportation choices such as public transit, shuttles, vehicle sharing, etc.	▪ Multi modal transportation choice with pedestrian emphasis ▪ Reduction of Clean Air Act contaminants: particulate matter, diesel particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead etc.	▪ Reduce levels of air pollutants
Carbon and Energy Use	▪ Reduce non-renewable energy consumption ▪ Temperature and urban heat island - reduce localized temperature and localized heat island impacts ▪ Carbon sequestration and avoidance - capture, store or prevent the release of carbon to the atmosphere.	▪ Reduce urban heat island effects ▪ Encourage fuel efficient and multi-modal transportation ▪ Reduce outdoor energy consumption ▪ Use renewable sources for landscape electricity needs ▪ Use vegetation to minimize building energy use ▪ Communicate and verify	▪ Mass transit accessible locations ▪ Connected and open community ▪ On-site renewable energy sources ▪ Heat island reduction by solar orientation ▪ Reduced parking footprint ▪ Infrastructure energy efficiency - provide energy efficient neighborhood infrastructure ▪ Building energy efficiency	▪ Regional mass transit opportunities ▪ Renewable energy systems ▪ Multi modal transportation choice ▪ Pedestrian emphasis ▪ Mixed land uses ▪ Energy sensitive orientation ▪ Energy efficient measures ▪ Use of reflective surfaces ▪ Use of dark-sky lighting (lighting products certified to	▪ Reduce carbon footprint, pollution ▪ Reduce localized temperature and localized heat island impacts

		sustainable construction practices ▪ Control and retain construction pollutants ▪ Optimize biomass	▪ Construction activity pollution prevention ▪ Light pollution reduction ▪ Light pollution reduction - limit exterior illumination	minimize glare, reduce light trespass and help protect night sky, *source: darksky.org*) and low-energy lighting	
Land	▪ Land efficiency and preservation	▪ Limit development on farmland ▪ Redevelop degraded sites ▪ Locate projects within existing developed areas ▪ Connect to multi-modal transit networks	▪ Smart Location ▪ Transit-Accessible Locations ▪ Compact development with mixed uses - efficient use of land. ▪ Brownfield Redevelopment ▪ Construction Activity Pollution Prevention - Implement an erosion and sedimentation control plan for construction.	▪ Restoration of degraded areas	▪ Land preservation and restoration
Land and Eco-system	▪ Shoreline protection ▪ Land efficiency and preservation	▪ Protect floodplain functions ▪ Conserve aquatic ecosystems ▪ Designate and communicate Vegetation and Soil Protection Zones ▪ Restore aquatic ecosystems	▪ Site Design for Habitat or Wetland and Water Body Conservation ▪ Restoration of Habitat or Wetlands and Water Bodies ▪ Imperiled Species and Ecological Communities ▪ Floodplain Avoidance ▪ Agricultural Land Conservation ▪ Steep Slope Protection ▪ Long-Term Conservation Management of Habitat or Wetlands and Water Bodies ▪ Minimize site disturbance in design and construction -	▪ Connectivity and corridors ▪ Protection of sensitive features ▪ Protection against natural hazards	▪ Ecological integrity and ecological quality of a landscape project.

			Preserve heritage trees and previously undeveloped land.		
Soil	▪ Soil Creation, preservation and restoration	▪ Restore soils disturbed during construction ▪ Restore soils disturbed by previous development ▪ Create and communicate a soil management plan			▪ Remediate soil remediation ▪ Constituency of soil ▪ Soil quality
Vegetation	▪ Carbon sequestration	▪ Control and manage invasive plants ▪ Use appropriate plants ▪ Conserve and use native plants ▪ Conserve and restore native plant communities ▪ Conserve healthy soils and appropriate vegetation ▪ Conserve special status vegetation	▪ Preserve heritage trees and previously undeveloped land. ▪ Tree-Lined and Shaded Streets	▪ Use of native plants/trees ▪ Preservation of existing vegetation ▪ Green roofs as potential habitats ▪ Low impact landscaping ▪ Number of trees retained and/or newly planted ▪ Xeriscaping/water-conserving landscaping techniques	▪ Change in land cover ▪ Change in density of vegetation ▪ Plant establishment
Habitat	▪ Habitat creation, preservation and restoration ▪ Habitat quality ▪ Population and species richness	▪ Conserve habitats for threatened and endangered species ▪ Use of native landscaping ▪ Green roofs as potential habitats ▪ Optimize biomass		▪ Connectivity and corridors ▪ Connects / Restores ▪ Wildlife crossings ▪ Use of native landscaping ▪ Preservation of existing vegetation ▪ Green roofs as potential habitats	▪ Change in habitat for pollinators ▪ Change in nesting and feeding conditions for birds ▪ Ecology/Biodiversity
Stormwater	▪ Stormwater management	▪ Manage precipitation on	▪ Access to Civic and Public	▪ Open space networks	▪ Stormwater Management

	▪ Flood Protection ▪ Water Quality ▪ Water Body/ Groundwater recharge	site and beyond ▪ Design functional stormwater features as amenities	Spaces ▪ Access to Civic and Public Spaces - Provide squares, parks, and plazas within walking distance of residents and commercial tenants. ▪ Connected and open community	▪ Open space connected to other open spaces	▪ Contribution of pervious pavers only in reduction of stormwater runoff ▪ Flood management (includes floodplain, watershed and others)
Water Use	▪ Water conservation	▪ Reduce water use for landscape irrigation ▪ Reduce outdoor water use	▪ Stormwater Management ▪ Wastewater Management	▪ Watershed protection measures ▪ Aquifer and well protection measures ▪ Use of green infrastructures to minimize runoff impacts ▪ Presence of rain gardens ▪ Minimization of impervious surfaces and use of pervious surfaces ▪ Corrects poor drainage/flow ▪ Reduces rate and volume of runoff ▪ Percent of stormwater runoff absorbed through bio filtration ▪ Treats runoff to a higher level of quality than set threshold	▪ Mediate water usage/ Irrigation needs
Material	▪ Reused & Recycles Materials	▪ Use regional materials ▪ Design for adaptability and disassembly ▪ Reuse salvaged	▪ Water-Efficient Landscaping ▪ Building water efficiency	▪ High density development patterns ▪ High density residential areas	

		materials and plants ▪ Use recycled content materials ▪ Eliminate the use of wood from threatened tree species ▪ Support responsible extraction of raw materials ▪ Support transparency and safer chemistry ▪ Support sustainability in materials manufacturing ▪ Support sustainability in plant production		▪ Low impact landscaping ▪ Rainwater harvesting measures	
Waste	▪ Waste Reduction		▪ Recycled Content in Infrastructure ▪ Solid Waste Management Infrastructure - Provide neighborhood composting, recycling, and hazardous waste collection.	▪ Use of locally or regionally sourced materials to reduce transportation costs ▪ Use of recycled materials ▪ Percentage or recycled materials used in new pavement/construction	▪ Prevent waste material from entering landfills ▪ Reduce carbon emissions by minimizing material transportation through re-use and repurposing practices on a site.

Overall, the purposes and formats of environmental performance factors and rating systems are varied. Review of established set of factors and measures help formulate a rational framework for this research. Following are the general categories of environmental performance extracted from the literature review and Table 2.1 above:

- Vegetation
- Stormwater Management
- Water Use
- Habitat
- Open Space Connectivity
- Air Quality
- Energy Use
- Carbon
- Land Efficiency
- Soil Quality
- Materials And Waste

Among the listed categories of environmental performance factors: air quality, energy use, vegetation, habitat, green and open space, land, stormwater management and water use were more common factors in environmental performance evaluation literature. Also, these are more relevant factors for evaluating the resident's perception in the New Urbanist landscapes, and are used to assess environmental performance of the New Urbanist communities in the thesis.

2.4. Perception and Environmental Performance Studies

2.4.1. Environmental Perception

The way in which human experiences and interacts with the environment is dependent on the individual's perception (Kaplan & Kaplan 1978). It evident in literature that human perception is influenced by the presence of natural environment, which has direct impact on their decision about spaces and their quality of life (Kaplan & Kaplan, 1989; Ryan, 2006). Besides the environment various other factors like cultural

background, attitude, interests, education, and experiences affect individual's perception (Kaplan & Kaplan, 1989; Ryan, 2006).

According to Zube et. al. (1982), the landscape perception researches which depend on human landscape interaction are identified by categories such as: the expert paradigm, psychological paradigm, cognitive paradigm and experiential paradigm. This research specifically involves cognitive paradigm which searches for "human meaning associated with landscapes or landscape properties," and processes information relating to observer's experiences and expectations (Zube et al, 1982, p.8). This study takes a subjective approach to understand landscape values in the visible landscape and studies environment from an experiential perspective (Zube et.al., 1982).

2.4.2. Importance of Residents' Perspectives and Preferences

Perceptions and preferences of residents and home owners are important to understand because these end user groups are familiar with the needs and the problems of the development projects (Ryan, 2006). Learning about the perceptions of the end user group helps designers and developers enhance projects according to user needs. In turn, this enhances sustenance of the project by inducing ownership (Kaplan and Kaplan, 1978). In recent years, organizing charrettes have promoted people's participation in the design process by allowing the end users to collaborate with the designers. This way people can be involved in the design process, and get an opportunity to express their perspectives to designers and developers. Eventually, everyone has a stake in the project. This process is more efficient as it addresses all aspects of the design and ideally everyone is gathered which allows for the process to be more efficient and cost effective (The Town Paper, 2017a). Perceptions and preferences of residents and home owners are important to understand because these end user groups are often familiar with the

needs and problems of the development projects (Ryan, 2006). Understanding the resident's perceptions about environmental impacts of landscapes establishes the learning about environmental performance in this research.

2.5 Chapter Summary

Chapter 2 discussed New Urbanism theory, principles, response to environmental issues, and factors as part of its design and planning strategies. This chapter explored the environmental performance factors used for landscape and planning performance studies and rating systems. Review of various performance and rating systems which deal with landscape and planning were included in this chapter. The list of environmental performance variables provided in this chapter, can be used to evaluate the environmental performance of landscape projects. The study also explored on perception studies in Landscape Architecture. Chapter 2 establishes understanding of the research goals set forth in the earlier chapter and created the necessary foundation, from the literature, for evaluation based on what data can be collected and evaluated. The next chapter reviews the methodology used to collect and analyze the data for this research.

Chapter 3
Methodology

3.1 Introduction

This chapter discusses research methods used in this study. This thesis primarily uses qualitative study research methods, which includes in-depth interview data analysis, supplemented by passive observation and secondary data review. The goal is to understand end users' perceptions of environmental factors in three New Urbanist Communities (Austin Ranch, Addison Circle and Hometown) in DFW region, North Texas. This chapter describes the research design, study population, study locations, data collection methods, data analysis strategies, and recognizes biases and delimitations in the study.

3.2 Research Design

This research uses qualitative research methods (Deming & Swaffield, 2011). The in-depth interviews of residents' perception primarily inform the research regarding environmental performance of landscapes in the three study locations. This data is supplemented by passive observation data, collected by the researcher and systematic review of literature from secondary and archival documents providing additional data to inform this research. The literature review was first conducted to understand and establish the environmental performance factors and indicators, followed by secondary and archival data review for three New Urbanist study locations. The literature review refers to various landscape performance and rating systems which establishes an understanding of the environmental performance categories.

The three study locations (Austin Ranch, Addison Circle and Hometown) are exemplary of New Urbanist development projects built before 2010 in the DFW region.

The in-depth interviews of the residents were conducted on-site and via phone. In-depth and open-ended interview questions allowed the interviewees to express their perceptions freely. The in-depth interview was followed by passive observations and site visits. Figure 3.1 below illustrates the research design followed in this study.

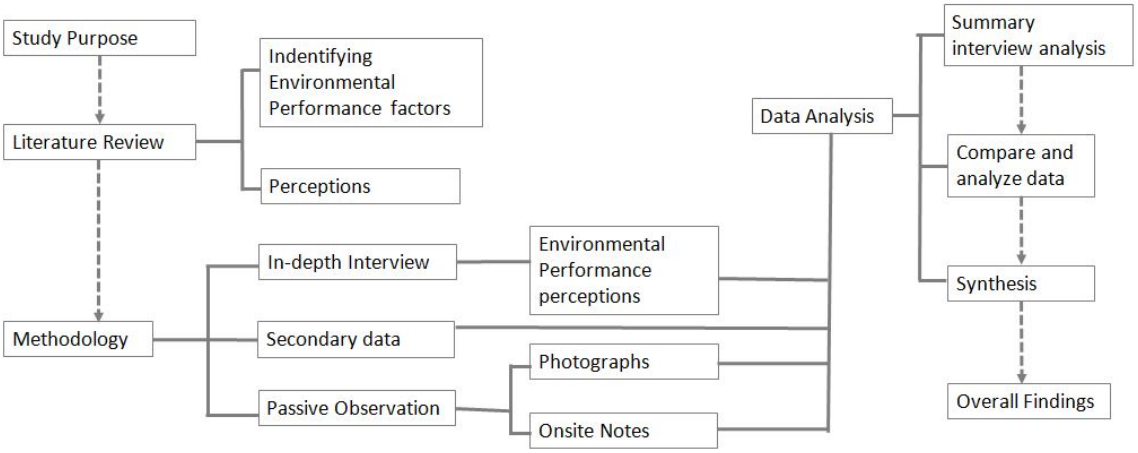


Figure 3. 1 Research design

3.3 Study Population

The research focuses on end users' perceptions of environmental factors of New Urban communities. This study specifically focuses on residents' perceptions. Occupants or residents are the end users of the built project and their perception implies to the overall functioning of the development. Learning resident's perceptions from their daily experiences establishes understanding of environmental performance of the built project. Participating residents for this study were selected through random sampling on-site. Snowballing technique was also applied to find more participants (Deming & Swaffield 2011; Goodman, 1961).

3.4 Study Locations

The study locations were selected through convenience sampling from a directory of New Urbanism projects listed in The Town paper publication (The Town Paper, 2017) as well as from the local sustainable development projects directory provided by North Central Texas Council of Government (NCTCOG, 2017b). While the DFW metroplex has seen many years of urban spread, the region is one of the early adopter to embrace to this new innovation in architecture and planning. Currently, there are many examples of New Urbanist developments in DFW. The benefit of conducting performance studies for this well-established movement is the availability of built instances. Therefore, three study locations Addison Circle, Austin Ranch and Hometown were chosen from the list of projects built before 2010. In the literature, these projects are recognized as exemplary New Urbanist developments in DFW region (see Figure 3.2).

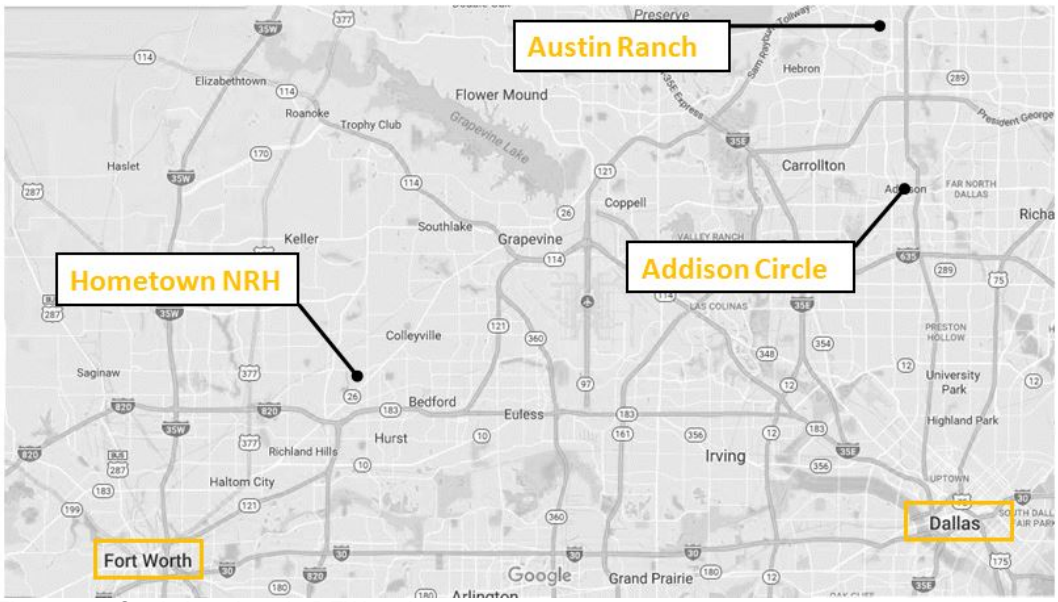


Figure 3. 2 Study locations in DFW region

As located in DFW map above, Addison Circle located in Addison, Austin Ranch in The Colony, and Hometown in North Richland Hills are selected to sample residents'

perceptions of environmental factors in New Urbanist communities. All three study locations are residential based mixed-use new urban and suburban communities in the DFW Region of North Texas. These New Urbanist communities provide a wide range of housing opportunities accompanied by large amount of area dedicated to commercial, civic, institutional, and recreational use. Austin Ranch is largely multifamily housing focused development with more than 3,000 dwelling units. Similarly, Addison Circle has 3,000 plus residential units with varying types of multifamily dwellings. Hometown at North Richland Hills has 850 single family homes and 1,200 multi-family units. These well-established large developments provide ample opportunities to communicate with residents and observe environments in close proximity to study environmental performance is these landscapes.

3.5 Data Collection Methods

The study involves primary data collection through in-depth interview and passive observations. The study benefits from archival and secondary data regarding location attributes of all three study sites. In-depth interview provides information about residents' perceptions while additional information is fulfilled by passive observations (see Figure 3.3). Both qualitative and quantitative methods inform the research's framework, while primarily qualitative methods are used to gather the end users' insights on environmental performance. Literature review helps to build theoretical framework and assessment measures for research. The objective is to understand resident perception of environmental performance of New Urbanist communities in the DFW region. Primary data from end user interview aims to understand the gap between findings and the theoretical underpinnings of New Urbanism.

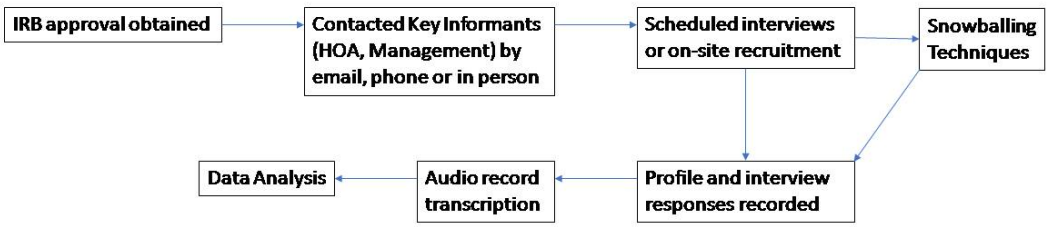


Figure 3. 3 Data collection method for interview data

3.5.1 Interview

Interview Procedures

First step for the interviews was to develop data collection protocols and procedures for human subjects and attain University Institutional Review Board's (IRB) approval (See Appendix A). Interviews and observation protocols are developed based on the literature review IRB approval is attained from the university. This step is an important university requirement prior to conducting research based on human participants to ensure that the participant's human rights are protected.

Once the research protocol is approved the research participants were contacted on site and through recruitment letter (See Appendix B for recruitment material). More participants were reached through snowballing method (Deming & Swaffield 2011; Goodman, 1961). After participant recruitment, a time is set with the prospect interviewee, their consent is required and the interviews are conducted. Electronically recorded interview information is transcribed and analyzed to document resident perceptions of environmental factors in their respective communities.

Interview Questions

The main objective of the interview was to understand the environmental perception of the residents in new urban communities. The in-depth open ended questions were developed to understand the environmental perception of the landscapes in the basis of the connection the residents had with the study areas. The interview questions were set up in three parts: background information, Part II in-depth interview, and Part III in-depth interview. The first part was formulated to understand the interviewee's demographic profile and their residency profile. The second part of the interview was in-depth questions pertaining to environmental performance factors. This discussed the environmental performance categories, including air quality, energy use, vegetation, habitat, green and open space, land, stormwater management, and water use. The third part of the interview was in-depth questions pertaining to overall environmental performance perceptions and residents' attitude towards the environment in general.

3.5.2 Secondary and Archival Data

The secondary and archival data reviews were applied in two levels. The first level was to understand the environmental performance factors, and to list them as guiding parameters to study the environmental factors. Second, review of secondary and archival data to comprehend the study locations. Secondary data were collected from credible sources like the North Central Texas Council of Government (NCTCOG), Urban Land Institute (ULI) studies, and secondary data from respective cities (City of Addison, City of the Colony and City of North Richland Hills), planners, designers, and management companies. Archival data like historical imagery were obtained from Texas Natural Resource Information System (TNRIS) GIS maps.

3.5.3 Passive Observations

Passive observations were recorded for each site to supplement in-depth interviews (Francis, 1999). Collecting such data gave research an opportunity to observe site condition and to document environmental factors visibly present in each location. In this process the environmental performance factors and residents' behavior were

Addison Circle/ Austin Ranch/ Hometown, Texas	
Environmental factors observed by the reviewer:	

Figure 3. 4 Passive observation data form

recorded. The researcher travelled through the study sites seeking environmental performance factor indicators (Figure3.4 shows the form used for recording observations). These were recorded both weekdays and weekends, early fall season, between 10 AM and 6 PM.

3.6 Analysis Procedures

The researcher collected data and information which were later transcribed for analysis. The analysis uses 'grounded theory approach' to generate themes and codes before getting inspired from or using other researches' framework in analyzing the data (Taylor & Bogdan, 1998). In perception research involves "discovering theories, concepts, hypothesis, and proposition directly from data rather than approaching data from assumptions or other research" (Taylor & Bogdan, 1998).

Data obtained from interviews, the primary data, were analyzed and categorized into emerging theories, codes and themes. The framework obtained from literature, passive observation and the emerging themes from interview data were compared to generate concepts. After analyzing the findings from interview data, the data from observation and secondary data review were synthesized and grouped into themes.

3.7 Bias, Error, and Delimitations

Varied data collection techniques and data analysis procedures employed in this research are susceptible to bias and error. The data were collected from multiple sources including in-depth interviews, passive observations and secondary data.

Since the researcher is the sole source for data collection, the study was subject biases and human errors. As the researcher collected responses from in-depth interviews, the open-ended nature of this type of qualitative research gave wide opportunity to varying responses. The validity of perception assessment methods is questioned in research and depends on participant's opinion and judgment. (Danielet.al, 1973). One of the drawbacks was inaccessibility to primary sources for secondary data collection, specifically about stormwater management practices, energy efficiency, and water usages. Thus, observational data are based on judgment of the researcher for all sites reviewed in this research.

Dissimilarity in types of projects selected gave variety in responses collected. Thus, planning, design and implementation of these projects created varying conditions which may not be fully captured using this research protocol. Even then, the researcher made every effort to document these sites and their environmental features.

Due to time limitations and resource limitation for the research, all the potential study population could not be asked to participate. The researcher was able to sample

the environmental performance of three sites from the ten potentially available study sites for the study.

3.8 Chapter Summary

Chapter 3 discussed the methodologies used in this research. The chapter encompassed overall research design, and briefly reviewed mandatory University IRB documentation prior to research pertaining to human subjects. Chapter 3 also provided brief introduction of the study population and the study locations. Data collection technique and data analysis procedures were also reviewed. Collected data were grouped in themes parallel to literature review and interview questions, which will be discussed in following chapter. The following chapter describes the analysis and findings in more detail by reviewing data grouped in themes documented by the researcher.

Chapter 4
Analysis and Findings

4.1 Introduction

This chapter describes analysis and findings to explore environmental performance of three New Urbanist communities in North Texas. Findings from interviews, passive observations, and secondary data are analyzed in this chapter. The researcher collected interview data, secondary data, and observational data which are categorized into various components and themes to draw findings. The chapter primarily includes analysis and findings about subset of environmental factors (such as air quality, energy use, open space connectivity, vegetation and habitat, stormwater management, water use and land use efficiency), which are found to be important in the literature. The chapter also summarizes residents' overall views of environmental factors, issues and/or concerns in New Urbanist communities. The chapter concludes with the synthesis of findings from all three sources.

4.2 Data Analysis and Findings

This section reviews the study locations and discusses the analysis and findings from interviews with the residents, passive observation, and secondary data. The researcher collected information from interviews with the residents and users, on-site and via phone. The on-site interviews and passive observation took place in three case study locations. This section analyzes the findings from the case studies.

4.2.1 Three Study Locations

4.2.1.1 Austin Ranch, The Colony

Austin Ranch is a 300-acre greenfield development that incorporates a mix of land uses types, such as, multifamily residential, offices and retail, surrounding a Town Center (Vision North Texas, 2011a). The site's master plan also includes open spaces, parks and trails and "embraces the natural environment" (ULI, 2002, para.2). The development was built in phases from 1998 to 2012, with each phase incorporating unique character in design (Vision North Texas, 2011a).

Although the development is only about half a mile from Dallas North Toll way, the community is buffered from most roads and other nearby developments on all sides by trees and other features (see Figure 4.1) Bordering the south of the site is Arbor Hills Nature Preserve and Lewisville Lake to the north west of the greater region. The region supports suburban office campuses and gated residential communities. ULI study described this New Urbanist community as "the development stands on terrain atypical of North Dallas which features 100-year-old oaks that dot the green prairie hillsides" (ULI, 2002 para.3). The developer and owner, Billingsley Company, planned for a multiuse garden apartment community, aiming to preserve the natural setting of the site (ULI, 2002).

Austin Ranch is located near office campuses, which creates live – work environment for some of its residents. This intention here was to reduce vehicle trips, and improving air-quality (Vision North Texas, 2011a). Grid pattern street layout manages vehicular flow and supports pedestrian connectivity (Calthorpe Associates, 2002). Bike and walking trails connect the community to adjacencies as well as the future connection masterplans such as the regional Veloweb (NCTCOG, 2017c)(a network of off-street shared-use paths and trails in North Texas designed for multi-use trip purposes) and city trails intend to link the community to the region (Vision North Texas, 2011a).

Pocket parks and courtyard gardens throughout the development offer social and environmental benefits, while connection to adjacent nature preserve offers a “range of activities and experiences” (Vision North Texas, 2011a).The building arrangements form a series of courtyards for swimming, relaxation, and entertainment. The landscapes of the multi-family community reflect neo-traditional inspirations as “each courtyard uses pavement materials, sculpture, plants, and graphics to convey a naturalistic ranch approach” (MESA, 2017).

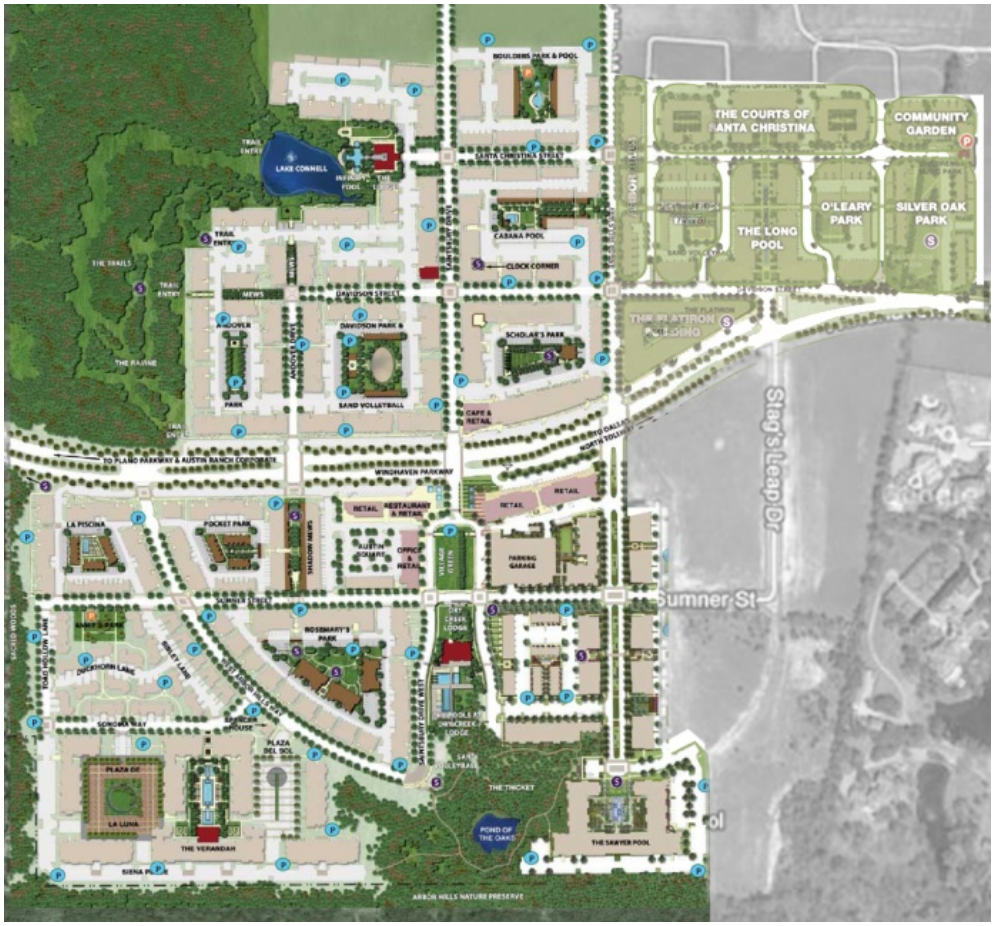


Figure 4. 1 Austin Ranch site plan; Source: MESA, 2017

4.2.1.2 Addison Circle, Addison

Addison Circle is a high-density, mixed-use development in a suburban area located 13 miles north of downtown Dallas (Vision North Texas, 2011b). The built project comprises approximately 124 acres, and its latest phase was completed in 2009 (Ozdil et al., 2011). Addison Circle houses 3000+ dwelling units intermixed with retail, offices, commercial spaces, parks, and civic spaces (see Figure 4.2). The core of the development is a dynamic open space, which serves as a common ground for many high rise mixed-use buildings, with apartments, offices and ground floor retail shops (RTKL Associates, n.d.).

Various other open spaces within this grid pattern compact layout of the mixed-use development serve as gathering spaces for residents as well as for other users (Vision North Texas, 2011b). A large blue sculpture 'Blueprint' gives visual identity to Addison Circle and serves as a traffic calming roundabout (City of Addison, n.d.).

Figure 4. 2 Addison circle site plan; Source: City of Addison, n.d.

4.2.1.3 Hometown, North Richland Hills

Hometown in North Richland Hills is a 300 acre suburban infill site development, which includes mixed land uses, such as residential, retail, offices, and civic buildings all within walking distance of each other (Miller, 2004). This mixed-use development located north of Fort Worth was designed by DPZ Partners. The neighborhood is predominantly neo-traditional in style with variety of residential options such as single-family houses, apartments, assisted living, town houses and patio homes (NCTCOG, 2016). Landscape features include 28 acres of linear park and a lake, green open spaces (see Figure 4.3)

throughout the development (Miller, 2004). The lake at Hometown acts as a stormwater retention basin while also preserving other ecosystems and natural habitat area (NRH Parks and Recreation, 2017a).

Figure 4. 3 Hometown site plan; Source: City of North Richland Hills, 2017

4.2.2 Analysis of the Interview Data

Interview data were collected from residents for all three sites. Thirteen residents and users agreed to participate in the interview via face to face method or by phone. For Austin Ranch, five informants responded. For Addison Circle and Hometown, four respondents from each site participated. Data collected from interviews used the following labeling system to protect the participants' anonymity:

- Each participant was assigned a code. For example (R1)
- The number in each code is specific to that participant.

The following sections describe the analysis of the interviews including the themes and categories determined by the researcher.

4.2.2.1 Part I: Profile Summary

Research participants' profile data are broken down into the following categories of demographic and residency data. This profile data is used to further understand responses and aid in the forming of themes.

Respondent's Demographic Profile

In the beginning of the interview, several questions were asked about participants' background. Overall, the respondents represented diverse backgrounds of demographic profile. Seven respondents were male and six were female. Three of the respondents represented millennial generation (ages 22-37, for 2017), six were Gen X (ages 38-53, 2017) and four represented baby boomers (ages 53-71, 2017) (see Figure 4.4). Six respondents had pets that required outdoor activities. Regarding occupation, five respondents worked in the field of sales, finances or management (see Figure 4.5). Respondent's occupations included various fields, such as business and finances, engineering, sales, real estates, property management, interior designing, and biology (see Figure 4.5).

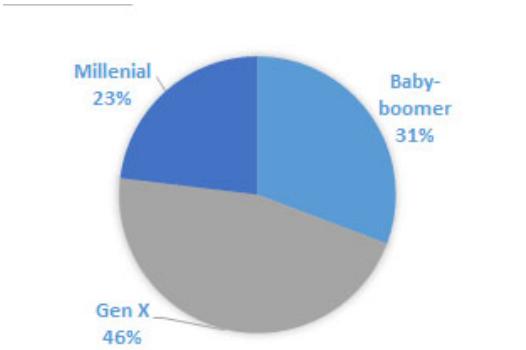


Figure 4. 4 Respondents' demographic data: Age group

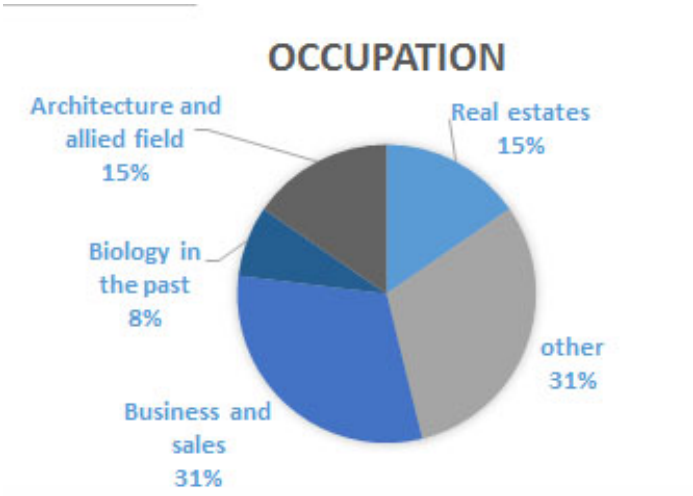


Figure 4. 5 Occupational profiles of the interview participants

Residency data

This section summarizes the residency backgrounds of the participants. Research participants' profile data are categorized into duration of current residency, primary reasons for residents' choice of living in these New Urbanist community, and familiarity with New Urbanism concept.

Almost all of the respondents were current residents. In two cases, one respondent was a former resident and one a Home Owners' Association (HOA) employee. In five cases, residents had lived in the neighborhoods for more than two years. In four cases, respondents stated that their choice of living was due to environmental features like parks, trails, and abundance of trees. In six cases, the choice of living was due to proximity to their workplace. Safety and nature of people in the neighborhood were other reasons influencing respondents for their choice of residence (see Figure 4.6). In four cases, respondents were familiar with the concept of New Urbanism (see Figure 4.8). One respondent described New Urbanism community as "place where you can work live and play" (R5). The following figures illustrate graphical representations according to the interview questions.

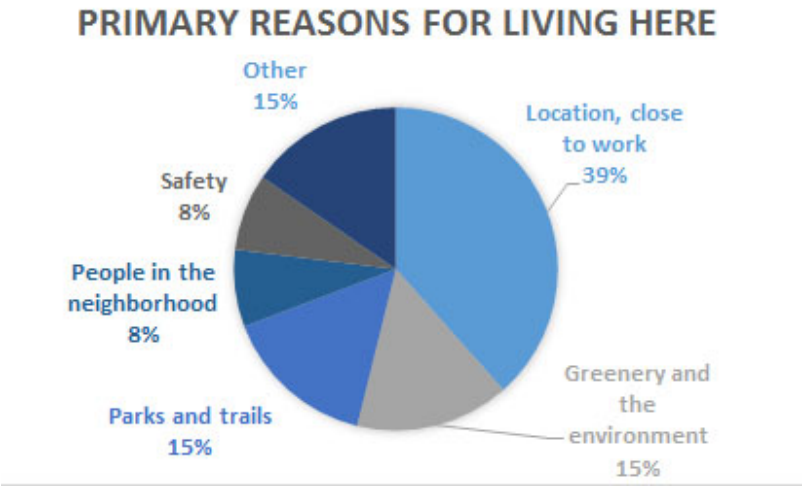


Figure 4. 6 Primary reasons for residency

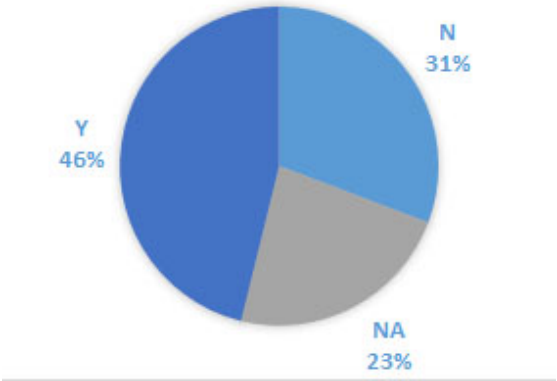


Figure 4. 7 Have pets requiring outdoor activities

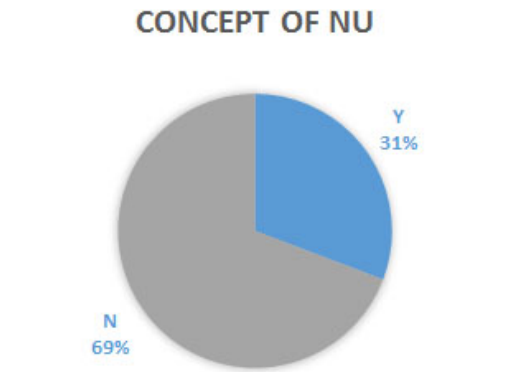


Figure 4. 8 Familiarity with concept of New Urbanism

4.2.2.2 Part II: Analysis of Interview Questions: Environmental Performance Factors

This section summarizes participants' responses to interview questions about environmental performance factors. The environmental performance variables were extracted from the literature as described in Chapter 2. These variables were chosen to promote understanding of the environmental performance of New Urbanist landscapes. The categories of environmental performance factors extracted from the literature review included: air quality, energy use, vegetation, habitat, green and open space, land,

stormwater management, and water use. These factors were commonly used in environmental performance evaluation literature. Also, these are more relevant factors for assessing the residents' perceptions, and were used to assess environmental performance of the New Urbanist landscapes in this thesis.

Questions were asked to assess respondent perceptions of environmental performance factors in the three study locations. Eight interview questions dealt with the environmental variables listed above. The purpose of this categorization was to identify similarities and trends. Follow up questions were asked when the respondent showed signs of having trouble describing their perception of environmental performance variables. Tables 4.1 to 4.12 represent the environmental variables and supporting statements by respondents.

a. Air Quality

The following question intends to capture responses on New Urbanist landscapes' influence to air quality. The related characteristics are not explained to the respondent unless that respondent shows signs of having trouble describing influence of New Urbanist landscapes.

Q1. In your view, do the landscapes of this neighborhood have an impact on **air quality**? If so how? Please elaborate in detail. (What is your view regarding the impact of cars/traffic to air quality in your neighborhood? How frequently do you walk, bike or use public transportation?)

Table 4. 1 Interview responses and common themes for air quality

Interviewee Responses:
R5: Having a lot of trees here helps. Dallas is behind in public transportation.
R3: It is probably better with the trees over here but in general, Dallas has a lot of pollution days, I am disappointed about that but trees can only help. Dallas has not been doing enough light rail and things that would decrease the cars, so that's a problem. My understanding is most of our pollution is by cars in Dallas.
R9: The goal of business is to have people spend the most money possible. If businesses can't charge more, they need more patrons. This brings more traffic, which contributes more pollution.
R7: It could have an impact because there is much more car traffic.
R1: No problems here till now, automobile air pollution is minimal here. But they are building here, if you bring 40 families here means there are going to be 70 -80 more cars and then it is a problem. But not right now. Here I drive, I don't want to walk. I drive; it's very dark and too far to walk. I just walk for exercise, when I intend to walk.
R4: Less car traffic and more greenery balance. I drive; I don't use public transportation, because it is a problem in whole Dallas. It is about the time efficiency. I don't think that this neighborhood influences me to use public transportation, but walkable, it is.
R6: Car and traffic have not impacted in the air quality because it's such an open space. I usually walk around for walking, not for grocery or work.
R8: The greenery and open space balance the car pollution. The public transit doesn't support overall air quality

Common Themes:
Greenery promotes air quality
Auto dependency
Insufficient public transportation facilities
Increasing car traffic
Negative descriptions about DFW transit system

In response to Q1, most responses seem to go beyond the community. A majority of participants gave positive responses about landscape's positive impact on air quality with two exceptions. In many cases, positive responses were used to describe the

respondents' feelings, such as "air quality is good here" (R1) and "having a lot of trees here have helped" (R5).

Each participant framed their response differently and made comments as listed in Table 4.1. However, all the participants stated that they relied on their personal vehicles to run their daily errands. Hence, responses insinuate that these New Urbanist communities are as much auto-dependent as conventional real estate developments. One respondent criticized the environmental values in design of New Urbanism and stated "The goal of businesses is to attract more people, which brings in more traffic and contributes to more pollution" (R9). Many respondents describe the overall problem of public transportation system in DFW region. Responses were directed to concerns beyond the community such as "Dallas has not been doing enough public transit, light rail and things that would decrease the cars, so that's a problem" (R3). However in many cases, respondents described the positive impact of greenery in New Urbanist landscapes stating "greenery balances the car pollution" (R8). Overarching themes emerged relating to greenery, auto dependency, insufficient public transportation facilities, and increasing car traffic in the three New Urbanist neighborhoods.

b. Energy Use

The following question was designed to capture the informants' response on energy-efficient measures used in New Urbanist landscapes. The follow-up questions were presented to the respondent, if the respondent showed signs of having trouble describing influence of New Urbanist landscapes.

Q2. In your view, are New Urbanist landscapes designed with **energy**-efficient measures? If so how? (If needed follow up: Does your community have provision for use of effective solar orientation, dark sky low lighting, or alternative energy systems or for units, buildings, and or sites?)

Table 4. 2 Interview responses and common themes for energy use

Interviewee Responses:
R3: I don't really see anything. They are using the sunlight but I don't know if they are doing the LED or not,
R5: We have lighting here in the circle that is very interesting because it turns down. They try and shine downwards. They did at one point in time on the top of our water tower they put wind turbines up there, but that didn't work.
R6: street light lamps, they will turn off and cool down and turn back on. They do recycle plastic, paper and boxes.
R7: street lights they don't light as much. They need to get the street light working, for safety; they need to make it brighter at night.
R9: They may have been designed with energy-efficient measures; ultimately they are governed by bottom line maintenance budgets.

Common Themes:
Recycle waste
Night-time low lighting
Unaccustomed to alternative energy sources

Energy use is viewed as related to air quality in terms of automobile dependency in the literature. Most of the respondents were not aware about alternative energy usage in these communities. Responses to this question hinted lack of concern or interest for energy use efficiency among the respondents. Each participant framed their response differently as listed in Table 4.2. However, a respondent at Hometown reported that aesthetic codes have prevailed over the energy efficiency performance. The respondent stated:

> "there are certain architectural requirements that actually prohibit some of the latest energy efficient items. Like the really dark screens (designed to help lower the amount of sunlight that enters a home to help with cooling mechanisms) can only be allowed in parts of the home not facing the street, due to aesthetic reasons" (R12).

In many cases respondents chose not to add more comments about energy efficiency.

c. Open Space Connectivity

The following question intends to capture informants' response about presence and availability of green and open spaces. This question is intentionally open-ended to allow the respondents to comment on the aspects of green and open spaces.

Q3. What do you think about the presence and availability of **green and open spaces (**parks, natural corridors, greenways, open fields and so on) in *(Austin Ranch/ Addison Circle/ Hometown)? Please elaborate in detail. (How well does your neighborhood integrate natural areas and open spaces into neighborhood?

Table 4. 3 Interview responses and common themes for open space and connectivity

Interviewee Responses:
R3: You don't get this scenery in other places.
R5: that was one of the things that I think they really designed well in Addison Circle. We have a number of parks reaching to go and sit. So, it's not just housing apartments. There are a lot of different parks here.
R9: The problem with Austin Ranch is they built a mixed-use community in an area with great natural resources (hills, views, and nature), then took the natural resources away, and then put in built green spaces.
R2: lots of greenery, and many parks, walkways, pleasant environment. Natural areas like parks and ponds. After work, I walk around this area. Yes, there are lot of trees and greenery and grasses. It's good for the residential area.
R7: if you go outside of Austin ranch, it's fine. But right in here there is nothing but more housing, traffic in the street is a lot. I walk the trails over here.
R8: you can walk anywhere, open spaces all around. **R12**: There is just the right balance of parks, natural areas, walkways, etc to balance out the homes that make up the neighborhood. This helps lead to a closer community feel for the residents residing there.

Common Themes:
Variety of parks
Abundant trees
Greenery
Scenery
Openness
Natural areas
Walk ways, trails

In response to Q3, the majority of the participants gave positive responses about presence and availability of green and open spaces with two exceptions. In many cases, positive responses were used to describe the respondents' feelings such as "the outdoors is nice with a lot of trees" (R2) and "right balance of parks and natural areas" (R12). Respondents tend to enjoy variety of opportunities and experiences provided by diverse type of parks and open spaces. Each participant framed their response differently and made comments as listed in Table 4.3. In two instances from Austin Ranch, respondents commented about undeveloped natural environment outside Austin Ranch.

Emerging themes related to scenery, greenery, openness, abundant trees, variety of parks, trails and natural areas. The responses focused on human experiences and use of these spaces. A majority of the respondents were indifferent about ecological benefits of these spaces. Many respondents described their perceptions about human use of open spaces, rather than the contribution of these spaces for ecological benefits like reducing habitat fragmentation. Only few respondents were aware about undeveloped preserved natural features. The general feeling described by the participants indicates the human use of these green spaces.

d. Vegetation

The following question intends to capture informants' response about vegetation used in New Urbanist landscapes. The follow-up questions are presented to the respondent if the respondent shows signs of having trouble describing influence of New Urbanist landscapes.

Q4. What do you think about the presence and availability of **vegetation** (native or adapted) in *(Austin Ranch/ Addison Circle/ Hometown)? Please elaborate in detail. (What do you think about the amount of trees, shrubs, and grass in your neighborhood? Do you recognize Texas native plants used frequently in the vegetation? (If homeowner, do you practice planting low maintenance native plants in your yard?)

Table 4. 4 Interview responses and common themes for vegetation

Interviewee Responses:
R3: Different type of vegetation than regular suburban houses.
R4: I see them watering in few areas. I think the trees are still not enough around parking alleys; some alcoves could use more plants.
R6: Native plants, very low water need plants used around here.
R8: It is natural and its very relaxing, greenery, scenic, cooling in summer, refreshing. Easier to walk in shade.
R5: They are not completely native yet but they've tried. We have huge trees now, so big that their canopies go over the street. The problem with that is we have a lot of shade so under those it's really hard to grow other plants and grasses
R9: It is minimally sufficient. The density could have been increased which would have allowed for more open space. How can nature compete against the entire pavement it takes to supply infrastructure to a place this size?
R10: I think it's all pretty to look at and creates a warm and inviting vibe for everyone who sees it. It promotes calm and serenity.
R12: The plush green feel of hometown can be seen throughout the neighborhood. The careful design of the neighborhood ensured there were many green areas left in the community

Common Themes:
Greenery
Abundant trees
Serenity
Aesthetics
Huge canopies
Native
Different than conventional lawns
Pre-developed cannot be attained

Question 4 explored respondents' understanding of quantity and the quality of vegetation in New Urbanist landscapes. The general perception of participants indicates that they tend to enjoy the abundance of vegetation. However, most of the respondents were not aware if vegetation were native & well adapted or invasive. The responses

indicated positive views about the abundance of trees, shrubs, perennials and ground covers in their neighborhood with exception of two. Table 4.4 shows the general responses described by participants. However, one respondent commented that the vegetation is “minimally sufficient” (R9). Emerging themes relate to greenery, serenity, aesthetics, and canopies.

e. Habitat

The following question intends to capture informants’ response about New Urbanist landscapes’ influence on habitat for flora and fauna. The follow-up questions are presented to the respondents assisting them to explain more about the topic.

Q5. In your view, do the landscapes of this neighborhood have an impact on **habitat** (native wildlife and vegetation)? If so how? Please elaborate in detail.
(Do you know of protected, newly created or restored sensitive natural features in your neighborhood?)

Table 4. 5 Interview responses and common themes for habitat

Interviewee Responses:
R4: I think the vegetation is supporting habitat to certain extent. I don't know of any sensitive area protected.
R5: It looks like they have left the native trees and there is a small water feature in the center of that. In the summer time, it's really nice because it's all shaded and it doesn't get too hot.
R7: All kinds of rabbits; a baby wild cat, bobcat; urban birds, loud ones.
R8: its supports animals, small ones, there birds and insects. Nature reserve beside the pool next to Arbor hill road. There is a natural pond with turtles.
R9: Nature will always find a way to adapt to how we affect their habitats. More emphasis placed on those effects and less on construction budgets. More signage about the native flora and fauna and what humans to impact that may help in a grassroots effort. Not many people think about nature at that scale so keeping those things in mind may be beneficial in the long term.
R1: Pond in Hometown has created habitat for many plants and animal species. But are decreasing in population; big fishes sensitive to water environment here. Thousands of baby fish in the summer. Bird life is decreasing. Environment dictates the animals, I see fewer birds, fewer trees because of they are adding houses on the north side. If you change environment the animals leave, they are sensitive. They could have done better and let the people living her know what they were going to do. People and animals co-exist.
R2: I like fishing here.
R 12: The lakes designed through the middle of the community feature an area that is habitat friendly and encouraged. Minimal maintenance is performed on the area so as to not disturb its natural feel and appearance.

Common Themes:
Urban wildlife sightings
People and animals co-existence
Natural feel and appearance
Pond habitat for plants and animals
Presence of protected natural areas
Decreasing flora & fauna
Lack of education about native flora and fauna
Needs signage to educate people

In response to Q5, majority of the participants from Austin Ranch and Hometown responded positively about the landscape influence on habitat creation, while majority of

respondents from Addison Circle made limited comments about this environmental performance factor. Table 4.5 shows that many respondents from Hometown were aware about newly created and preserved natural features. One respondent described, “Pond in Hometown has created habitat for many plants and animal species” (R1). Few respondents were aware about preserved trees and natural features in Austin Ranch and Addison Circle. One respondent criticized stating “emphasis needs to be placed on habitat improvement and less on construction budgets” (R9). Emerging themes related to urban wildlife sightings, naturalness, co-existence and need for more education about these issues.

f. Stormwater Management (improving water quality)

The following question was intended to capture informants’ response about stormwater management techniques used. The follow-up questions were presented to the respondent if the respondent showed signs of having trouble describing New Urbanist landscape’s impact on rainwater drainage and stormwater management.

Q6. In your view, do the landscapes of this neighborhood have an impact on **rainwater drainage and stormwater management?** If so how? Please elaborate in detail.
(How effectively is rainwater handled here at *(Austin Ranch)? Are you aware of any water management practices that can minimize runoff here at *(Austin Ranch/ Addison Circle/ Hometown)?)

Table 4. 6 Interview responses and common themes for storm water management

Interviewee Responses:
R3: it would be better to have more ground cover to absorb the rain certainly than concrete so assume it would be better here. I don't see any problem with flooding.
R4: No problem while it rains no puddles or flooding. I don't know of any rain water management structures.
R5: I think it just goes down to wherever the creeks and collection places are.
R6: Very good rainwater management, they put up a lot of gutter up in the apartments, so it drains very well.
R7: Everything drains into the sewers.
R8: Engineering wise, we don't have any problem with flooding.
R9: a minimal effect. The ultimate goal will always be to move water out as quickly as possible. When the goal is to mitigate stormwater as safely and efficiently as possible, these communities will reap more benefits. Management can be tricky and more studies need to be implemented to better understand how to address the constraints creatively.
R1: This place here is stable water wise. Over there in the other side of the lake I know some people are having problems with flooding in their basements. So, they didn't drain this area right, where you get the proper runoff. More things to be done here, always, bring in environmental people to see environmental impact. Water used to run down this hill here when they first started building this, Muddy water and water with oil so I think this used to be all wild flowers. Bottle brushes all died off due to construction. Did you really account for all the sewerage that is going to come, did your account for all the people and transportation? No green infrastructures.

Common Themes:
Groundcover and impervious surface
No problems with puddles or flooding
Green Storm Water Management
unaware/ unaccustomed
Efficient drainage engineering
Move out water as fast as possible
Retention pond

In response to Q6, the majority of the participants were unaware about green stormwater management practices in the New Urbanist landscapes. Responses to this question focused on quick drainage of rainwater, as shown in Table 4.6. Many responded that "there is no problem with rain water drainage because it doesn't flood" (R4), while

some appreciated that sewerage engineering in these communities as it drains quickly in an intense rain event. The general perspective described by participants indicates that they tend to be content about the rain water drainage in these communities, with three exceptions. One respondent suggested that “more ground cover to absorb the rain is needed as compared to concrete” (R3). Two respondents focused their comment on need to implement strategies to improve stormwater runoff quality (R1, R9).

g. Water Use

The following question intends to capture responses about water use in New Urbanist landscapes. The follow-up questions are presented to the respondent if the respondent shows signs of having trouble describing water conservation techniques used in New Urbanist landscapes.

Q7. In your view, do the landscapes of this neighborhood have an impact on **water use (efficiency)?** If so how? Please elaborate in detail.
(How efficiently does the neighborhood use water in its common areas? If homeowner, what do you do to conserve water, (for example conservation techniques watering your yard, using xeriscape low water requiring native plants?)

Table 4. 7 Interview responses and common themes for water use

Interviewee Responses:
R5: they use a lot of dwarf yupon, a lot of liriope. Red oak, most of the trees are different kinds of oaks, that’s about it. I don’t think that they really care about water conservation here.
R6: Its green grass all the time, I think they have been watering in balance.
R8: they don’t use much water in garden unnecessarily.
R7: no better than any other place,
R12: there are many parks and common areas that require a lot of water to thrive. Hometown's concept requires owners to maintain their which creates a need for increased watering. Xeriscaping in limited in this community and is mostly filled with water thirsty plants.

Question 7 challenged the respondents’ knowledge about water use and water conservation. In response to Q7, the majority of the respondents were not aware of water

conservation in the outdoor landscapes of these communities. Few respondents expressed negative views about water use in New Urbanist landscapes, as shown in Table 4.7. One respondent, HOA employee mentioned that “there are many parks and common areas that require a lot of water to thrive. Xeriscaping is limited in this community and yards are mostly filled with water thirsty plants” (R12). Another respondent asserted that the management does not care about water conservation in Addison Circle. One respondent described that grass is watered all season, which implies use of water thirsty plants. This deviates from the concept of water conservation.

h. Land Use Efficiency

The following question intends to capture informants’ response about efficiency of land use in New Urbanist communities. This question is intentionally open-ended to allow the respondents to comment on the aspects of New Urbanist landscapes.

Q8. Do you think that *(Austin Ranch/ Addison Circle/ Hometown) development uses **land** efficiently? If so how? Please elaborate in detail.
(It is considered that the high density compact planning and design minimizes impervious surface and increases overall efficiency of such communities.)

Table 4. 8 Interview responses and common themes for land use efficiency

Interviewee Responses:

R3: Nice to have dog parks which is excellent. A lot greenery to sit here for the residents. Lot more green here, a lot more trees than the conventional suburban neighborhood

R4: .If you build big homes then there won't be parks, I like the parks here.

R5: they have done a good job on the bottom part you know where we have businesses and in the upper part we have apartments. So, I think they've done a really good job of making it look, you know more like home to be part of town.

R2: Environment is built very nicely. Schools, convenient stores nearby. I think it was designed as a new kind of development.

R10: by minimizing concrete they are maximized the experience for each resident.

R7: on that side (pointing to undeveloped areas) but not in here. They are building new apartments all around.

R8: Focused for living, not making more crowded area here, they make more naturally to be at home. A lot of thing to interact with nature

R9: Zoning and codes can be made to make density higher and maximize the benefits of it and minimize the impact on nature. Its evident design was more important than the efficient use of land at Austin Ranch

R1: Closed in compact planning, lesser property acreage here.

Common Themes:

More greenery than the conventional

Apartments built up vertically

Closed-in planning with lesser property area

Mixed use buildings

Small front-yard

Focus for living not being overcrowded

High density minimize impact on nature

Compact and crowded

In response to Q8, the majority of the respondents spoke positively about effective use of land. Many respondents related vertical rise in building structure to increased spaces for parks and gardens. In many cases, positive responses were used to describe the respondents' feelings, such as "it's nice to have variety of parks" (R3) and "by building vertically they maximized use of land and so we have more parks here" (R6). Few respondents also commented on mix of land uses in these communities, which

promotes the town-like perception. One of the respondents mentioned that these neighborhoods can be taken as example of how increasing residential density can maximize the benefits of landscapes and reduce impact on nature.

Responses were positive regarding greenery, parks, mixed use buildings, vertical built up, closed-in planning, lesser property area in their neighborhood. Each participant framed their response differently and made comments as listed in Table 4.8. A few respondents described feelings about overcrowding and compact land use. In one case a respondent stated that “it is evident design was more important than the efficient use of land at Austin Ranch” (R9).The general feeling described by participants indicates that they perceive that land is used efficiently in these New Urbanist communities.

4.2.2.3 Part III: Analysis of Interview Questions – Overall Environmental Performance

The overall in-depth interview questions seek to allow the participant to share their overall thoughts and feeling about the environmental performance of the three New Urbanist landscapes. These questions were asked deliberately towards the end so that the respondents were aware about the categories of environmental performance factors, as suggested in the Part II of the interview section.

a. Most and Least Valued Environmental Performance Features

The following question intended to lead the informant respond about what they value the most about environmental features in New Urbanist landscapes.

Q9. What do you value the most and the least about the environmental features of *(Austin Ranch/ Addison Circle/ Hometown))?

Table 4. 9 Interview responses and common themes for most and least valued environmental features

Interviewee Responses:

R1: Most valuable: clean water best, **least valuable**: overcrowding, compact land use.

R2: the way the houses are built with scenic views from houses and apartments here. Small porch, it's quite nice you can have a good view of pond and greenery from over here. It's safe here.
Least favorite: like you said I need to drive a long way to work.

R3: greenery is the most valuable, because it cuts down on heat, pollution.
R4: greenery and the park. I came here because of this environment.

R6: the amount of trees, I like it a lot, because it keeps a little cooler, when it's hot. **Least** part I like is that it is truly not walkable to your office, unless you just want walk to go around the neighborhood.
R7: open space. **Least:** car traffic.

R8: greenery, sitting areas, pools.

Common themes for most valued:
Greenery
Clean water bodies
Openness
Scenic view
Architecture

Common themes for not preferred:
Not truly walkable
Overcrowding
Car traffic
Closed-in planning

Question 9 sought to determine the resident preferences of environmental factors. In several cases, the respondents stated that they valued greenery the most. In many cases, the most preferred factor was the abundance of trees and green spaces. These responses came from respondents in all three New Urbanist communities. Second, most valued environmental features were green and open spaces, scenery, and architecture of the New Urbanist communities. Respondents from Hometown considered water body as a valuable environmental feature in their community. For some, the least valued environmental factor was car-traffic and overcrowding. Few respondents commented on the neighborhood not truly supporting 'work, live, and play' theme of New Urbanism.

b. Environmental awareness

This section aimed to question respondents about their environmental standing. This question aims to understand, if New Urbanist communities have improved the respondents' consciousness about the environment. This questions also attempts to understand, if the residents' environmental awareness attracted them live in these New Urbanist communities.

Q12. To what extent has living in this neighborhood increased your environmental awareness?

Table 4. 10 Interview responses and common themes

Interviewee Responses:
R1: I use the environment, fishing in the ecosystem make me aware, I notice because I use it.
R2: I am usually aware about environment.
R3: No because I am usually environmentally aware for having biology background. It is because that this area is different than the rest I chose to live here.
R5: Yes this place makes me aware. You know when you walk over here and then here in the fall the trees will start turning in and it just makes you aware what you can do with plants and trees to make it look pretty and your environment look good.
R6: Not a lot because I am pretty environmentally aware. Except for the recycle because a lot of apartment doesn't have recycles.
R8: I think AR has saved the environment; there are many parks, here per block, per 4 blocks. It's different from conventional housing; there are different types of park at different spots. Different experience of environment while walking through so yes this made me aware.

Common themes:
Variety of parks per block, variety of experiences
Seasonal changes in trees
Recycling program

Question 12 sought to determine environmental awareness promoted by the New Urbanist landscapes and to what extent has living in these communities influenced the

respondents' environmental outlook. In some cases respondents stated that living in these community have increased their environmental awareness. One respondent mentioned that the aesthetic quality of seasonal changes (in trees) makes one aware about the environment (R5). While another respondent mentioned that the variety of parks offered variety in experiences, which makes them aware of the environment (R8). In many cases respondents stated that they were environmentally aware prior to moving to these communities (see Table 4.10 above). One respondent mentioned that her decision to live was due to the environmental aspect of these communities (R2).

c. Environmental performance consideration in design

This question aimed to understand the overall perception of the design and planning of these communities and its environmental implications.

Q 13. Developed/designed to consider environmental factors
Do you think *(Austin Ranch/ Addison Circle/ Hometown) is developed/designed to consider environmental factors? If so, to what level please elaborate. (How could the landscapes of *(Austin Ranch) be improved to respond environmental needs?)

Table 4. 11 Interview responses and common themes

Interviewee Responses:
R1: No! They want to build as much as they can and as fast as they can. I wish they consult the environmental people for outside view, third party with no investment here. Fresh perspective needed on thinking for what kind of tree what lives in it, what does it benefit that area.
R2: Well thought of nicely built. They have actually thought about parking. But we don't need more houses in here, there needs to be more parks, trees than more parks.
R3: I think its better, looking around I think that they were more conscious than other places.
R4: Yes, I think that it environment was considered.
R5: I think when they built Addison circle; I think they were ahead of their time. Round-about, the way they laid it out, parking garages, so environmentally that's better and it looks better. Bosque park over here, they did not tear down all the trees, they could have easily put another building over there, but they kept a park.
R7: the lighting could have been a little better in AC.
R8: Maybe energy wise, solar. Less space for parking and more for greenery.
R6: Yes, because if you go around this area there is a lot of green space that is undeveloped, (referring to the thicket).

Common Themes:
More environmental input needed in planning
Parking well thought out
Comparatively Environment conscious
Protected and undeveloped sites present

Question 13 was aimed at evoking more specific responses on viewpoints about environmental performance factors considered in the New Urbanist community design and those that need improvement. As summarized in Table 4.11, respondents perceived that the design and development is well-thought out in terms of environment performance. Positive responses to this question tended to focus on the greenery, parks, trees, and vegetation. Residents suggested more needs to be done in terms of alternative energy use, water conservation, and environmental consultation.

d. Additional questions

Question was asked allowed the respondent to add any further thoughts on the subject that were not covered in the previous questions. This open-ended question allowed respondents to answer freely.

Q11. Is there anything you want to add?

Table 4. 12 Interview responses

Interviewee Responses:
R1: More things to be done here, bring in environmental people to see environmental impact.
R5: I think Addison Circle is a little gem inside Dallas suburb. I like to be able to walk down stairs and walk outside and to be able to walk to shops and civic places, that's why I live here. Addison is a town within Dallas. It just has a good vibe in the circle.
R6: it's almost like a new town
R8: Work nearby, restaurants and cafes, pools. (Live, work, play)
R10: Access to the trails for our dog was important. So was the aesthetic of the area with the fountains and greenery everywhere.

Most respondents felt their previous responses were adequate and chose not to add any further comments. In a few cases, the respondents added that New Urbanist communities felt like a town where one can 'live, work and play' (R6, R8, R5). Participant R5 stated "I think Addison Circle is a little gem inside Dallas suburb". While another respondent mentioned "more to be done to assess environmental impact" (R1). Many commented on the aesthetic value of the place.

4.2.3 Analysis of the Passive Observation and Secondary Data

The passive observations were used to better understand the environmental performance of New Urbanist landscapes in these three communities. The environmental

performance factors and residents' behavior were recorded. The purpose of observation was also to get photographical records of the landscape design characteristics of the New Urbanist communities. Passive observations included walking through parts of the three communities, specifically the parks and sidewalks. This also included driving through the community, while observing the physical design of the neighborhood. Additionally, photographic records were also taken during passive observation. Besides passive observation, secondary data from primary sources were used for supplemental information to the interview data.

The secondary data helped in understanding the study locations. Also, secondary data is used analyze the findings in more detail. Overall, passive observation and secondary data supplements the data collected from the interview. The analysis of observations and secondary and archival data is further explained in the synthesis of findings section below.

4.3 Synthesis of Findings

This section contains a synthesized descriptive summary of interview data, observational and secondary data. Figure 4.9 below explains the synthesis process in analysis of findings. Passive observation and secondary data were used to collect additional data to evaluate the environmental performance of the three New Urbanist landscapes. Passive observation was done through site visits which included walking through the sites. Section a – h discusses the environmental performance indicating factors, such as: air quality, energy efficiency, open space connectivity, vegetation, habitat, stormwater management, water use and land use efficiency. This section analyzes the interview data and supplemental data from passive observation and secondary data.

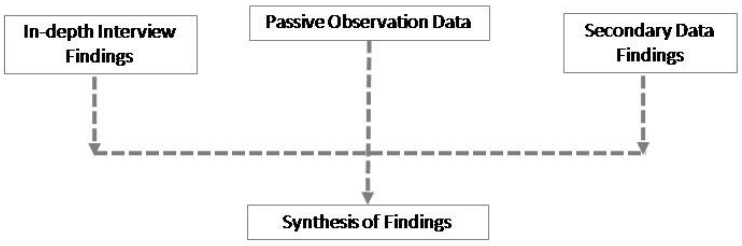


Figure 4. 9 Synthesis process diagram

a. Air Quality

The findings of this research illustrated that there are several ways indicating landscape's impact on air quality. Presence of trees and vegetation, and reduction of automobile use has been associated as effective measures to improve air quality. It can be observed that among three study sites, Addison Circle encompass both environmental indicators. Whereas, the New Urbanist landscapes of Austin Ranch and Hometown partially contribute to the air quality.

Since major parts of all of the three developments were built at least a decade ago, most trees and vegetation here had established and matured. According to secondary data findings, there was provision of preserved area for older mature trees in all the study sites, which contribute to air quality. For example 8 acres of preserved 'the thicket park' in Austin Ranch, and 0.1 acre of 'Bosque Park' in Addison Circle. Also, the presence of planted trees in these built projects can potentially improve air quality. According to observation findings, the mature tree canopy in the built projects comprised chiefly of Texas native and well adapted trees, such as: Live oaks, Bur oaks, Bald cypress, Cedar elm, Crape myrtle etc. Tree canopies in all three projects shade over the major and minor streets. According to observation findings, tree planting has been carefully avoided around the traffic intersections and the turning areas. Trees and vegetation in urban areas help improve air quality by absorbing ground level ozone,

carbon dioxide and other pollutants. According to interview data, the majority of the respondents replied positively stating “having a lot of trees here have helped in improving air quality of the place” (R5).

Trees also help lower air temperature (National Tree Benefit Calculator, 2017).Presence of mature trees along streets and parks help in carbon sequestration and contribute to air quality improvement. Maturity of trees is directly proportional to the amount of carbon it sequesters. For instance the value calculated from the National Tree Benefit Calculator illustrates that a mature 12-inch Live oak tree reduces atmospheric carbon by 365 pounds. Most car owners of an average car (mid-sized sedan) drive 12,000 miles generating about 11,000 pounds of CO2 every year (National Tree Benefit Calculator, 2017). This shows that the amount of carbon sequestered by a 12-inch Live oak tree per year is equal to carbon generated while driving an average car for 400 miles.

In Addison Circle, the pedestrian friendly design with provision of rail station in walking distance from the neighborhood provides multi modal transportation options for the residents. This potentially reduces the use of personal cars, and thus reducing air pollution. Austin Ranch and Hometown do not provide multi-modal transportation options. Secondary data illustrated that all three projects are suburbs of major cities in their metropolitan region. The residents here have to depend on their personal vehicles as these neighborhoods are not truly connected to the urban fabric by public transit. All respondents reported that they use their private vehicle daily. The nearest bus or rail access point from Austin Ranch is 22 minutes by foot, and for Hometown it is 15 minutes’ drive to nearest transit station. This implies that the residents here have to rely on their personal vehicles to run their daily errands, which has adverse effect on air quality. Connected street networks and high-density urban development have the potential to promote non-motorized forms of transportation. However, since Austin Ranch and

Hometown are not connected to the urban fabric by transportation options, this is only partially efficient.

Research also suggested that the business and restaurants located in Addison Circle, Austin Ranch, and Hometown invites more car traffic. One respondent reported “businesses need more patrons which brings more traffic and that contributes to more air pollution” (R9). Additionally, the pedestrian friendly design encourages residents to walk for exercise, but not to run daily errands. These findings deviate from sprawl reforming statements and principles of New Urbanism.

The landscapes performance regarding air quality in the three built projects was significant in terms of availability of green and open spaces (see Figure 4.10). However, the environmental performance of the New Urbanist landscapes to air quality in terms of automobile-use reduction was limited.

Photo source: SWA group, 2017

(a)

(b) (c)

Figure 4. 10 Example of tree canopy spread and public transit presence (a) Addison Circle transit center with DART, (b), Addison circle, street view (c) Hometown, sidewalk in front of single family units.

b. Energy use and carbon

According to observation findings, examples of strategies to reduce energy use observed in the three communities were, shading by tree canopies and dim outdoor lighting at night. In all three examples no evidence of use of alternative energy systems like solar and wind energy was found. According to interview data, a majority of the respondents were unaware about energy efficient techniques in the neighborhood landscapes.

One of the respondents stated, “certain architectural requirements actually prohibit some of the latest energy efficient items. For example: the dark screens (to help cooling in summer) can only be allowed in parts of the home not facing the street” (R12). This infers that although residents want to use this type of energy saving techniques the aesthetic codes of the neighborhood do not allow. Thus, aesthetics related codes seem to outweigh efficient energy use. The high density, mixed-use pedestrian oriented design reduces energy use, as compared to the standard conventional developments. The

overall landscape performance regarding energy efficiency was minimal because of limited alternative energy use, absence of efficient energy systems, and limited use of recycled materials.

c. Open space connectivity (moderating fragmentation)

Open space connectivity includes network of parks connected by pedestrian friendly sidewalks and abundant tree canopies. According to secondary data, in Addison Circle and Austin Ranch the apartment block sizes of approximately 300'x250' helps promote walkability (see Figure 4.11 a& c). In both examples approximately 20% of land in neighborhoods is dedicated to main and pocket parks in between the apartment blocks. Addison Circle accommodates 5 main parks and other pocket parks in between the apartment block (see Figure 4.11 a). The park at the south sides of Addison Circle is 10 acres, and is mostly open space. In Austin Ranch 8 dedicated park spaces and other pocket parks provides approximately 20% green and open space within the developed area excluding unused portions of land. According to secondary data findings, presence of unused or preserved areas were noted in Austin Ranch, including preserved Lake portion at the north of the development and the thicket adjacent to Arbor hills nature reserve towards the south of the development. In Hometown, a central lake and adjoining linear park covers 28 acres, and additionally 5 parks and other pocket parks around apartments providing green and open space. (see Figure 4.11 b) According to interview data, the majority of the respondents are positively affected by these abundant green and open spaces in the community. The emerging themes for this environmental performance factor are scenery, aesthetics, human use and greenery.

(a)

(b)

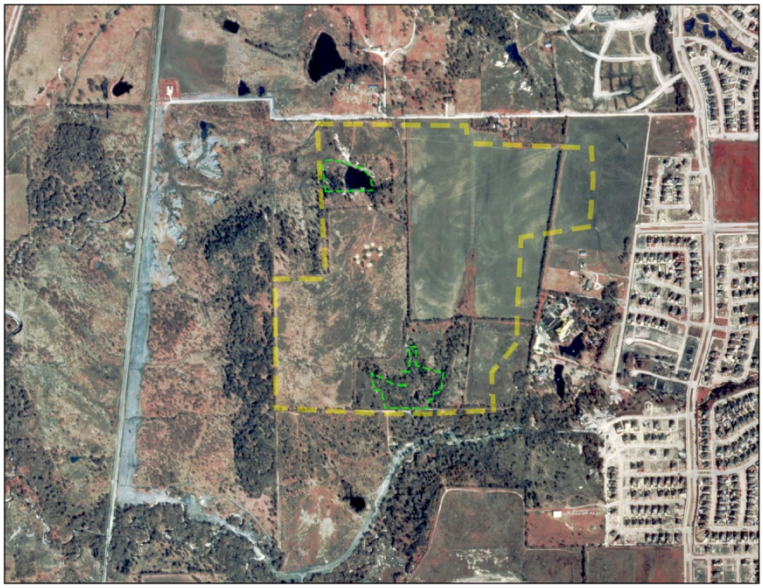
(c)

Figure 4. 11 Green and open space network aerial view. Source Google earth, 2017 (a) Austin Ranch (b), Hometown (c) Addison Circle

Addison Circle is a development in urban context where moderating fragmentation is unlikely (see Figure 4.11a). The open space network here performs minimally in terms of connectivity with the greater bio-region. This New Urbanist landscape has preserved trees that existed before the development, and has created a preserved park area within the neighborhood. Austin Ranch is a greenfield development. A large amount of land consists of unused open spaces in the immediate periphery of the Austin Ranch development (see Figure 4.11a).The majority of respondents report aesthetic character in the open spaces of Austin Ranch. In Hometown, the landscape performs well in terms of open space networks. The Walkers Creek, which flows to Trinity River, passes through this neighborhood and is dammed to form a lake. This has created a habitat for many wildlife species. This green and open spaces form a connection corridor with the greater region.

Overall, the emerging themes according to the interviews are scenery, aesthetics, human use, and greenery. Respondents relate this environment performance variable to human use rather than habitat fragmentation or natural corridor connectivity. The parks and gardens are geared more towards human use, whereas the preserved areas in these communities enhance the ecological benefits in the community (see Figure 4.11c).

(a.1)



(a.2)

(b.1)

(b.2)

(c.1)

(c.2)

Figure 4. 12 Historical aerial with project boundary showing protected areas (green dashed areas). 2016 and 1996 (a) Austin Ranch (b), Hometown (c) Addison Circle. Source: TNRIS imagery, 2017

d. ***Vegetation***

Population of birds, insects, and wildlife depend on native plants. Native plants enhance the ecological benefits in the community. Researcher's observations revealed that native and well adapted trees species such as species of oaks, elms, crape myrtle, and yupon are used extensively in these communities. Big canopy trees in the streets provide shade and reduce urban heat island effect. Native and adapted shrubs, perennials and ground cover are used in the common areas of these communities. Uses of native and well adaptive plants support the pollinators, birds and wild life. They also benefit in water use conservation. However, one respondent also a HOA employee commented "there are many parks and common areas that require a lot of water to thrive" (R12).

As per secondary data and observation findings, the front yard for residences in Hometown is relatively small as compared to conventional suburban houses. This discourages the green monoculture lawn in front yards and potentially reduces water use. However, according to interview data, one respondent reported that "Xeriscaping is limited in this community and most of the homeowner's yards are filled with water thirsty plants" (R12).

Majority of the respondents were unaware about use of native plants. The emerging theme for this environmental performance variable was greenery, natural, scenic and canopies. One respondent stated "the plush green feel of hometown can be seen throughout the neighborhood. The careful design of the neighborhood ensured there were many green areas left in the community to help provide a more urban feel, in the heart of the city" (R13). Figures 4.13 and 4.14 shows the planting design in Austin Ranch and Addison Circle.

Figure 4. 13 Native and well adapted plants as seen in Austin Ranch

Figure 4. 14 Bosque park with pre-development existing trees in Addison Circle

e. Habitat

Habitat supports survival of fauna and flora species. In Austin Ranch and Hometown, provision of a network of parks and open spaces, provision of native and well adapted plants, and preservation of mature trees; potentially offer habitat for certain urban wildlife species.

According to interview data and observations, the central lake in Hometown has created a habitat for many flora and fauna. Respondents have reported sightings of many species of aquatic life in the pond. According to interview data, one respondent reported that as the new phases of the development were being built, the population of flora and fauna were decreasing. One respondent stated “Environment dictates the animals, I see fewer birds, fewer trees because of they are adding buildings on the north side. If you change environment the animals leave, they are sensitive” (R1).

A respondent from Austin Ranch commented, “this neighborhood has been a habitat for all kinds of rabbits, bobcat, urban birds and squirrel” (R7). The habitat contribution of this green field development is minimal as compared to its predevelopment state. However, in Austin Ranch a significant portion of land remains unused. The thicket park in the southern side of the development preserves preexisting trees. Similarly, a pond area in the north is unused. A respondent with the knowledge of pre-development state of the site commented that “more signage about the native flora and fauna and what humans to impact that may help in a grassroots effort” (R9).

According to interview data, Addison Circle respondents report general sightings of urban wildlife like common grackle, mourning dove, squirrels, insects and pollinators. Grove of trees protected and 5 main parks added not only benefits human but adds to ecological systems. The habitat contribution in Hometown is found to be significant as compared to other two New Urbanist developments studied in this research.

Figure 4. 15 Lake Hometown at Hometown, North Richland Hills

f. Efficient Use of Land

High density compact planning and variety in land and building uses encourages larger common open areas, as opposed to conventional residential divisions. In addition, locating building foot prints strategically moderates habitat fragmentation. High density residential and compact grid planning can be observed in all three study examples. The three study developments accommodate density while also provides a few ecologically beneficial areas and many green open spaces for human use. According to interview data one respondent commented that “closed-in compact planning, lesser property acreage here” (R1).

Vertical rise decreases building footprint coverage. Relating to this one respondent commented “they have built the apartments up, on the bottom we have businesses and in the upper part we have apartments” (R5). Site observations in

Hometown, revealed that the residential front yards are smaller in area, which is more efficient than having a large lawn with plants that do not contribute to environment performance. 4-story parking structures in Addison Circle are more efficient than having surface parking for same number of vehicles.

Compared to other conventional suburban neighborhoods, land use efficiency is significant in these three examples. However, increased imperviousness tied with high density urban development still exists. Majority of the respondents' associate land use efficiency with the presence and availability of numerous parks in these neighborhoods. Vertically built apartments save land and accommodate more number of people for the similar amount of building footprint. These three study examples show that zoning and codes can be made to make density higher and maximize the benefits of the land and minimize the impact on nature. Additionally a respondent at Hometown stated "Hometown has wonderful design that utilizes every part of land possible, to the extent of having pocket parks/green areas, and narrow streets" (R12). However, a respondent commented that the garden apartment style of design was more important in Austin Ranch than the efficient use of land.

Figure 4. 16 Austin ranch aerial, Source: Thousand Oaks at Austin Ranch, 2017

g. Stormwater Management

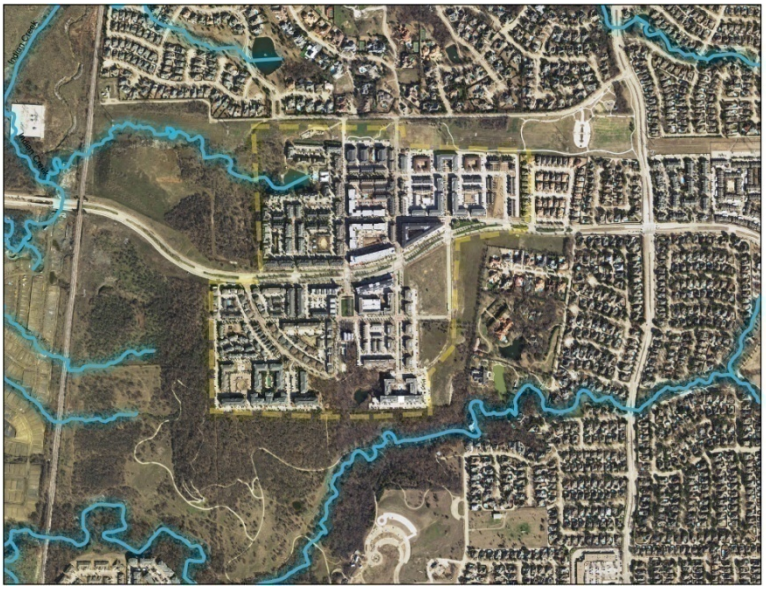
The parks and garden spaces provide permeable surface that intercept stormwater runoff. Also the use of native and adaptive plant palette may require low watering and fertilizers. Stormwater runoff washes harsh chemicals from impervious surfaces which adversely affect drinking water, aquatic life, and entire ecosystem, thus incorporating green stormwater infrastructures helps improve water quality (National Tree Benefit Calculator, 2017). According to secondary data findings and the interview data, in these three study locations site scale stormwater technologies were not observed. However, in Addison Circle, structure parking and street parking reduces parking footprint, as well as in Hometown, the central pond acts as a retention basin.

Both secondary data and site observation illustrated that Hometown development retains and restores natural water way by creating lake and day lighting the existing creek instead of channeling it. Additionally, less lawn space in the front yard discourages

monoculture green lawns. However, numerous streets and back alley way increase the use of impervious surface, which increases runoff intensity during rain events.

According to interview data, majority of the respondents were unaware of stormwater management practices in these communities. Respondents suggest that they have not faced flooding issues in these neighborhoods. Most residents' perception and concern about stormwater management included quick drainage of rain water, respondents were rarely aware about stormwater quality. One respondent even commented "they have very good rainwater management, they put up a lot of gutter up in the apartments, and so it drains very well" (R6). However, few residents suggested that more things need to be done in these communities in terms of water quality.

The considerable number of trees present in all the three neighborhoods control runoff by decelerating rainfall, this also help in reducing soil erosion (National Tree Benefit Calculator, 2017). In all three examples many Live oak trees were observed. According to National Tree Benefit Calculator, a 12 inch DBH (diameter at breast height) Live oak will intercept 2,021 gallons of stormwater runoff in a year. Figure 4.17 shows the natural water systems and processes in these study sites.



(a)

(b)

(c)

Figure 4. 17 Aerial imagery showing creeks and flow lines. (a) Austin Ranch (b) Hometown (c) Addison Circle. Source: TNRIS, GIS map, 2017

Figure 4. 18 Walkers branch creek pooled to form Hometown lake and activated surrounding in Hometown, North Richland Hills

h. Water Use

According to observation findings, the individual lawns were smaller thus potentially require less water than conventional developments. Also, use of native and well adapted plants in common areas may suggest low water requirements. However, one respondent and employee stated “there are many parks and common areas that require a lot of water to thrive” (R13). Proper selection of plants helps reduce water use for irrigation. Majority of the participating residents were unaware about water use and water conservation techniques applied in these neighborhoods. One respondent commented that “it is green grass all the time; they have been watering in balance” (R6). This implies regular maintenance and irrigation in the common areas of the neighborhood. Overall, these neighborhoods perform moderately regarding water conservation.

i. Overall Perceptions

The quality of the aesthetics and the design of the landscapes can be observed as highly prioritized in these neighborhoods. Site observations illustrated that these communities are walkable but depend upon automobiles because they are located far from urban centers. According to findings from these three neighborhoods, people have to depend upon cars to run their daily errands which contradict the design principles formulated by CNU. Despite of their establishment of at least a decade, these study communities do not seem to fully align with their design ideologies regarding auto dependency reduction. According to interview data, many informants infer that the public transportation system in Dallas is not very supportive of such walkable and pedestrian friendly concepts.

These communities do not seem to distinguish themselves from conventional urban development in terms of stormwater management features, water-use, and energy efficiency according to interview findings and observation. Few respondents commented that more ecological inclination is needed here and natural processes should not be disturbed.

As per observation, people use the green and open space extensively, for walking, sitting, walking dogs, running, and fishing. A majority of the people in the community seem to take evening walks in favorable weather conditions. In all three study locations, numerous people were sighted in the evening and the weekends. Majority were seen using common outdoor spaces for strolling, walking their dogs, running, fishing (Hometown), gathering, spending time in their balconies and porches etc. Observation suggests that design of these neighborhoods encourage people to use the outdoors actively, compared to other conventional suburban residential communities. This suggests active human interaction with nature in the green open spaces of these communities.

A majority of the respondents claimed that they were environmentally aware. One respondent mentioned recycle techniques used by Austin Ranch management. Few respondents claimed that New Urbanist community landscapes made them environmentally aware by encouraging them to use and experience the environment. One respondent commented that “fishing in the ecosystem makes me aware of the environment, I notice because I use it” (R1). While many respondents mentioned that they were usually aware about the environment prior to living in these New Urbanist communities.

Overall, the synthesis of descriptive interview, observational and secondary data illustrated that there are varying levels of environmental impact regarding each of the environmental performance factors reviewed in this study.

4.4 Chapter Summary

This chapter reviewed the analysis and findings regarding environmental performance of New Urbanist landscapes in three major communities in DFW region of North Texas. The interview data was reviewed in environmental performance categories established in Chapter 2, at the beginning of the research. The profile information of the interview participants was analyzed first. Each of the eight categories relating to environmental performance was discussed individually for three cases, and the supplemental findings from the passive observation and secondary data on those components were also described. Finally, all three data sets are synthesized to capture overall findings. While several themes were found to be common between all three study sites, there were few differences in the types of responses at each New Urbanist community. Chapter 5 covers these major findings, and includes the conclusion and final discussions of this research.

Chapter 5
Conclusions

5.1. Introduction

The objective of this research was to investigate the residents' perceptions of environmental performance in three selected New Urbanist landscapes in the DFW region. Environmental performance review provided evidence on how the environmental improvements in study sites align with the theoretical ideology of New Urbanism. Residents' perceptions of environmental performance inform landscape architects, planners, and developers on how to respond to the residents' needs. In this thesis, the researcher used qualitative research methods to address the research questions. There were three types of data acquired for this research including, interview data from end users, secondary data, and passive observation data. The final chapter of this thesis presents the summary findings by covering each research questions, draws key conclusions, discusses the relevance of this research to the profession of Landscape Architecture and discusses the areas of future research.

5.2. Summary of Findings

In order to understand the residents' perception of environmental performance in New Urbanist landscapes in North Texas, this research used the knowledge gained from individual face to-face interviews, passive observations, and secondary data. The perceptions of environmental performance factors varied from participant to participant. The perceptions of residents and users firstly informs about their daily experiences living in the New Urbanist communities. Secondly, the knowledge acquired guides landscape architects to understand the needs of the end users. End users tend to only care about those tangible and intangible features of their communities that they are aware about.

Learning about the perceptions of the end user group helps designers and developers enhance projects according to user needs. In turn, this enhances sustenance of the project by inducing ownership (Kaplan and Kaplan, 1978). Thus, in the field of landscape architecture it is crucial to learn about users' perceptions, needs, and preferences.

After the review of findings from each research instrument the common descriptive words and themes are generated from these data. This procedure helped the researcher to answer the research questions set forth in the beginning of this thesis. The following section briefly summarizes the findings in regards to each research question set forth in the beginning of this research.

5.1.1. Residents' perceptions about environmental performance of landscapes in New Urban communities.

Eight categories of environmental factors were identified from literature to evaluate environmental performance of New Urbanist landscapes (see Chapter 2). Some of these categories, such as air quality, open space network, vegetation, habitat and land use were recognized and responded by the interview participants in North Texas. In general, respondents in these neighborhoods were not fully informed about few other environmental factors considered critical in this research such as energy efficiency, storm water management and water conservation.

Participants' had varying responses to the eight critical environmental performance factors. Responses suggested that the following factors better versed than the others: air quality, open space network, vegetation, habitat and land use. Overarching responses captured by this research were greenery, abundant trees, scenic value and aesthetics in these communities. Some informants mentioned New Urbanist landscapes

as “Well thought of nicely built” (R2) and in one case “Addison Circle was built ahead of its time” (R5). However few respondents (20 percent) were more critical about the ecological performance of these neighborhoods, one informant responded “Austin Ranch built a mixed-use community in an area with great natural resources (hills, views, nature), then took the natural resources away to put in built green spaces” (R9). Another respondent argued that pre-development state cannot be achieved. One informant suggested the importance of awareness and educating the users about their ecology. Educating people with signage and investing more on nature than the real-estate can help fix this problem. This particular sentiment seems to especially apply for greenfield developments. Similarly, in Hometown one respondent replied that quality control check from ecologists and environmental professionals are needed in the design phase prior construction, which could help solve sensitive environmental issue, like that of providing habitat for flora and fauna.

Overall, the perception of the residents suggests that New Urbanist landscapes in these three communities are more beneficial than the conventional suburban developments, in terms of environmental performance. Nonetheless, there were limitations to responsiveness to environment in few of the environmental factors highlighted in the literature.

5.1.2 Environmental performance factors affecting the residents’ perception of landscapes in New Urbanist communities

The respondents’ views of environmental factors in the three neighborhoods were collected from the interview data. This data later triangulated with researchers observations and review of secondary data. Overall analysis of each interview question responses generated overarching themes relating to positively perceived environmental

performance factors. Themes like greenery, openness, scenic view, live work play, town like and variety of parks and trails were most valued. These relate to environmental performance factors land use efficiency, vegetation and open space network. Whereas, themes like auto-dependency, car traffic and closed-in planning were negatively perceived. In general, residents' perception of environmental performance in New Urbanist landscapes as per emerging themes from the interview were greatly influenced by abundance of greenery, scenic views and variety of choices these communities present.

Overall, the research findings show that for the study locations environmental performance in terms of land use efficiency, vegetation and open space network was significant, whereas environmental performance input was found to be limited in terms of storm water management, water conservation and energy use. Environmental performance in terms of air quality and habitat was found to be case based. For example, in the case of Addison Circle, the easy access to public transit provides the residents with multi modal options, so air quality assessment of resident's perception appear to be better than other two cases. In the case of Austin Ranch, unused portion of land with pre-existing thicket in the southern side was observed. This portion with its adjacency to Arbor Hills Nature reserve, contributes to habitat preservation. Similarly in Hometown, a suburban infill development (see Figure 4.3), day-lighting the existing creek and creating pond (instead of channeling the creek) has contributed in creating habitat for flora and fauna to flourish.

5.1.3 Significance of environmental performance in communities that are planned designed and built primarily with New Urban principles.

It is demonstrated from the interviews that design and aesthetics can be prioritized and valued more than the overall environmental performances factors as captured in literature, in New Urbanist landscapes in North Texas. Besides aesthetics, there are other aspects of the environment like soil quality, pollution, and biodiversity that may not be easily detectable. There are also social and economic aspects, which may restrict New Urbanism's contribution to its environmental performance. For example, auto-dependency in the three study neighborhoods can be observed as a regional concern of the North Texas region, because there is lack of public transit options in DFW metroplex. It can also be argued that auto dependency in some instances is related to individual choice and is a socio-cultural matter. It can be inferred that the environmental performance factors including land use efficiency and vegetation are perceived positively by the residents in these New Urbanist neighborhoods.

From the literature it appears that in the recent times, the CNU is engaging more on environmental aspect of sustainability (Calthrope; Duany; Talen, 2013). With updated CNU charter, it can be deduced that New Urbanism is slowly evolving (Steuteville, 2017). The environmental performance research method utilized here in this research can be one of those strategies for New Urbanism planning and design to improve the environmental implications of a project in its design stage.

5.3. Conclusion and Discussion

This study primarily utilized interview data from residents' point of view. Perception study through interview is a direct way to assess the functions and qualities of built projects as well as to understand the needs and wants of end users about their communities. Residents' perception interviews offered a better understanding of users'

perspective of the three built New Urbanist projects. Surprisingly, 69% of the respondents who were residents in the three New Urbanist study sites were not aware about New Urbanism. For the majority of the respondents the concept of New Urbanism did not directly influence their choice of residence. Residents' perception of environment in New Urbanist communities related to themes (emergent from interview data) like greenery, abundant trees, openness, scenic view and variety of parks and trails. These emerging themes can be viewed as additional achievements of these New Urbanist communities.

Residents' perspective of environmental performance in North Texas New Urbanist communities was significant in terms of land use efficiency, vegetation and open space network, whereas environmental performance input was limited in terms of storm water management, water conservation and energy use. Although this information found to be revealing, it is also realized by the researcher that these factors are easily detectable to residents as trees, greenery, scenic view and aesthetics. Environmental performance in terms of air quality and habitat contribution revealed varying and case based answers. This means these study sites did not perform adequately and/ or the design and planning responses to these environmental factors were not apparent to residents that were interviewed.

It is also learnt from the research that other major factors like social and economic forces, design and aesthetics, and city regulations and rules may restrict New Urbanism's contribution to its environmental performance. Therefore, New Urbanist developments can benefit by considering the assessment of environmental performance framework utilized here in this research.

Congress for the New Urbanism's ecological practice principles include increased density, green transportation modes (serving Transit Oriented Districts), pedestrian friendly design, energy efficiency in design, and reduced environmental

impact of development (by respecting natural systems; CNU, 2017). The evidence from this research suggests that these three New Urbanist study locations in North Texas deviates from the CNU principle in terms of provision of green transportation, energy efficiency and in relating to natural water processes. These particular study locations do not seem to minimize auto dependency and promote energy efficiency to its fullest. Also the consideration of natural water systems and processes seems to be somewhat limited and varied from one community to the other according to respondents of this research. Arguable there are efforts to mitigate such environmental issues through engineering in the greater scale, such as the lake in Hometown but such utility, and infrastructure improvements are not fully apparent for residents.

These varying results imply that there seem to be a gap to be filled between theory and practice of in New Urbanism in these three examples from North Texas. Nonetheless the overall result of this research also suggests that the New Urbanist landscapes in these three communities perceived to be more impactful and beneficial than the conventional suburban developments, in terms of environmental performance.

5.4. Relevance to the Profession of Landscape Architecture

Landscape architects play an important role in providing decisions about planning and design of landscapes in residential and mixed use communities. As discussed in Chapter 1, there is a growing need to evaluate and understand the environmental performance of built environment, and New Urbanist communities and landscapes are no exception. Especially since New Urbanism is one of the more influential movements affecting built environment, its practices must be studied to improve its outcomes.

Firstly this research promotes landscape performance studies and provides a framework for environmental performance evaluation. This framework is applicable for understanding environmental factors impacting similar communities beyond the three cases studied here. Also, understanding residents' perceptions of environmental performance of New Urbanist landscapes can help landscape architects, architects, planners to design more ecologically responsive living environments while providing a range of benefits for people in these communities.

Lesson relevant to the profession of landscape architecture according to interview findings is that the residents tend to care for those things that they are actually aware about. There were residents who use the environment in the daily basis and value the environmental performance of these New Urbanist landscapes. However, as predicted, they have been more in tune to identify and capture things that are visible in their daily routine. For example, a respondent in Hometown stated that he visits the central lake 3 to 4 times a week for fishing, and he considers himself as a part of the ecosystem. This was not the case for many other respondents. So to make the users care and invest in high performing landscapes, these seem to be a need for education, to be initiated by landscape architects and planners.

Learning from this research provides information to landscape architects about the residents' expectations, and it informs landscape architects about the environmental performance of New Urbanist landscapes. Most importantly, improving environmental conditions and needs through planning, design, and management of landscapes may provide sustainable and resilient communities for future generations.

5.5. Suggestions for Future Research

Along with the findings of residents' perceptions of the environmental performance of New Urbanist landscapes in North Texas, there are still several areas of concern that require future research. Landscape architects need to play a leading role in planning and development of such master planned projects. Assessing residents' perceptions of built environments can help landscape architects to better understand the needs of communities. Several recommendations for future research are listed below. These future research questions can provide landscape architects, architects, and planners with the knowledge needed to design and plan more environmentally successful landscapes.

- Similar study can be done to assess quantitative measures of environmental performance of New Urbanist landscapes.
- This research focuses primarily on residents' perceptions. Other stakeholder's perception of environmental performance of New Urbanist landscapes can be studied.
- A study can be developed which compares New Urbanist communities and conventional/traditional communities in terms of environmental performance.
- A study can be developed which compares the perceptions of New Urbanist apartment dwellers and New Urbanist homeowners in terms of environmental performance in New Urbanist landscapes.
- This study primarily focused on perceptions of New Urbanist landscapes' performance relating to environmental factors which are documented and reviewed in Chapter 2. A similar study can be done primarily focusing on New Urbanist landscapes' performance relating to social factors as well as economic factors.

APPENDIX A

Institutional Review Board Approval Documents

UT Arlington
Informed Consent Document

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TITLE OF PROJECT
Residents' perceptions of environmental performance of landscapes in New Urbanist communities: Learning from Addison Circle, Austin Ranch, and Hometown North Richland Hills

INTRODUCTION
You are being asked to participate in a research study about your perception of living around New Urbanist landscapes. You are being selected because you have used, have knowledge of or live in the Austin Ranch/ Addison Circle/ Hometown North Richland Hills, North Texas. Participation in this research is in the form of interview. Your participation is voluntary. Refusal to participate or discontinuing your participation at any time will involve no penalty or loss of benefits to which you are otherwise entitled. Please ask questions if there is anything you do not understand. This research will be compiled into a thesis format and is the final step towards earning my degree at the University of Texas at Arlington. Thank you so much for your time and consideration.

PURPOSE
The purpose of this study is to study end users' perceptions of environmental performance of landscapes in three New Urbanist communities in DFW region, North Texas. Through in-depth interviews and passive observations this research specifically focuses assessing the value given to environmental factors in landscapes of New Urbanist communities that are planned, designed and built primarily with New Urbanist principles, in North Texas. The research also aims to provide empirical data to connect the prevailing literature gap between New Urbanism ideologies and its environmental implications.

DURATION
Participation in this study will last approximately 25 minutes.

NUMBER OF PARTICIPANTS
The number of anticipated participants in this research study is 60 adults.

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UT Arlington
Informed Consent Document

PROCEDURES
The procedures, which will involve you as a research participant, include:

- You will read and sign the UT Arlington Informed Consent Document
- You will be asked verbally whether you would like to participate
- A map will be provided to you to mark on it
- You will be asked interview questions which were prepared by the researcher.

Questions will be about environmental performance (in criteria's such as air quality, energy use, storm-water management, habitat preservation etc.) of the landscapes in New Urbanist community of Austin Ranch/ Addison Circle/ Hometown North Richland Hills, Texas
The interview will be audio recorded. After the interview, the tape will be transcribed, which means they will be typed exactly as they were recorded, word-by-word. The tape and transcription will only be used for the thesis study as well as any follow up scholarly publications and/or presentations by the researchers.

POSSIBLE BENEFITS
Participants would not be directly benefitted from this research. This research does have the possibility of benefitting fields such as landscape architecture, residential development, and urban design. Indirectly, this study would potentially benefit the residents and the City of The Colony/Addison/ North Richland Hills as well as North Texas.

POSSIBLE RISKS/DISCOMFORTS
There are no perceived risks or discomforts for participating in this research study. Should you experience any discomfort please inform the researcher, you have the right to quit any study procedures at any time at no consequence.

COMPENSATION
There will be no compensation for participation in this study.

ALTERNATIVE PROCEDURES
There are no alternative procedures offered for this study. However, you can elect not to participate in the study or quit at any time at no consequence.

VOLUNTARY PARTICIPATION
Participation in this research study is voluntary. You have the right to decline participation in any or all study procedures or quit at any time at no consequence.

CONFIDENTIALITY
Every attempt will be made to see that your study results are kept confidential. A copy of this signed consent form and all data collected including transcriptions/tapes if applicable from this study will be stored in Architecture Building Room # 417, the office of Dr. Taner R. Ozdil, for at least three (3) years after the end of this research. The results of this study may be published and/or presented at meetings without naming you as a participant. Additional research studies could evolve from the information you have provided, but your information will not be linked to you in anyway; it will be anonymous. Although

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your rights and privacy will be maintained, the Secretary of the Department of Health and Human Services, the UTA Institutional Review Board (IRB), and personnel particular to this research have access to the study records. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above. The IRB at UTA has reviewed and approved this study and the information within this consent form. If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, the University of Texas at Arlington will protect the confidentiality of those records to the extent permitted by law.

CONTACT FOR QUESTIONS

Questions about this research study may be directed to me Riza Pradhan or my faculty advisor, Dr. Taner R. Ozdil. Phone numbers and emails are listed below. Any questions you may have about your rights as a research participant or a research-related injury may be directed to the Office of Research Administration; Regulatory Services at 817-272-2105 or regulatoryservices@uta.edu.

Riza Pradhan
Phone: 817-239-3740
Email: riza.pradhan@mavs.uta.edu

Dr. Taner R. Ozdil
Phone: 817.272.5089
Email: tozdil@uta.edu

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

Riza Pradhan	9/13/2017
Signature and printed name of principal investigator or person obtaining consent	**Date**

CONSENT

By verbally agreeing to participate, you confirm that you are 18 years of age or older and have read or had this document read to you. You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before your verbal agreeing to participate, and you have been told that you can ask other questions at any time.

You voluntarily agree to participate in this study. By verbally agreeing to participate in the study, you are not waiving any of your legal rights. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits, to which you are otherwise entitled.

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APPENDIX B

Recruitment Letters

(Script for Recruitment of Interviewees
This attachment contains script used for recruitment via email/ social media inquiry and/or phone call)

Email/Phone/Letter Script Recruitment (May also be used as a flyer for recruitment)

Dear Mr. /Mrs. /Ms. (First name) (Last name),

I am a graduate student in the Master's Program in Landscape Architecture at the University of Texas at Arlington. As a part of degree completion, I am conducting research for my Master's thesis titled: Residents' perceptions of environmental performance of landscapes New Urbanist communities; Learning from Addison Circle, Austin Ranch and Hometown North Richland Hills.
I would like to request you and/or your residents' participation in my thesis research via face-to-face or by phone interviews. You are being selected because you have used, have knowledge of, or live in *(Austin Ranch, Addison Circle, Hometown), Texas. The primary goal of this research is to study residents' perceptions of environmental performance New Urbanist Communities of *(Austin Ranch, Addison Circle, Hometown), Texas.
I would like to request your time and participation in this research through a phone/in-person interview. The interview will take approximately 25 minutes of your time.

Thank you for your time and consideration. It is only through your generous support, time and effort that we are able to contribute to the knowledge in the field of landscape architecture. If you know of anyone who is interested in participating in this interview, please do let me know how to best to contact him or her.
Please feel free to call or email me with your availability and/or questions.

Sincerely,
Riza Pradhan
Graduate Student
Landscape Architecture Program
College of Architecture, Planning and Public Affairs
The University of Texas at Arlington

Email: riza.pradhan@mavs.uta.edu
Phone: 817-239-3740

(Script for Follow Up on Recruitment of Interviewees
This attachment contains script used for follow-up via email and/or phone call)

Dear Mr. /Mrs. /Ms. (First name) (Last name),

My name is Riza Pradhan. I am a graduate student in the Landscape Architecture Program at The University of Texas at Arlington. I am currently working on my master's thesis. I am reaching out to you to follow-up with the e-mail/phone call I sent/gave you xx days or xx weeks ago, to request your participation in an interview for my thesis.

I would really appreciate, if you can let me know your availability from the provided options in the email and/or previous phone call conversation or provide me with some other options based on your availability for the interview, via email and/or phone call.

Thank you for your time and I am looking forward for your reply.

You can contact me at my cell phone number 817-239-3740and/or email me at:
riza.pradhan@mavs.uta.edu

Thank you.

Riza Pradhan
Graduate Student
Landscape Architecture Program
College of Architecture, Planning and Public Affairs
The University of Texas at Arlington

(Script of Confirmation; script used for confirmation via email and/or phone call)

FOR PHONE INTERVIEW

Hello Mr. /Mrs. /Ms. (First name) (Last name),

I am confirming our phone interview on (Month) (Date), 2017 at hh:mm. Thank you for agreeing to be part of my research thesis.

If there are any questions, feel free to contact me at my cell phone 817-239-3740and/or email me at riza.pradhan@mavs.uta.edu.

Regards,

Riza Pradhan
Graduate Student
Landscape Architecture Program
College of Architecture, Planning and Public Affairs
The University of Texas at Arlington

(Script for Recruitment of Interviewees On-site
This attachment contains script used for on-site recruitment)

(Note: SITE, DATE, TIME, #INTERVIEW)
[PERSONAL INTRODUCTION]
Hello my name is Riza Pradhan. I am a graduate student at University of Texas at Arlington. I am doing a research on environmental performance of landscapes in the New Urbanist Communities in DFW region. I am conducting this interview to collect information which will be incorporated into my master's thesis at UTA. If you have few minutes, may I explain interview that I am administrating at *(Addison Circle, Austin Ranch or Hometown North Richland Hills) today?

[INTERVIEW INTRODUCTION]
I am inquiring to ask your help in a study of the resident's perception of the site and this community we stand upon today as part of research being conducted for thesis at The University of Texas at Arlington. This study is part of an effort to better qualify the environmental benefits that this site provides to said users.

[INTERVIEW PROCESS]
As a participant for this interview, you were chosen at random from being on-site during the time and date that this questionnaire is administered. The interview is structured to measure environmental performance in criteria's such as air quality, energy use, storm-water management, habitat preservation. The interview results will be used to see how well the site environmentally performs and is perceived by its users.

[ADMINISTER INTERVIEW] ***Interview will take approximately 25 minutes to complete.***

[CONFIDENTIALITY REITERATION]
This study is confidential. Your name will not be used and identified with your interview. Your answers will be completely confidential. Profile questions will be asked to better understand the background and environmental awareness of the resident. Your name will be disassociated from this document.

[ACKNOWLEDGE INTERVIEWEES TIME AND EFFORT]
This interview is voluntary. However, you can help me very much by suggesting interested residents for this interview. Your input will contribute to future, innovative public spaces like the one you currently stand on.
[FINAL THANKS]
Again, your time and input is greatly appreciated and the data will be a great boon to our research.

[CONTACT INFORMATION] *Interviewees will be asked, if they would like a copy of this form (as a cover letter) to future contact opportunities.*
If you have any questions or comments about this study, we would be happy to talk with you. Please feel free to write us at the address:

Riza Pradhan,
Graduate Student
Landscape Architecture Program

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BIOGRAPHICAL INFORMATION

Riza Pradhan graduated with a Bachelor's degree in Architecture from Institute of Engineering at Tribhuwan University in Nepal. Ms. Pradhan has over two years of experience working as an architect with Prabal Thapa Architects in Nepal. She also collaborated with architectural and non-profit social organizations in Nepal. In August 2014, she moved to Arlington, Texas to pursue a Master's degree in Landscape Architecture at University of Texas at Arlington. There, she worked as an Enhanced Graduate Teaching Assistant, and was a research assistant in 2017 LAF case studies. Her research interests include green infrastructure, urban design, urban restoration, and construction. She looks forward to working in these areas after graduation.