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APPROACHES TO URBAN LAND USE GOVERNANCE: CONSERVATION OR HOUSING DEVELOPMENT?

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ABSTRACT

Around the globe cities are growing and expanding in size. The increase in urban areas changes the face of our planet. Since every city, county, and state have a set amount of land that they can conserve or develop, this thesis investigates factors that impact land conservation or land development for housing. It also establishes the relations between land use, economic, social, and environmental processes in the selected area. From the very beginning, this paper researches different approaches to land use that help municipalities maintain and use their land resources.

The focus of this research is an area of land in an urban environment. This thesis develops a hypothetical conceptual model with five levels of analysis, based on conducted research, and applies it to analyze the City of Albuquerque, as a case study. This paper also researches current methods of funding for public land conservation in Albuquerque. Analysis of policies, programs, ordinances, and plans that the City of Albuquerque uses in the context of its interactions with Bernalillo County and the State of New Mexico shows the process of land use governance. Qualitative analysis describes factors that impact land conservation. Statistical analysis provides information on what factors influence housing value.

Keywords: *land conservation, urban, housing development, governance*

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ABBREVIATIONS

ABCWUA	Albuquerque Bernalillo County Water Utility Authority
CIP	Capital Implementation Program
CAFR	Comprehensive Annual Financial Report
DDDM	Data Driven Decision Making
EPA	Environmental Protection Agency
EPC	Environmental Planning Commission
LWCF	Land and Water Conservation Fund
MRCOG	Mid-Region Council of Governments
NGO	Non-Governmental Organization
NMACD	New Mexico Association of Conservation Districts
U. S.	United States
UGB	Urban Growth Boundaries
UGS	Urban Green Spaces
USB	Urban Service Boundaries
WWF	World Wildlife Fund

Chapter 1

Introduction

Around the globe cities are growing and expanding in size, height, and density. Modern cities are global “sociocultural phenomenon” (Zijderveld, 2009, p. 17). Depending on the location and system of governance, different policy instruments control how each city expands and grows. In the United States (U.S.), many different factors impact city development. Land plays a very important role in the “social and economic development” of urban areas (Greenstein & Sungu - Eruilmaz, 2005, para. 19). Land use in an urban area can be "residential, industrial, transportation, recreation, and vacant" (Schwarz, Herrmann, & McHale, 2014, p. 57).

This thesis investigates approaches that cities take towards land conservation for recreation or land development for housing as part of their growth. This paper uses definition of “governance” as “establishing, promoting and supporting a specific type of relationship between governmental and non-governmental actors in the governing process” (Howlett, 2011, p. 8). “Participatory governance” is the “essence of governance” in the democratic society (Chhotray & Stoker, 2009, p. 179). Land conservation definition includes “preservation of open space”, “outdoor recreation opportunities”, “protection and restoration of ecological functions and wildlife habitat” (Randolph, 2004, p. 531).

This thesis studies economic, social, financial, instrumental, and environmental approaches that help municipalities to maintain and use their resources wisely. Multiple institutions, including local, state, and federal governments, governmental and non-governmental agencies and organizations, private institutions, actors and citizens, influence different processes in the city, including what parts of land will be conserved and what will be developed. Since every city, county, and state have a set amount of land that they can use,

conserve, or develop, especially the land conservation can influence multiple economic, social, financial, instrumental, and environmental processes in the selected area. Land development for housing contributes to economic development and provides living spaces for a growing urban population. Land use governance is quite complex, as it involves the participation of multiple actors, and a combination of different levels of governance.

This thesis analyses existing conservation policies, programs, ordinances, acts, methods, plans, and projects in Albuquerque City, in the context of its interactions with Bernalillo County and the State of New Mexico, as a case study, to find out what factors influence urban land use. This paper also studies different levels of land development in urban areas.

This paper researches outdoor recreation and open spaces preservation in cities. "Urban conservation" includes both "competition for land uses on one hand and preserving the common good on the other" (Chau, Choy, & Lee, 2018, p. 456). "Global trends such as urbanization, demographic and climate change that are currently underway pose serious challenges to sustainable development and integrated resource management" (Kurian & Ardakanian, 2015, p. 3). How can land be conserved in an urban area? A case-study analysis of Albuquerque City, New Mexico helps to investigate this question.

Land is a very valuable natural resource that influences many different processes in the city. Land conservation and land planning "are interconnected" (McQueen & McMahon, 2003, p. 136). An environmental approach, such as an "ecosystem restoration" (Salazar, 2012), is investigated as well. Land conservation is very important, because it helps communities to be healthy and sustainable (Wildlands Conservation, 2018). This thesis researches economic benefits and externalities of land conservation and housing development within the city limits.

This paper also studies how different markets work in a democratic society. According to Friedman (1962), “Free markets have positive consequences for the overall economy and are both the most efficient way to allocate resources and to achieve freedom” (as cited in Varga, 2016, p.90). “Markets are established throughout the machinery of public organizations and other places hitherto considered as being outside the market” (Varga, 2016, p. 91). Zats (2016) writes that markets are very “complex institutions” (as cited in Varga, 2016). Modern governance is more about “market-driven governance” (Varga, 2016).

This paper proposes a multileveled hypothetical “conceptual model” (Bedimo-Rung, Mowen, & Cohen, 2005; MacKay, n.d.; Yalon - Chamovitz, 2009) that can be applied towards urban land conservation or housing development analysis. This thesis applies some of the levels for the land conservation analysis, and investigates a dependent variable, *housing value*, that can be used as an important point in the decision-making process for housing development. Since “data-driven decision-making” (DDDM) (Miller, 2019) becomes more advanced every day, this paper conducts a statistical analysis of selected U.S. cities to find out what factors impact housing value in urban areas.

This paper discovers that many different factors influence land conservation in an urban environment. Qualitative analysis provides a simple model of factors that impact land conservation. Quantitative analysis produces a list of factors that impact housing value. When deciding whether to develop or conserve the land, this paper provides conclusions, based on research and data analysis. Housing development contributes to the growth of urban areas. At the same time, urban areas need recreation. How can the local government provide both?

Chapter 2

Questions, Approaches, and Findings

Problem Statement. Today, more than ever, green space is decreasing in size in urban areas. Land is being developed at a very fast rate, not just in the U.S., but globally. Selzer writes that "according to the Natural Resources Conservation Service's 1997 National Resources Inventory, over the fifteen-year period from 1982 to 1997 the total acreage of developed land in the United States increased by 34 percent (25million acres)" (as cited in McQueen & McMahon, 2003, p. ix). "About 6000 acres of open space are lost every day" to development (U.S. Forest Service, n.d. a). Selzer states that in the U.S. open spaces are developed "three times faster than population growth" (as cited in McQueen & McMahon, 2003, p. ix).

According to the U.S. Census Bureau, by 2050, and mostly in urban areas, the U.S. population will increase up to 40% (as cited in Carbonell & Yaro, 2005). Currently, more than 80% of the population lives in urban areas in the U.S. (Grimm, Grove, Pickett, & Redman, 2000, p. 572). Growing urbanization, urban sprawl, and changing policies put a strain on natural resources; with that more land is used for developmental purposes within the city limits due to demand.

Land conservation helps to preserve open spaces and provides opportunities for recreation activities in urban areas. Conservation organizations, private foundations, and local land trusts contribute to land conservation. This thesis researches what conservation efforts and approaches would be the best in an urban environment. What value does the conserved land provide? What are the benefits of land conservation for city residents? Urban communities need a "strategic approach to land conservation: land should be planned and developed as a system" (McQueen & McMahon, 2003, p. 134).

This thesis also investigates how land conservation funding is conducted in the City

of Albuquerque. By 2040, according to the Albuquerque/Bernalillo County Comprehensive Plan, the "Albuquerque area is expected to increase by 311,000 people, representing a 46% increase from 2012" (City of Albuquerque, 2017b, p.3). This paper investigates mechanisms of land conservation in the city and how they impact the city's housing development.

Land conservation is closely connected to water conservation, especially because of land and water use, conservation policies, ordinances, permits, and water rights in agriculture. Very often agricultural land is being considered for conservation by using different methods and instruments. This thesis touches on water conservation in Albuquerque, because it is an arid Rio Grande watershed area, and agriculture is an inseparable part of the City's historic growth, development, and infrastructure.

Research Problems. Urban areas are constantly increasing around the world (United Nations [UN], 2019)**.** By 2050 over 67% of the world population will live in cities (UN, 2019). In 2018 North America was the highest urbanized region in the world with 82% (UN, 2019, p. 28). The urban population worldwide went from about 751 million in 1950 to projected 6.7 billion people in 2050, with the biggest expected growth in Asia (UN, 2019). The emerging question is how cities will manage their land resources. Should they conserve more land or develop it? What factors will influence land development for housing? Why should the city conserve land? This thesis looks at the following problems in urban land conservation:

1) a decrease of green open space in urban areas due to housing development and urban sprawl;

2) a growing population and growing demand for both housing development and recreation opportunities;

3) conservation programs and projects financing;

4) and possible water shortages due to population growth and climate change.

The Purpose of This Study is to find out what approaches work best to decide whether to conserve or develop land in urban areas. It identifies the effects of local government programs and policies on land conservation. The study of the sources of finance identifies the factors that influence fund allocations for conservation programs.

A case study of Albuquerque City, its interactions with Bernalillo County, and the State of New Mexico, shows process of land use governance. Although it looks like Albuquerque has plenty of land available for development or conservation, a case study reveals mechanisms involved in land use. This paper studies the history of the city's land conservation, housing development, participation of local government in land conservation governance, and use of current and alternative "governing instruments" (Trebilcock, Prichard, Hartle, & Dewees, 1982), in situations where land conservation or development raise multiple questions.

Central Research Questions:

What approaches should the government consider towards urban land use?

What should the local government support: land conservation or housing development?

What factors impact urban land conservation and urban housing value?

Supporting Research Questions:

1. What instruments can the local government use to conserve urban land?
2. What is the purpose of land conservation or land development for housing in an urban area?
3. Are land conservation programs effective?
4. How do cities finance conservation programs and projects?
5. How can water shortages impact land conservation?

Supporting Research Questions for the Case Study Analysis

6. What factors influence the support by local government of housing development or land conservation?

Supporting Research Questions for Qualitative Analysis:

7. What factors impact land conservation in urban areas?

Supporting Research Questions for Statistical Analysis:

8. What factors increase/decrease housing value?

Research Approach. This thesis uses a mixed method. It has a combination of case study analysis, qualitative, and quantitative analysis. This thesis is limited to publicly available information only, retrieved from publicly available sources, books, documents, articles, and websites. Information provided during interviews is also limited to publicly available information only. All interviews were conducted at the local level. Two representatives from the City of Albuquerque Parks and Recreation Department and Open Space Division provided publicly available information. Four conservation organizations were selected due to location – the City of Albuquerque. Representatives from two conservation organizations agreed to an interview. No personal information was requested.

This thesis uses different units of analysis. The unit of analysis for the proposed hypothetical "conceptual model" (Bedimo-Rung et al., 2005; MacKay, n.d.; Yalon-Chamovitz, 2009) is a patch of land, any size, that can be located anywhere in the city. The unit of analysis in the case-study and statistical analysis is a city. Qualitative analysis provides valuable information regarding land conservation in Albuquerque. Quantitative analysis of national city-level data investigates what factors impact *housing value*, as an essential part of housing development.

Findings: Current literature review show multiple approaches to urban land use. This study proposes that economic, social, environmental, instrumental, and financial approaches need to be considered together for better decision-making over land conservation or development for housing. Different factors impact land conservation, including *land cost, land ownership, zoning, conservation programs, funding, policies, and environmental education*. Land conservation is a mechanism itself that influences the value of land and housing. It also depends on size, location, previous use of the patch, and the state of nearby land. Land conservation is also a development restriction mechanism. Due to high demand for land in urban areas, there will be at a minimum a low level of development on the land that has been purposed for conservation for recreation. Land conservation for recreation purposes with no-development is possible, but it depends on ownership type and the presence of conservation easements. Land ownership is a very important factor that impacts land development level.

Statistical analysis of the national - level data set shows that social, environmental, financial, instrumental, and economic factors can increase or decrease *housing value*. Especially in an urban area, *median income, senior urban population, middle level of housing development,* and other factors can increase *housing value*. *Homeownership, population, low and high levels of land development,* and other factors can decrease *housing value*. Level of land development is a mechanism itself that can impact housing value.

Both qualitative and quantitative analysis draw conclusions on what factors impact land conservation and housing development. The proposed hypothetical "conceptual model" (Bedimo-Rung et al., 2005; MacKay, n.d.; Yalon-Chamovitz, 2009), applied to a case study of land conservation in Albuquerque City and statistical analysis, shows elements of "multi-level governance" (Hooghe & Marks, 2003; Zeemering, 2016). The application of Heaton,

Mayson, and Stevenson's (2017) method and proposed hypothetical "conceptual model" (Bedimo-Rung et al, 2005; MacKay, n.d.; Yalon-Chamovitz, 2009) (Level 2) helps to identify effects and "sensitive" (Leon-Moreta, 2019a) factors that impact *housing value*.

Chapter 3

Literature Review

When it comes to urban land use governance, policy initiatives and instruments play a very important role. Local government can use different tools to conserve or develop land for housing. Public land management is the task that is usually done by the governmental agencies (Howlett, 2011, p. 65). Land conservation can happen anywhere and anytime, if there is a need to conserve land or natural resources. Since land has high value in an urban environment, many factors are involved in the decision-making process. This research finds that multiple authors study the process of governance and use of policy instruments.

Governmental services can be provided at federal, state, regional, urban, and local levels (Howlett, 2011, p. 64). Editors Eliadis, Hill, and Howlett (2005) write about the role of choice of instruments such as laws, regulations, subsidies, grants, and taxes that the government can use. Gunningham and Sinclair (1999) write about different policy creation mechanisms that include both "government and market approaches" (p. 49). They suggest that a combination of different instruments must be used to represent the interests of all stakeholders. Also, "public and private interests should be considered" (Gunningham & Sinclair, 1999, p. 50).

Howlett and Rayner (2007) investigate interaction of different instruments within the policy. Howlett (2004) writes about the importance of instrument choice during the policy creation and implementation process. The author mentions different studies by political scientists and economists of policy instruments, especially studies of the role of the government in creation of economic policies and how they impact businesses.

According to Trebilcock et al. (1982), the choice of "governing instruments" depends on the choices of such important actors as "politicians, bureaucrats, and interest groups"

(p.7). Howlett (2005) writes that "policy instruments are the techniques of governance that involve state authority or its limits within political science and economy" (p. 31). According to Bressers and Klok, Schneider and Ingram, "procedural policy instruments" include "education, training, institution creation", "formal evaluation", "hearings", "institutional reforms", "treaties", "agreements", etc." (as cited in Howlett, 2005, p. 36). It is very important for the instrument to have public support.

Trebilcock (2005) explains policy changes and relations between the state and the market. He writes about the importance of ideas, interests, and political institutions such as "governance system", "electoral rules and norms", "bicameralism", and "judicial review" that influence the process of policy formation and outcome (Trebilcock, 2005, p. 69). Trebilcock (2005) also mentions that U.S. has an increase in environmental regulations (p. 60).

Howlett and Rayner analyze the impact of different methods on policy change such as: "layering" (adding new goals and instruments - not effective), "drifting" (change of goals without change of instruments - inconsistent and ineffective), and "conversion" (change of instrument mix) (2007). The authors underline the need for creation of "consistent and coherent policy designs" (Howlett & Rayner, 2007). The use of instruments will have different levels of impact in the area.

Knapp and Hopkins (2001) discuss the use of "Urban Growth Boundaries" (UGB), as an "instrument of inventory control", to manage urban growth (p. 314). The authors analyze different types and sizes of UGB expansions as "time-driven instruments" and their impact on land availability (Knapp & Hopkins, 2001, p. 315). The authors found out that too much

emphasis is being put on whether UGB can support growth in the long term, rather than its short-term impact.

Michael Howlett (2011) explains different modes of governance such as "legal, corporatist, market, and network" (p. 56). Government has an ability to control different processes in the society with the help of "direct government and quasi-governmental tools" (Howlett, 2011, p. 63). According to Hardiman and Scot (2010), Verhoest et al. (2007), O'Toole and Meier (2010), many modern organizations, agencies, and partnerships try to change legal and corporatist activities into "the market modes of governance" to reduce budget and taxpayers' expenses (as cited in Howlett, 2011, p. 79).

Kalkuhl and Edenhofer (2017) develop "multi sector general equilibrium growth model" with land taxes as an instrument in different types of policies. Authors describe impact of land taxes on land conservation, forest preservation, and land value. Kalkuhl and Edenhofer (2017) show benefits of forest conservation and losses of deforestation in the regional and international perspective. There is an interdependency between manufacturing and agriculture, forest conservation and deforestation in both open and closed economies (Kalkuhl & Edenhofer, 2017). Developing countries use more land for agricultural purposes, while rich countries spend more on manufacturing with less land use. Having more people in manufacturing, reduces the amount of people in agriculture, thus reduces the amount of used land in the area (Kalkuhl & Edenhofer, 2017).

Many different authors have conducted statistical analysis of land conservation. Chamblee, Colwell, Dehring, and Depken (2011) offer statistical analysis of the effect of conservation on land prices before and after the conservation takes place. The study is done in Buncombe county, North Carolina. Carruthers, Lewis, Knaap, and Renner (2010) explore

the application of “proportional hazard models” towards spatial “point patterns in urban development”.

Davies, Kareiva, and Armsworth (2010) offer statistical analysis of the contribution of non-governmental organizations (NGO) to conservation, in particularly, The Nature Conservancy. Clifton, Ewing, Knaap, and Song provide quantitative studies of urban form by classifying it in five different classes:” landscape ecology”, “economic structure”, “surface transportation”, “community”, and “urban design” (2008). “Landscape ecology” includes environmental protection of land cover and land conservation, while “community design” focuses on planning of land use (Clifton et al., 2008). They use data from the National Land Cover Database to analyze land patches as basic units of analysis. They also recommend using data from the U.S. Census Bureau and the Bureau of Labor Statistics. “Many local governments use data layers with information on taxes, land cover, land use, zoning, planning, wetlands, etc.” (Clifton et al., 2008, p. 31). “Planning of land use” is very important for strategic population and employment growth (Clifton et al., 2008, p. 31).

Social and economic aspects are very important for the city’s development and growth. Parks availability provide interest for the physical activity in the neighborhood for the residents. Different social interactions can occur in urban spaces and environments (Clifton et al., 2008, p. 35). City residents need places for outdoor activities, including their pets. Urban designs impact walking and physical activity (Clifton et al., 2008, p. 37).

John Randolph (2004) discusses different approaches to land use. With population growth and development of different technologies, multiple changes happened on the planet, including climate change, “fresh water scarcity”, and “loss of biodiversity and agricultural

land" (Randolph, 2004, p. 3). Hambler and Canney (2013) discuss different meanings of *conservation,* land and water use, and habitat protection.

Social, economic, and environmental systems (Randolph, 2004; Ostrom, 2009; Simon, 2018) can intercept at so many different levels. John Elkington (1998) writes about sustainability and importance of social, environmental, and economic aspects in the business world. Social, economic, and environmental sustainability is very important for an urban area (Matsumura, 2014).

Urban area also provides an opportunity for different types of housing development. "Small-scale" housing blocks and "large -scale housing complexes" are parts of urban environment (Takada, 2014, p. 201). Modern cities tend to "restrict low-density urban expansion" due to the "loss of agricultural land" and "high cost of providing infrastructure" (Moore & Higgins, 2016, p. 10). "Innovative, higher density housing developments" include "affordability, environmental sustainability, housing quality and social improvements" (Moore & Higgins, 2016, p. 10). "Urban development direction" (Morishige, 2014, p. 216) plays a very important role in how each city grows, develops, and manages its natural resources.

Ostrom (2009) discusses "sustainability of social-ecological systems", different levels and factors that influence natural resources governance. Location and size of the resource influence sustainable natural resources management systems (Ostrom, 2009). There are different types of levels in "complex subsystems", such as "resources system", "resources units", "users", and "governance systems" (Ostrom, 2009, p. 419). "Social, political, and economic settings" play a very important part in how resources are managed (Ostrom, 2009). Laws, rules, and regulations will also influence the behavior of "users". Another very

important aspect of the “users’ behavior” is their “self-organization” (Ostrom, 2009). When there is an abundance of the resources, users will keep using it. When there is “scarcity, the users will self-organize” to manage the resources better (Ostrom, 2009).

Elinor Ostrom (2015) also discusses the role of institutions and three major models in the process of governing natural resources. Hardin’s (1968) “the tragedy of the commons”, Dawes (1973; 1975) “prisoner’s dilemma game”, and Olson’s (1965) “logic of collective action” models are “diverse representations of a broader and still-evolving theory of collective action” (as cited in Ostrom, 2015, p. 7). Multiple institutions are involved in the process of governance. Hooghe and Marks (2003) discuss two types of “multi-level governance”. Zeemering (2016) discusses the importance of sustainability, “multi-level governance”, and public administration in urban environment.

Decision-making and sustainable growth are very important. Choumert and Salanie (2008) suggest that because of rapid urbanization, “Urban Green Spaces (UGS)” start having more value to the city residents. The biggest emerging question is how cities will manage growing demand for housing development and preservation of green spaces.

Chapter 4

Theoretical Foundations

"Theory of Urbanity" (Zijdervelt, 1998). According to Anton Zijderveld, urban areas are divided in both "public and private life" (1998). Cities constantly attract more people. "Western urbanity" has always been based on "economic and political interests" (Zijdervelt, 1998, p. 140). Today urbanity is as a "way of life" (Zijdervelt, 1998, p. 141) that includes "society-building" and "community-building factors" (Zijdervelt, 1998, p. 130). Due to the development of technologies, especially communication and transportation, "urban lifestyles" have moved beyond the city limits (Zijdervelt, 1998, p. 130).

Social, economic, and cultural aspects are closely interconnected in urban areas. Cities compete, they "often act like corporations and try…to lure investors, professionals, businessmen, artists, and tourists to visit them, and to live and to work within their administratively delineated orbits" (Zijdelvelt, 1998, p. 130). A special place in the modern city belongs to public administration, to implement rules and regulations (Zijderveld, 1998).

Theory of "Urban Land Use" (Harvey, 2009). According to Smith (1776), the term "value" by itself means "value in use" and "value in exchange" (as cited in Harvey, 2009). Land has its own value, depending on urban/suburban/rural location. A patch of land can be improved, but it is always in one location (Harvey, 2009). Thus, its value can be influenced by the surrounding areas. "Land and improvements" are in "constant use" and have owners (Harvey, 2009). Housing value has many different components as well. In an urban area, the value of the land has characteristics such as "life support system" and "market exchange system" (Harvey, 2009, p. 161). Owners sell space that is occupied by the house and the house's accessibility that includes cost of being able to get to different places in town (Harvey, 2009, p. 161).

Theory of Conservation. Precise definition of the word *conservation* would depend on the context the word is used in. The word "conservation" means a "plan avoiding the unnecessary use of natural materials such as wood, water, or fuel", also "protection of plants, animals and natural areas" (Conservation, 2019). Conservation also means "protection of wildlife from irreversible harm" (Hambler & Canney, 2013). It can include protection of forests, land, water, animals, and different ecosystems (Hambler & Canney, 2013, p. 2). Especially when it comes to the protection of the ecosystems, preservation of biodiversity is very important (Rao & Ginsberg, 2010). Protection of land and natural resources is done with the help of different legislative acts. The term "land conservation" can also be used with the meaning of "permanent protection of land areas" (Randolph, 2004, p. 531).

"Theory of Governance" is "about the practice of collective decision-making" (Chhotray & Stoker, 2009, p. 3). The whole structure of governance contributes to the "well-being of the society" (Chhotray & Stoker, 2009). Government by itself has a very "complex architecture" (Chhotray & Stoker, 2009, p. 23). Different institutions and agencies are parts of the governance process (Chhotray & Stoker, 2009). Institutions are created to provide more opportunities for participation in the governance process. Especially when it comes to public lands, many different actors are involved in the decision-making process.

"Decision Theory" is "a combination of axiomatic and scientific method applied to selection process" (White, 1969, p. 152). The author discusses "decision theory" and applies it to the "practical decision-making" (White, 1969, p. vii). The main discussed concepts of the theory are "ambiguity, decision, action, choice, primary problem, secondary problem, problem, mental commitment, knowledge, decision operation, preference, consequences, partial decision, relative preference, decidability, weak decidability, definition of the problem,

hesitancy, striving, willing, decisionary effort" (White, 1969, p. 12). It is "partly a logical theory" (White, 1969, p. 113).

Chapter 5

Discussion

Urban environment provides opportunities for multiple land use. Land conservation protects natural resources, recreation opportunities, "open space provision, wildlife habitat and biodiversity protection, and water quality protection" (Chamblee et al., 2011, p. 453). Development of urban areas depends on economic and industrial development (Morishige, 2014). In cities, open space is a public space that offers recreational public benefits (Miyagawa, 2014, p. 262). Recreation includes trails for biking and hiking, hunting, fishing, boating, and swimming (Chamblee et al., 2011). Open spaces include "scenic views, farmland and forest preservation" (Chamblee at al., 2011, p. 453). Parks and recreation areas in urban settings support the quality of life of the city residents (Leon-Moreta, 2019b).

To answer the central research questions, this paper chooses social, economic, instrumental, financial, and environmental approaches to urban land use as its central study. Since many interests collide in an urban environment, consideration of different approaches can help local governments in the decision-making process of whether to develop or conserve available land.

Social Approach

Local government needs to consider all pluses and minuses of either land development for housing or land conservation. Land used for conservation can add value to the neighborhoods (Miyagawa, 2014). A patch of land in an urban environment can be developed or redeveloped for business/office housing and to increase revenue generation and job creation for the city (Miyagawa, 2014). In either case, both benefits and costs need to be considered. Proper land maintenance can increase land value. Housing can also add value to the area.

Urban population. According to Konijnendijk (2003) and Cetin et al. (2017), by 2000 about 47 % of world population lived in urban areas, and by 2025 there will be an expected increase up to 60 % (as cited in Sen, Gungor, & Sevik, 2018). With such rapid growth of urban areas, there is a growing demand for natural resources and land. According to the U.S. Census Bureau (2015), "Urban areas represent densely developed territory, and encompass residential, commercial, and other non-residential urban land uses" (para. 8).

There are two types of urban areas: "urbanized areas" have 50,000 people or more, and "urbanized clusters" have between 2.500 and 50,000 people (U.S. Census Bureau, 2015; Ratcliffe, Burd, Holder & Fields, 2016). Such factors as "total population thresholds", "density", "land use", and "distance" are being used to identify urban areas, according to the U.S. Census Bureau (as cited in Ratcliffe et al., 2016). Currently, "the urban areas of the United States for the 2010 Census contain 249,253,271 people, representing 80.7% of the population, and rural areas contain 59,492,276 people, or 19.3% of the population" (U.S. Census Bureau, 2015, para.16). Population in the U.S. "increased from 79% in 2000 to 80.7% in 2010 (U.S. Census Bureau, 2015, para.17).

System of governance. Decision-making on land use is greatly impacted by the system of governance. In American society, "governance operates from multiple centers and is a part of nearly every faucet of public and private life" (Schechter, 2016, p. 347). Governance involves citizens, public, and private organizations (Webb, 2005). American system is a "polycentric system with many centers of decision-making and multiple avenues of governance" (Schechter, 2016, p. 347). It is a federal system that consists of federal, state, and local governments. "American governance goes beyond government and involves an active citizenry, a healthy civil society and a diversified economy" (Schechter, 2016, p. 347).

Interests in the United States are "institutionalized" (Schechter, 2016, p. 348). Institutions are "organizational structures of government, industry and non-governmental organizations that carry out particular governance function" (Webb, 2005, p. 250). Five principles of the American governance are: "autonomy and self-governance", "consent of the governed", "accountability" for decision-making, "constitutional authority and the rule of law", separation of power that is "distributed and shared among federal, state, and local governments" (Schechter, 2016, p. 350). "Institutional feature" of the American governance is a shared authority between federal, state, and local governments, governmental and non-governmental institutions, including "civic associations, political associations, and business associations" that function in "local communities, civil society, national political arenas and markets" (Schechter, 2016, p. 355).

When it comes to land conservation governance, many different actors are involved. "Federal, state, regional, and local governments; national and local land trusts, community groups and citizens, farmers, rangers, land developers, and other property owners – all are involved in land conservation in the United States" (Randolph, 2004, p. 532). Different tools are used for land conservation that include: "land acquisition, conservation easements, collaborative design for conservation and development, green infrastructure management, private land stewardship, and enhancing the economic viability of farm and forest use of the working landscape" (Randolph, 2004, p. 532).

"Urban governance" (Broto, 2017; Raco, 2009). Since urbanization is increasing, the whole concept of *urban governance* is a "process through which government is organized and delivered in urban areas and the relationships between state agencies and civil society" (Raco, 2009, para. 1). "Urban governance" is a new form of governance that has "local and

global expression and impact" (Broto, 2017, p. 2). "Urban governance and local empowerment are crucial factors for increasing the quality of life in towns and cities" (Commission of the European Communities, 1998, p. 23).

"Democratic representation, power and decision-making" are at the core of "urban governance", since so many people are affected by different rules, regulations, and policies in cities (Raco, 2009). Governmental and private institutions and organizations have opportunities for "multiagency partnerships", with more active citizen participation and local communities' engagement" (Raco, 2009). Sustainable "urban governance" includes government agencies, NGOs, different processes, instruments, actors, collaboration, and regulations (Webb, 2005, p. 243). Especially when it comes to urban land conservation governance, multiple institutions are involved.

"**Multileveled governance**" is a new "popular theoretic framework" (Hooghe & Marks, 2003; Zeemering, 2015, p. 204). Public administrators need to coordinate "environmental policy, economic development and social policy" in growing cities (Zeemering, 2015, p. 204). "For local government administrators, urban sustainability poses strategic choices about engagement in "multilevel governance" to promote and manage development" (Zeemering, 2015, p. 204). "Modern governance" is shared between "multiple centers of authority" (Hooghe & Marks, 2003, p. 233). "Type I governance" is federalism, or "power sharing" among governments on a "a few levels" (Hooghe & Marks, 2003, p. 236). "Type II governance" is "collaborative" and involves "multiple institutions and jurisdictions" (Hooghe & Marks, 2003, p. 236). "Multi-governance" is flexible, but it has coordination costs (Hooghe & Marks, 2003, p. 239).

Federal government is the main source of legislation and protection of public lands. It also provides different types of incentives for land conservation, such as "federal tax laws" to preserve land for the future, funding, "agriculture conservation programs", "National Flood Insurance program", "Forest Conservation program"; regulations such as "Endangered Species Act", "Wetland Permits" (Randolph, 2004). Recent *John D. Dingell Jr. Conservation, Management and Recreation Act (S47)* protects many new areas nationally (Congress.Gov., 2019a).

State government provides land conservation programs, such as "land acquisition", "farmland protection programs", "green infrastructure programs, and "tax credits" (Randolph, 2004). State government also provides legislative process and financial assistance for land conservation. State and local governments play "a critical role" in land-use decisions (Moore & Higgins, 2015, p. 10).

Local government makes very important decisions on zoning, land use, regulations, taxes, local legislature, plans, and ordinances. "Legislative referendums for open space conservation" provide a democratic opportunity for the city residents to influence land conservation process (Leon-Moreta, 2019a, p.2). With local "referendum, a city government delegates the responsibility for policy choices to public" (Leon-Moreta, 2019a, p.2). Such referendums are "crucial mechanisms for enabling conservation projects" (Leon-Moreta, 2019a, p. 3). Local government at the municipal and county levels can also establish different land conservation programs, such as "land acquisition for parks and open spaces, and purchase of conservation easements", "agricultural zoning", "overlay zoning", "open spaces zoning", "transfer of development rights" (Randolph, 2004). Local governments also provide funding for conservation initiatives.

Local communities. Land area for either development or conservation can impact the local community in many ways. “Social engagement” (Chau, Choi, & Lee, 2018) is one of the factors that impacts conservation in urban areas. For example, according to Lee et al., “social movements” influenced the development of conservation policies in Hong Kong (as cited in Chau et al., 2018, p. 460). “Social cohesion”, as Marissing et al. (2006) state, is a part of “urban governance” that impacts many different processes in the city (as cited in Chan & Siu, 2015). Urban housing “redevelopment”, “rehabilitation”, “conservation” and “revitalization” are strategies that would improve the city (Chan & Siu, 2015) and add new value to the neighborhoods.

Historical, cultural, and social land value. Land also has “social significance” for the communities that live there (Brunori, 2015, p. 54). Land value does not always have only monetary value. De Sutter (2010) states, “For indigenous people, land has a strong spiritual and cultural value, and their ancestral territory is a core element of identity” (as cited in Brunori, 2015, p. 54). Land conservation helps to protect places of high value for the people. Conservation of “historical environment and culture” is a very important part of sustainability (Morishige, 2014, p. 216). “Art and culture” have “creative power” (Morishige, 2014, p. 217).

“Urban identity” (Glaeser, Kominers, Luca, & Naik, 2018). Urban environment is very complex and multilayered. People engage in many different activities in big cities. Urban areas have high population density, high concentration of buildings, “introduced vegetation”, and “some wildlife species” (McCleery, Moorman, & Peterson, 2014, p. 1). People have created multiple “urban systems”, according to Warren et al. (2010) (as cited in McCleery et al., 2014) that are interconnected. Within these systems, people unite in

different activities and movements, including conservation. The "preservationist" movement protects historical buildings in urban areas (Glaeser et al., 2018). "Urbanist identity" is connected to walking and using public transportation" (Glaeser et al., 2018), because different activities are available in urban areas.

Accessibility depends on the context in which it is used. "Accessibility" can depend on the instrument that is being used to "provide or deny access to the resource" (Bressers & O'Toole, 2005, p. 144). Being able to access recreation areas, and enjoy different recreation opportunities that they offer, depends on many different socio-economic conditions (Leon-Moreta, 2019b; Malcolm, 2019). Accessibility of recreation areas also includes different levels of access (Heinrich, 2018). Many public lands that are located outside the city limits remain inaccessible for the public, since they are landlocked (Malcolm, 2019). At the same time, in urban areas, all city residents should have access to green recreation areas and open spaces (Malcolm, 2019).

"Instrumental Approach"

The term "instrumental (instrumentalist) approach" is used in different fields of study (Chuaqui, Ford, Barua, Janes, & Eng, 2007; Mares, 2011). When making decisions on land use, local government can use different instruments during the process of creation and implementation of policies on land conservation or development. In other words, "tools approach" considers choices of different "governing instruments" (Hill, 2005, p. 21; Peters & Hoonrbeek, 2005, p. 77).

Policy designs. One of the very important tasks of governance is "policy decision-making" (Schechter, 2016, p. 354). According to Peters and Hoornbeek (2005), any policy design includes three models: "causation, instrumentation, and evaluation" (p. 77). Any problem that needs to be solved with the policy, has many different factors or variables, that

describe the problem (Peters & Hoornbeek, 2005; Perlman, 2018). Ringeling (2005) writes that policy itself consists of "problem analysis, problem definition, and possible solutions" and "strategies for reaching these solutions" (p. 188). For example, in an urban setting lack of green space becomes a problem, since there is not enough recreation opportunities for the city residents. Another problem can also be a lack of affordable housing. Problems can be solved with the creation of a program, funding, or other actions such as rules and regulations (Perlman, 2018). The relation between the "policy problem and instruments selection" also includes the capabilities that the government has (Peters & Hoornbeek, 2005, p. 98).

Policy instruments are "techniques of governance", according to Howlett (2005). Government uses policy instruments "to achieve the policy goal" (Howlett & Rayner, 2007, p. 2). Landry and Varone (2005) identify such main "policy instruments" as: "operating cost" of the resource; effective targeting of the policy recipients; "political risks", and "constraints of interventions" (p.110). A combination of new policy instruments can be "complementary or counterproductive", when applied (Gunningham & Sinclair, 1999, p. 51).

Different combinations of policy instruments can have different effects and efficiency (Gunningham & Sinclair, 1999; Howlett, 2005). Policy makers must consider all instrument combination for the policy to be effective, including costs. It is also not so easy to create a new policy instead of an old one, due to the established set of instruments (Howlett & Rayner, 2007).

Policies do not always work. Sometimes a policy can fail. Two most important aspects of any policy instrument are: "efficiency and legitimacy" (Howlett, 2004). Public support of the policy is also important. Since the society is constantly changing, there are new ways to implement policies, considering "information technologies, citizen networking

and information sharing" (Howlett, 2004). Local municipalities can use different policy instruments for urban land use (Feiock, Travares & Lubell, 2008).

Government can use such financial tools as "grants", "subsidies", "user fees", "tax incentives", "deductions", "tax credits", "insurance", "vouchers", and "loan guarantees" (Howlett, 2011). Planning is another important government instrument (Ringeling, 2005). Taxes and regulations are instruments of government intervention (Trebilcock, 2005).

Policy intervention is an instrument itself. Governmental policies can influence the growth or decline of the urban area. Public interventions can be tested in four stages: by "analyzing intervention", "defining criteria", "evaluating shortcoming", and "choosing an action with the best justification" (Issalys, 2005, p. 174). According to Talen and Knaap, the city can use "smart growth policies" such as : "cluster zoning", "open -space zoning", "urban growth boundary", "public transit", "environmental overlay districting", "scenic preservation zoning", "agricultural protection" or "conservation zoning", and "infill development" (as cited in Warren, 2009).

Government can also use "design review", "incentive zoning", "impact fees waivers", "floor area ratio credits", "performance standards" or "point systems", and "special -use or conditional -use permit requirements" (Warren, 2009, p. 25). Creation of "knowledge-based policies" to regulate "demands, resources availability and quality" can be beneficial (Kurian & Ardakanian, 2015, p. 3).

Regulation is another type of government instrument that includes rules, "standards, permits, prohibitions and executive orders" (Howlett, 2011, p. 83). Some regulations can become laws, and some can be used continuously (Howlett, 2011, p. 83). Regulation is a "command and control instrument" (Howlett, 2011, p. 84). Government can create "strategic

land-use planning regulations" that can impact land development (Moore & Higgins, 2015, p. 10).

Urban Service Boundaries (USB) and Urban Growth Boundary (UGB). A very powerful instrument, such as "Urban Service Boundaries" (USB) is used by local governments to "restrict new development, preserve public goods, and minimize negative externalities" (Feiock et al., 2008, p. 466). Another instrument is "Urban Growth Boundary" (UGB), the best measure to control "urban sprawl" (Song & Knaap, 2004).

Cities try to control their growth and development. For example, Portland, Oregon has a very successful growth management program. The city prohibits development beyond UGB (Song & Knaap, 2004). UGB is also a "time driven" instrument of "inventory control" (Knaap & Hopkins, 2001). It is a regulatory instrument that is used to regulate how much land will be developed. It is very important to consider the state of the market, land prices, and land supply before UGB expansion (Knaap & Hopkins, 2001).

Zoning is "a tool for rationalizing the pace and direction of urban growth "(Warren, 2009, p. 2). It is also "the process of dividing a community into districts and prescribing the type of development permitted in each" (Hess, Moorman, Thompson, & Larson, 2014, p. 253). Local government has the "police power" to zone, according to *Standard Zoning Enabling Act* (as cited in Warren, 2009, p. 7). This instrument helps to plan the city development. Although it is very useful, it limits how homeowners can change the look of their property.

Generally, zoning has four categories: "residential, commercial, manufacturing, industrial, and institutional" (Warren, 2009, p. 9). Zoning districts are "commercial, industrial, manufacturing, residential of various density, and rural agricultural" (Hess et al.

2014, p. 253). Cities can also use local zoning ordinances, policies, and land regulations (Warren, 2009).

On the other hand, "restrictive zoning" and presence of land regulations can dramatically influence housing prices (Ingram & Hong, 2007). With limited supply of land, housing prices will go up, and investment opportunity into development will be lost according to Thlanfeldt (as cited in Feiock et al., 2008, p. 467). The shape of urban form can be governed by a "plan, ordinance, or a regulatory regime" (Warren, 2009, p. 17). Many cities adopt "Smart Growth" plan or "form-based or transact based zoning" (Warren, 2009, p. 17). Appointed committees, public hearings, and local elected body, for example, City Council can make decisions on zoning (Hess et al., 2014, p. 253).

Conservation easements is a voluntary "multi-optional mechanism" to conserve land (Chamblee et al., 2011). Conservation easements can be used for "specific goals" (Leon-Moreta, 2019a, p. 14). They include federal and state tax benefits (Chamblee et al., 2011). "Land owners, different public and government agencies and organizations participate in conservation projects" (Leon-Moreta, 2019a).

Political aspect. Very often decisions on land conservation are "a political act" (Kendle & Forbes, 1997, p. 117). Some pieces of land can have more support from political leaders and local communities. This would greatly depend on the "value judgments" (Kendle & Forbes, 1997, p. 114) or how the value of the land is perceived in a selected area, with a current or a strategic perspective. Another aspect is preservation of "particular species such as rare butterflies or plants" in that area (Kendle & Forbes, 1997, p. 117). "Conservation priority" can also have "political appeal" (Humbler & Canney, 2013, p. 109). Especially in urban areas, "public officials, local conservation organizations and other public actors" will

choose conservation referendums to protect “scarce land” (Leon-Moreta, 2019a, p. 4). “Public engagement” can also be a “strategic choice to achieve…goals” for local government (Zeemering, 2015, p. 211).

Environmental aspect. Policy instruments have a certain impact. They can be “environmentally and cost-effective” (Barton et al., 2017). “Payment for ecosystem services” is an “economic policy instrument for biodiversity conservation” (Barton et al., 2017, p. 406). Policy instrument can be a combination of rules such as: “boundary rules”, “pay-off rules with rewards and sanctions”, “position rules with decision making”, “choice rules”, “scope rules”, “information rules”, “aggregation rules with collective voting”, or lack of “agreement rules” that need to be followed (Barton et al., 2017, p. 418). There can be economic, regulatory, and informational instruments in the policy mix (Barton et al., 2017).

Economic Approach

Land conservation has an economic impact on the area. The creation of protected areas provides recreation opportunities for local populations and visiting tourists. It also leads to additional job creation. “Public lands and waters are the backbone” of the outdoor recreation economy (Malcolm, 2018). Land conservation in a specific area also increases prices for nearby land for at least 46% (Chamblee et al., 2011).

Decision-making on economic processes in urban areas have both short and long-term impacts. On one side, actors such as real estate developers, business owners and organizations are interested in economic development, and on the other side, multiple groups and organizations are interested in environmental protection and conservation (Feiock et al., 2008). A Game theory model was used by Knaap, Hopkins, and Donaghy (1998) to construct development as a game with two participants: local government and developers (as cited in Warren, 2009, p. 13). State and local governments have special interest in economic

growth and revenue generation for the city, while developers are always looking for new opportunities. Policy instruments influence the economic development of the area.

Economic development is essential for the city. "The local economy constitutes a background of conditions influencing the likelihood of conservation programs" (Leon-Moreta, 2019a, p. 6). In large cities around the world, policies control the rate of development by measuring urbanization rate and arable land amount (Yang, 2015). In China, policies are focused on "steady growth, adjusting structure and promoting reforms" with focus on long-term development for very large cities (Yang, 2015, p. 194). The tendency to substitute "expansionary growth" with "structural adjustments" (Yang, 2015) would allow more optimal land use in areas with land scarcity.

Urban land use impacts city's economic development and growth. According to Wang (2010), "industrial clusters" play the most important role in the city (as cited in Yang, 2015, p. 196). Also "chaotic forms of development zones" are signs of "land marketing decline" (Yang, 2015). Efficient land use is essential for the city. "Macro processes" such as "system, economy, and social structure transformation", and "local processes such as city development and construction of development zones" impact land use in an urban area (Yang, 2015, p. 197). Sometimes industrial lands have "low input and low outputs" and are inefficient, which is the result of market competition: companies grow, but cannot grow continuously (Yang, 2015, p. 205). This is where policies play a very important role in local economic development; still, companies usually orient not only on local, national, but also international markets.

Urban economy. Large metropolitan areas are becoming "America's economic engines" (Carbonell & Yaro, 2005, para. 19). Economic development brings new

technological development and innovation (Carbonell & Yaro, 2005), while constantly creating new demands and markets. Every household in the city has an economic constraint of a budget, that is mostly based on income, cost of travel, and rent, which is represented in the "physical pattern of urbanization" (Carruthers et al., 2010). Urban analysis can be done with either quantitative (density) or qualitative (patch) analysis (Carruthers et al., 2010).

Land prices. UGB can influence land prices (Knapp & Hopkins, 2001). Since USB reduce the amount of land, constantly raising housing prices impact low-income residents (Feiock et al., 2008). Housing prices have both social and economic impact as they depend on income level, financial, land, and housing markets. Some people argue that "UGB inflates land prices within the city" (as cited in Song & Knaap, 2004). Urban land resources are usually limited by the set city boundaries. "Allocation of protective mechanisms or management resources must be …targeted towards most vulnerable and valuable habitats and communities" (Kendle & Forbes, 1997, p. 115).

Land prices can be also considered in a timeline with land appreciation or depreciation possibilities, depending on market land prices, location, and cost of living. Different studies show that any land restriction from the development influences housing prices, depending on their location, and one way or the other, benefit the land owners (Ingram & Hong, 2007, p. 6). Glaeser and Quigley point to the necessity to "identify an optimal level of governmental intervention at which marginal social benefits of regulation equal the marginal social costs" (as cited in Ingram & Hong, 2007, p. 6). Government intervention can be supported or opposed by the local community (Feiock et al., 2008). USB should be used when there is a greater need to preserve parks and recreation areas within the city limits.

Housing development. Real estate development consists of "industrial, commercial and residential" housing development (Harvey, 2009). Especially in an urban area, due to population growth, multiple "public-, private-, and community-sector interests" collide (Moore & Higgins, 2016, p. 9). Policy instrument such as "incentive zoning" "allows to build in "higher density" as a bonus for the developer in exchange for building "parks, open spaces, schools, and affordable housing" (Feiock et al., 2008, p. 467). This would provide benefits for the city residents in highly populated cities by providing places to work and recreation. "Incentive zoning", Abrams (1968) writes, would provide the inclusion of green open space to the project in exchange for bigger houses with more space, bring more revenue for developers, and increase maintenance costs (as cited in Warren, 2009, p. 10).

On the negative side, some open spaces can be poorly designed, and later destroyed or privatized (Warren, 2009, p. 10). At the same time, "increase in impact fees and system development charges and zoning ordinances" will affect land prices (Warren, 2009). Another tool such as "transfer of development rights" reduces transaction costs and is often used to conserve agricultural land and open spaces (Warren, 2009). It all depends on the city location, demand for housing, value of land, and interests of involved parties.

Housing value. Adding to the price of the land, housing has its own value. "Urban conservation" also means "preservation" of buildings by their owners (Chau et al., 2018). Houses can have historical value in an urban area and become part of the local historical heritage that needs to be conserved in a "rapid city development" (Chau et al., 2018). This approach is very important, as preservation of historical buildings in downtown areas adds value to cities and attracts more tourists to downtown areas. With this it increases business revenue.

Economic mechanisms are involved in urban development (Bluffstone et al., 2008). Overdevelopment in cities can exhaust resources, both natural and financial, with a following increase of cost of infrastructure (Bluffstone et al., 2008). “Low-density housing development” reduces amount of open spaces and increases dependency on cars, while reducing opportunities for walking (Bluffstone et al., 2008, p. 435). “High-density housing development” is “more effective housing solution for many urban areas”, according to the City of Melbourne (2010) (as cited in Moore & Higgins, 2015, p. 10).

Market failures can occur in an urban environment as well. The first one is “the failure to account for the value of open spaces near the metropolitan areas”, the second is “the cost of commuting”, and the third – that “developers might not pay the full cost of infrastructure” (Bluffstone et al., 2008, p. 435). It is important to use the” right instruments to internalize externalities” (Bluffstone et al., 2008, p. 435).

Conservation or economic development? As the city increases economic development, there will be an increased demand for land conservation (Leon-Moreta, 2019a, p. 7). Every city chooses the way to conserve or develop available land. Some cities will conserve more land, while some will increase economic development (Leon-Moreta, 2019a, p. 8). One of the factors that impacts economic development is manufacturing (Leon-Moreta, 2019a). At the same time, economic development must be sustainable and conserve natural resources (Lawrence & Weber, 2014). Land conservation for recreation purposes can also contribute to economic development in the city.

Water and economic development. Huang, Yeh, and Chang (2010) write that with growing population, urbanization, and economic development, there will be an increase in “water, land, energy and mineral resources” use (p. 136). Lack of water can become an

economic “constraint” (as cited in Srinivasan, Seto, Emerson, & Gorelick, 2013) if there is no clear water management plan. Location of the city and population also impact water use (Huang et al., 2010). Studies done in India and China show a connection between the population growth and water demand, especially during summer droughts. A study of the Chinese city Shenzhen shows the necessity of either reaching a deep level aquifer or transporting water from somewhere else for the city use with increasing population (Güneralp & Seto, 2008). Since water is an important resource, its lack can be a slowing down mechanism of economic development and urbanization (Bao & Fang, 2008, p. 509).

Benefits of urban areas. Land in an urban area provides “resources, opportunities for investments, services, access to different markets” (Brunori, 2015). People live close to their work and shopping areas (Choa, 2010). People in cities use “less energy and open space resources” than people in the rural and suburban areas (Choa, 2010, p. 71). There are multiple benefits of infrastructure: zoning and tax incentives “encourage the development of urban density over suburban sprawl”, with that there will be a development of mass transit that will cause “environmental and energy benefits” (Choa, 2010, p. 73). Other community designs can involve smaller blocks and narrower streets, save travel time, and allow more walking (Choa, 2010).

Environmental Approach

Widely discussed is the environmental/ecological approach to urban land use. Central objects are land, water, and natural resources.

Land conservation. “Land is a crucial element for multiple reasons” (Brunori, 2015, p. 53). Natural spaces in cities “are fragmented due to intensive urban development” (Xing, Tang, Yu, & Xu, 2015). Especially “land use change occurs because of development, urban renewal, changes in land management or ownership, or infrastructure development” (Grimm

et al., 2000, p. 576). Land in the city can be “buildable and non-developable” due to multiple reasons (Xing et al., 2015, p. 219). Land conservation, preservation of land quality and natural resources are all parts of environmental protection (Brunori, 2015, p. 53). Conserving more land in urban areas would lead to “higher densities”, “improved community identity”, “facilitate mass transit”, “more efficient agricultural practices”, “recreation opportunities”, and “increased conservation behavior” (Brown, 2010, p. 77).

Land can also be conserved to create corridors to let different species migrate from place to place because of climate change (Brown, 2010), so wildlife would be able to share urban spaces. Especially in urban areas there is a need for “river restoration”, “blue-green space networks”, and creation of corridors to connect natural areas for wildlife (Xing et al., 2015). According to Kendle and Forbes (1997), “nature conservation is important”, because of “resource protection”, ”ecosystem balance”, “education and science for the study of urban species”, “human preference in determination of the conservation policies”, and “moral imperative”, that “all species have the right to exist and complete their evolution” (p. 116).

Urban Green Spaces (UGS). With urbanization, decreasing amount of open spaces increase in value for city residents. UGS in city areas are: “parks, public gardens, squares, traffic circles, urban trees, sport fields”, also “urban forests” and “family gardens” (Choumert & Salanie, 2008, p. 331). The value of UGS also depends on the city location and preferences of the city residents, including city history (Choumert & Salanie, 2008). For example, in France, environmental issues and UGS are more important to people than transportation issues. UGS is a “localized” public good (Choumert & Salanie, 2008). It is an “imperfect” local public good that provides benefits to the close by residents with reduction of the benefits for residents who live further (Choumert & Salanie, 2008). The economic benefits of

UGS are: “real estate value increase”, “attract investments and tourism”, “revitalize” the city, “increase productivity”, “stimulate the residential market” (Choumert & Salanie, 2008). UGS also improve “physical and mental health” (Choumert & Salanie, 2008; Leon-Moreta, 2019b).

Urban ecology. All open green spaces in the city help to reduce pollution, filter the air, reduce noise, absorb rainwater, produce oxygen, and recycle water, as Bolund and Hunhammar (1999), and Sherer (2003) state (as cited in Choumert & Salanie, 2008). Trees are the most important components of all parks, open spaces, and conserved areas. Sherer (2003) writes, “Trees in American metropolitan areas save $400 billion in the cost of constructing stormwater retention facilities” (as cited in Choumert & Salanie, 2008, p. 338.). There are many factors that impact tree growth in cities including “vandalism, drought, planting technique, soil compaction, and soil fertility” (Kendle & Forbes, 1997, p. 265).

Trees in cities need water and maintenance. Especially in arid communities, this might represent a challenge. Urban areas have more “loss of mature trees” due to multiple reasons, such as age, proximity to the houses, “poor soil, pollution, redesign, safety” (Kendle & Forbes, 1997, p. 267). Urban ecology is different, as urban residents want to see more of “neat and tidy gardens” (Kendle & Forbes, 1997, p. 105). Green areas also have maintenance costs.

City as an ecosystem. Human activity and increasing population, especially in urban areas, affect cities in many ways. Some studies consider an urban area and all human activity within it “an ecosystem” itself (Simon, 2018). Grimm et al. (2000) further develop Vitousek et al.’s (1997) idea that any city is a “human- dominated ecosystem” (as cited in Grimm et al., 2000, p. 571). Urban areas are complex environments that include “organismal

population, landscape patches, soils, … and local atmospheric and hydrologic systems" (Grimm et al., 2000, p. 574). They also interact with other local natural ecosystems (Grimm et al., 2000, p. 575).

"Land use and management" is one of the core areas of the "human ecosystem analysis", along with "demographics, economic system, power hierarchy and designed environment" (Grimm et al., 2000, p. 576). Since any urban area is a complex system of consumption and waste production, any pollution or excessive waste that it produces, will damage the natural ecosystem in the long term (Krassilov, 1995). Repair of such damage and sustainable development would prevent the urban areas from becoming the "devastating crises areas" (Krassilov, 1995, p. 103).

Krassilov's (1995) "ecosystem repair model" defines that "any system that aims at sustainable development sooner or later acquire some repair facilities" (Krassilov, 1992, as cited in Krassilov, 1995, p. 103). Land conservation can help to preserve the natural resources in urban areas, including trees, plants, and natural habitats for multiple species that can improve overall city health. It is necessary to plant trees, "restore grasslands, forests, wetlands", because these measures are "less expensive and more beneficial carbon offset technologies" (Brown, 2010, p. 78).

Climate change. One of the most important elements of land use, planning, and conservation has been stable climate, but with climate change, there is an emerging need for new, more adaptive approaches (Brown, 2010). According to United States Environmental Protection Agency (EPA) (2008), there can be a six degrees C increase of temperature in urban areas compared with rural (as cited in Brown, 2010, p. 78). Parks and green areas can help to reduce rising temperature in cities, with that reducing the number of "urban heat

islands" (Brown, 2010, p. 78). Other benefits, according to Brown are: "flood and tidal protection, erosion control, urban heat island reduction, pest control, improved air quality and pollination" (p. 80).

Climate change can impact the "stability and productivity" of the land (Rosenwax, Morgan, & Henderson, 2010, p. 64). Local ecosystems need to be considered in all community designs, to receive support of the environment they are in (Rosenwax et al, 2010). Urban open spaces need to be used productively to "filter water and air", "store carbon", "produce food", "generate microclimate", and "store flood waters" (Rosenwax et al. 2010, p. 66). Walker et al. (2004) write, creation of "resilient ecosystems" can help to withstand climate change (as cited in Rosenwax et al., 2010, p. 67).

Land and water resources. Amount of the resource is a very important factor in the city planning and development. Expanding urban areas need land and water as major natural resources. With climate change and population growth, cities need natural resources use and conservation strategies. More consideration should be given to combination of land and water conservation policies rather than separate approaches (Lucero & Tarlock, 2003). Overuse or pollution of the ground water can cause the destruction of the groundwater basin (Ostrom, 2015, p. 106). Predictability of the amount of the resource (Ostrom, 2009) is a very important factor. Water is an "unpredictable resource" (Ostrom, 2009). Land is a predictable resource, since it can be measured and planned.

Financial Approach

Leadership. State and local governments take the "central stage in land and open spaces conservation" (McQueen & McMahon, 2003, p. 17) by adopting policies, programs, and ordinances. Land use policies define which areas will be developed and which will be

conserved. Different actors engage in open spaces protection on different levels, including local, state, and federal (McQueen & McMahon, 2003, p. 16).

Interested citizens, conservationists, scientists, and land owners show initiative and support land conservation. Especially in an urban area, many different political, economic, and social interests collide. Most of the conservation initiatives start with an interested group of volunteers to protect a certain part of the land (Clark, 2007, p.10). Conservation effort always needs a leader. McQueen and McMahon (2003) write:

> Whether or not there's a strong financial incentive coming from the state level, local politicians often lead the drive for local land conservation funding. A mayor, city councilor, county commissioner, or state representative is in a good position to sense the need for public funding for open space and begin building public support for it. (p. 77)

People want to have parks, hiking and bicycling trails, golf courses, and open spaces in urban areas. Constantly growing population has a growing interest in land conservation for recreational purposes. "Local land trusts, local environmental advocacy groups, or even progressive chambers of commerce or realtor associations take the initiative to create land conservation programs" (McQueen & McMahon, 2003, p. 77).

Sources of funding.

The public sector has one constant problem: limited resources to "finance local public goods" (Ingram & Hong, 2012, p. 3). Investments into infrastructure and city projects provide long-term benefits for current and future generations. "Many central authorities have transferred spending responsibilities to local jurisdictions" (Ingram & Hong, 2012, p. 3). When local government tries to raise taxes to pay for their spending, they can meet public

opposition (Ingram & Hong, 2012, p. 3). The biggest problem with conservation finance is that it does not provide any immediate return, constant income, or carries debt (Clark, 2007, p. xv). Land conservation provides such benefits as clean air and opportunities for recreation, which are not so easy to calculate.

Private and public funding. There are many different approaches to land conservation financing. “Fee simple acquisitions” and “conservation easements” are two most “commonly used conservation approaches” (Davis et al., 2010, p. 29). Funding for land conservation projects can come from both private and public sectors. The private sector can provide donations from fundraising from individuals and organizations, while the public sector can provide governmental funds from taxes, bonds, and loans (Clark, 2007, p. xv). Citizens can vote to raise taxes to fund a conservation initiative. Such initiatives can be a part of a campaign to raise awareness of the necessity to conserve a certain area. Community support is very important for any conservation effort, especially financial (Clark, 2007, p. 15).

In many states “local ballot measures were approved to leverage the state funding by dedicating sales taxes, property taxes, and other local revenue sources to boost the state land conservation efforts at the local level” (McQueen & McMahon, 2003, p. 2). “Conservation referendums” can also help to conserve scarce land (Leon-Moreta, 2019a). Town and cities develop their own initiatives and conservation programs with “voter-approved ballot measures” (McQueen & McMahon, 2003, p. 101).

Another approach for the public sector would be to make projects together with the private sector by giving “regulatory and tax relief or leases”, in exchange for public goods such as affordable housing (Fainstein, 2012, p. 35). Developers can also pay fees that are

later used for the public projects (Fainstein, 2012, p. 36). Land taxation can be both beneficial and damaging to the urban area. If the government wants to promote development, but prevent sprawl, land tax will be high (Fainstein, 2012, p. 25). But if the development will be harmful to the environment, and social benefits would be greater than development, such mechanisms as "establishment of tax abatements for the farmland, agricultural zoning, green belts and wetland protection" for the protected areas would be beneficial for the city (Fainstein, 2012, p. 25). Such measures can also prevent further pollution.

"Green infrastructure" is a "planning method aimed at creating a network of open spaces for improvement of environmental, economic and social aspects as a part of infrastructure for cities" (Miyagawa, 2014, p. 264). Every governmental decision can have either "gains or losses" for the city (Shapiro, 2012). It is especially important for the decisions on public land – either development or conservation. Land conservation can help with the preservation of soil fertility for future agriculture use (Tai, Chao, Lu, Hu, & Wang, 2016, p. 2). At the same time, land conservation policy can decrease land supply (Tai et al., 2016, p. 6), especially in an urban area. There also will be the reduction of "private capital formation" (Tai et al., 2016, p. 6). If land is considered for conservation, the loss for the city can be revenue loss from the possible profitable business in that area, jobs, and affordable housing. Benefits for the city will include no additional pollution, recreation opportunities, clean air, habitat for plants and animals.

Conservationists, scientists and land use planners can work together to create "green infrastructure" that would combine the specific local ecosystems, watersheds, and public infrastructure (McQueen & McMahon, 2003, p. 17) into one efficient self-sustainable green city. "Green infrastructure" can connect open spaces, create new partnerships, regenerate

cities, and benefit people and nature (Miyagawa, 2014; McQueen & McMahon, 2003). It can become a "natural life support system" (McQueen & McMahon, 2003, p. 157) for urban areas.

Urban Green Spaces financing. "Bond referenda", "real estate transfer taxes", "dedicated development fees", "direct budgetary items" are all "conventional mechanisms to finance green infrastructure projects" (McQueen & McMahon, 2003 p. 134). Referendums also can help to fund open spaces (Leon-Moreta, 2019a). This way citizens can raise funding for UGSs (Choumert & Salanie, 2008, p. 340).

Ecosystem restoration. Local government can purchase conservation easements from the farmers in an area and provide support to farmers to restore natural vegetation in a specific area (Loomis, Kent, Strange, Fausch, & Covich, 1999). To fund such project, a "restoration fund" can be proposed in a ballot during voting (Loomis et al., 1999, p. 111). Thus, "ecosystem restoration" includes additional costs. Due to climate change, land conservation by itself might not be enough to preserve local ecosystem. As an ecosystem does not have a specific price for its services, it is considered a public good (Loomis et al., 1999, p. 79). It "contributes utility to individuals and therefore has value" (Loomis et al., 1999, p. 79).

Land value. Another approach is adding a new revenue source such as "land value increments created by public investment into infrastructure" (Ingram & Hong, 2012, p. 4) to the original land price. In case of land conservation, such value is defined by land accessibility for recreation purposes by the city residents. Land value has following factors: 1) "public investment into infrastructure and social services", 2) "changes in land use regulations", 3) "population growth and economic development"; 4) "private investments

that increase land value"; 5) "the original productivity of the land", according to Hong and Brubaker (as cited in Ingram & Hong, 2012, p. 4). Urban land can appreciate or depreciate in its value due to these and other factors as well. Usually, the land market puts the price on the land for sale (Shapiro, 2012). Land that is intended for conservation purposes might also increase or decrease in value with time, depending on its location. In urban areas the land value is usually included in the building value (Fainstein, 2012). Comparison of the land price during the sale can provide the information on the land value (Fainstein, 2012, p. 25).

Climate change and land value. A new factor that starts to influence land value is climate change. Some of the "decision-making strategies" that economists use to "deal with uncertainty in financial and commercial markets" can be used for land conservation (Ando & Hannah, 2011, p. 412). The reason to use such strategies in land conservation is the necessity to consider the impact of climate change on the value and use of the land. It also depends on the reason of land conservation. If the target of conservation is the type of species, then they might migrate if the climate conditions in that region change (Ando & Hannah, 2011). Urban conservation areas are focused mostly on space conservation for recreation activities for urban residents.

Protected areas are usually selected with the help of such "mechanisms as government decree, private purchase, and permanent easements" (Ando & Hannah, 2011, p. 412). Predicted outcomes and expectations about land conservation can be "altered" because of the climate change (Ando & Hannah, 2011, p. 412). "Temporary conservation" can be considered as well (Ando & Hannah, 2011, p. 413).

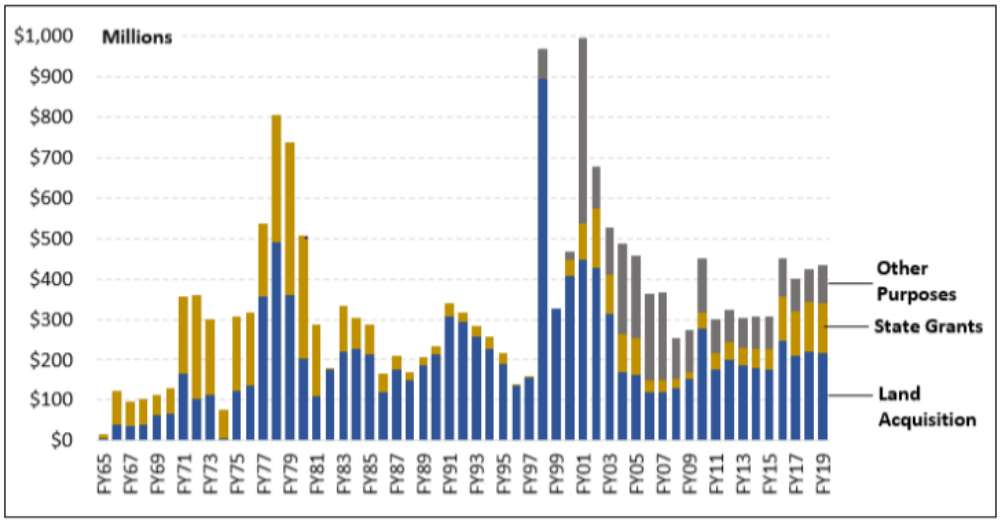
Conservation programs and funds are very important for land conservation. "Outdoor Recreation Legacy Partnership Program" provides grant money to states on competitive

bases to establish a recreation area in densely populated regions with preferences for low income communities (Congressional Research Service, 2019, p. 8). Private Foundations and donations provide money for open spaces protection and preservation worldwide. Conservation organizations and land trusts participate in conservation programs. In 1961 the World Wildlife Fund (WWF) had been established in Switzerland and incorporated in the District of Columbia as an "international fundraising organization to work in collaboration with existing conservation groups" (World Wildlife Fund, 2018). WWF contributed to conservation projects all over the world.

Land and Water Conservation Fund (LWCF) was created on September 3, 1964 as a Public Law 88-578 (Public Law 88-578, 1964). This Fund has been contributing to land conservation, "preservation of natural and cultural resources", "improving access", supporting city parks, "urban forests", "wildlife refuges", "urban green spaces", "wildlife habitat" in all states (U.S. Department of the Interior, n.d.). *John D. Dingell, Jr. Conservation, Management and Recreation Act,* 2019 permanently reauthorized the LWCF (Govtrack, 2019). This Program supplies funds for Federal acquisition of lands and provides grants to state and local governments for "recreation, planning, acquisition and development" (National Park Service, n.d., para. 6). U.S. Forest Service, National Park Service, Fish and Wildlife Service, and Bureau of Land Management purchase and manage federal lands (Congressional Research Service, 2019, p. 4). Following graph from the Congressional Research Service (2019) represents LWCF appropriations (p. 13).

Figure 4. LWCF Annual Discretionary Appropriations, FY1965-FY2019

(in millions of dollars, not adjusted for inflation)



Source: Graphic created by CRS. The primary source for the data is the DOI Office of Budget. Additional sources of information include the annual DOI *Budget in Brief* and congressional documents accompanying the annual Interior appropriations bill.

Notes: The graph does not reflect $76 million provided for the transition quarter from July 1, 1976, to September 30, 1976, due to a change by Congress to the fiscal year calendar. Amounts shown represent the appropriations in the fiscal years indicated and thus are not adjusted for inflation.

Figure 1. LWCF appropriations. Source: Congressional Research Service (2019).

Banking financial services. Another important actor in conservation finance is a bank. Banks lend money for land conservation purchases. They "offer financial services that can benefit the land conservation" (Clark, 2007, p. 198). State funding can impact the amount of loans for the area (Clark, 2007, p. 236). Different Conservation Intermediary Organizations also offer loan for conservation purposes specifically (Clark, 2007, p. 238).

Sources of charitable donations. Private independent foundations, family foundations, community foundations, charitable organizations, private citizens, and corporate foundations can also donate the money for the land trust conservation projects (Clark, 2007, p. 134). Sometimes a conservation idea is picked up by many organizations who support the same conservation project. Big corporations also have an interest in donations to the environmental projects to demonstrate their social responsibility (Lawrence & Weber, 2014).

The most successful conservation initiatives are those that have strong local community support, and if they are "located in popular tourist destinations" (Clark, 2007, p. 161).

Land trusts have different ways to raise money to support land conservation. They can negotiate with the landowner, design their own programs and raise or borrow funds (Clark, 2007, p. 10). If the land is located within the City, the City government might be the first to provide funding if possible (Clark, 2007, p. 32).

Conservation organizations. Wilcove and Chen, (1998), Ferraro and Kiss (2002) argue that buying land is the most important conservation strategy to conserve wildlife habitat (as cited in Davis et al., 2010). Non-profit organizations help to conserve land, when public financing does not have enough funds, according to Lerner et al. (2007), Albers and Ando (2003), and Merelender et al. (2004) (as cited in Davis et al., 2010). In other words, conservation organizations provide an alternative form of land conservation financing.

Chapter 6

Hypothetical "Conceptual Model" with Five Levels of Analysis

Proposal

"Model" by itself means communication of the concept (Gedo & Goldberg, 1973). The following "conceptual model" (Bedimo-Rung et al., 2005; MacKay, n.d.; Yalon-Chamovitz, 2009) draws ideas from conducted research and proposes five graphic levels of land use governance analysis. Yalon Chamovitz' (2009) "conceptual model of accessibility" graphic representation contributed to the graphic development of the proposed model (Appendix P).

"Multileveled models" (Nezlek, 2015) is a term mostly used in statistical analysis. The proposed hypothetical "conceptual model" (Bedimo-Rung et al, 2005; MacKay, n.d.; Yalon-Chamovitz, 2009) offers five "levels of analysis" (Nezlek, 2015; Ostrom, 2015) that are involved in the governance of land use for land conservation or development. The model proposes an option "or" as the central part of the model and establishes the dichotomy. According to "decision theory" (White, 1969), the user (land owner) has a choice to conserve the land "or" to develop it.

The unit of analysis is a patch of land under consideration of land development for housing or land conservation for recreation purposes. A patch can have any size, can be surrounded by other patches, and developed or not. The size of an area that would be considered for conservation "can be a very important criteria" since many different factors can impact it, such as "existing habitat edges, land ownership", "roads and rivers" (Hambler & Canney, 2013, p. 109). The size of land also determines which final "decision-making body" would be involved (Renz-Whitmore, personal communication, September 16, 2019).

City limits is another important factor that can impact the size of the patch. A unit of analysis is a patch, because in urban areas land is developed by patches (Simon, 2018).

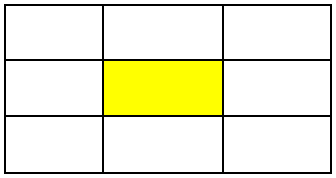


Figure 2. Land patch for analysis.

Social and Economic Approaches. With urban growth, comes the need for more careful land use planning. "The previous urban center model" was "surrounded by open spaces and agrarian areas" (Engblom & Bonham-Carter, 2015, p. 187). Since the amount of available land for development is decreasing, cities slowly transition from abundance of land resources to shrinking amounts because of economic development and population growth.

Cities have urban and suburban areas, which have different levels of development (Carbonell & Yaro, 2005). Development of the suburban areas offered "cheap land and green acres", developers provided "housing and affordable cars", and "local policy makers" approved more "road-building" and "suburban mortgage lending policies" (Engblom & Bonham-Carter, 2015, p. 188). Thus, mostly social and economic factors were considered, while environmental factors were excluded (Engblom & Bonham-Carter, 2015, p. 188).

Nobody considered the long-term impacts such as the "single-use land development", "loss of open spaces and biological diversity, and scarcity of water, clean air, and oil" (Engblom & Bonham-Carter, 2015, p. 189). At the same time, the amount of urbanized land will increase (Carbonell & Yaro, 2005).

Ecological/Environmental Approach. "Ecology needs to be considered as a primary context" and the society needs to be "committed to true cooperation with natural processes" (Engblom & Bonham-Carter, 2015, p. 190). "Environmental context" needs to be considered

in land policies creation (Cheesbrough, 2010, p. 109). “Ecological engineering” can help to “reconnect the urban fabric to its local ecology” (Engblom & Bonham-Carter, 2015, p. 194). “Reforestation initiative” can “improve air quality, manage storm water, provide wildlife habitat, mitigate heat island effect, offer recreation opportunities”, and reduce carbon levels (Engblom & Bonham-Carter, 2015, p. 195). “Environmental considerations” need to be part of “land-use development and planning” (Commission of the European Communities, 1998, p. 23).

Representatives of different agencies and organizations, both public and private, need to plan the city together (Cheesbrough, 2010, p. 109). Environmental factors have to be considered in the city development (Rosenwax et al., 2010). This can be done by using an “interdisciplinary approach” (Brown, 2010) by involving different agencies and organizations in community planning.

There must be a “multi-agency” approach to “address climate change” (Cheesbrough, 2010, p. 109). One of the most important elements in the process of urbanization is the ability of the city to “sustain ecosystem services” (Ernston, Leeuw, Redman, Meffert, Davis, Alfsen, & Elmquist, 2010, p. 531). This is where “urban governance” becomes very important (Ernston et al., 2010, p. 531). “Urban governance” needs to be sustainable, innovative, and consider the city being a part of a regional ecosystem (Ernston et al., 2010, p. 531). **“Instrumental Approach”** is essential, since instruments can greatly impact environmental, economic, and social aspects of the society (Braathen, 2005, p. 336). There should be integration of different systems, environmental considerations, planning, infrastructure, cooperation of private and public organizations, government and community, and “forward thinking” policies (Brown, 2010, p. 15).

In other words, there should be a combination of social, economic, instrumental, and environmental factors in policy considerations. “Well-planned city is itself a green machine and the most powerful integrator of economic, social, and environmental capital” (Choa, 2010, p. 73). When it comes to environmental policies, government can use such instruments as “information and education”, “pollution fees, permits, and taxes”, and involve stakeholders in “the policy making process” (Peters & Hoornbeek, 2005, p. 81).

Financial Approach is very important as any conservation program includes incentives for the participants. Selzer writes that there have been an increase of programs and funding “to protect open space” (as cited in McQueen & McMahon, 2003, p. x). Financial markets are involved in all parts of urban life. They supply finances to both urban development and conservation. “Fiscal instruments” need to be applied to “land-use planning” (Commission of the European Communities, 1998, p. 22).

Sustainable Development means “meeting the economic, social, and environmental needs of the present generation without compromising future generation’s ability to meet their needs” (Verster, 2002, p. 61; World Commission on Environment and Development, 1987, as cited in Lawrence & Weber, 2014). It is an “urgent issue for urban areas worldwide” (Matsumura, 2014, p. 225). “Sustainable urban development” includes “economic prosperity and employment”, “social inclusion”, “environmental protection”, “innovative and flexible decision-making process” (Commission of the European Communities, 1998, p. 6).

Cities need economic growth and development to combat poverty that deteriorates the environment (Lawrence & Weber, 2014). Cities need employment opportunities and environmental protection (Carbonell & Yaro, 2005). Such aspects as “environmental sustainability”, “social equity”, and “economic competitiveness” need to be considered

(Carbonell & Yaro, 2005). Verster (2002) includes social, economic, and environmental elements in his model. Different approaches must be considered on land use in an urban area due to scarcity of the land and high levels of demand for housing. Verster's proposed model includes ideas of risk, budget, and cost of property development in the environmental context. Following Figure 3 represents Verster's Model (Verster, 2002, p. 73).

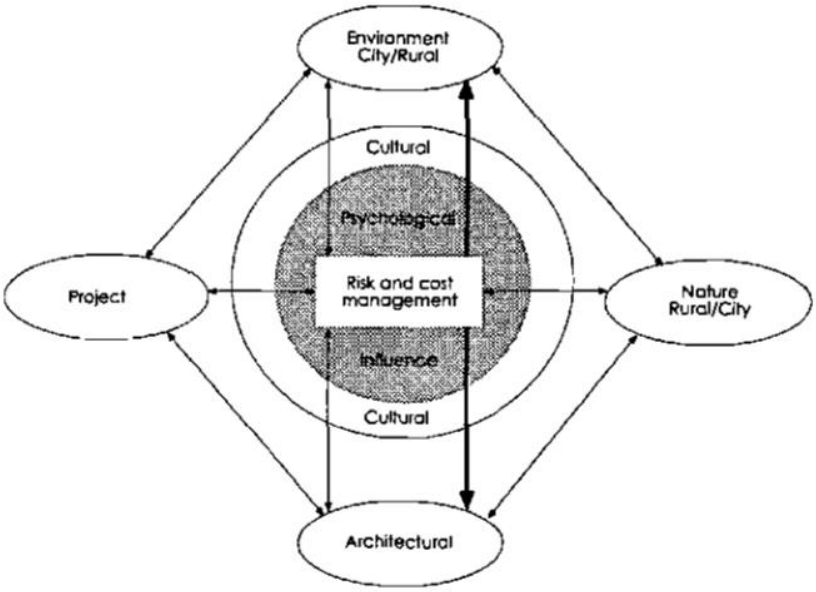


Figure 3. Verster's model. Source: Verster (2002, p. 73).

Social, economic, and environmental approaches are parts of the sustainable development. Multiple authors consider social, economic, and environmental factors in their models. Randolph (2004) considers "civil society" ("people power"), "the state" ("government power"), "the market" ("economic power"), and natural environment" ("ecosystems") as parts of the "sustainable environmental management" (p. 7). Every society "depends on the economy and the economy depends on the global ecosystem" (Elkington, 1998, p. 73). Social, economic, and environmental "bottom lines" are very complex (Elkington, 1998). In the business world, economic "bottom line" depends on economic capital, such as physical, financial, intellectual and human capital with different levels of

accounting and auditing (Elkington, 1998). An environmental "bottom line" includes natural capital which can be renewed, repaired, substituted, replaced, accounted and audited (Elkington, 1998). A social "bottom line" consists of social capital, such as human capital, public health, skills and education which can also be accounted and audited (Elkington, 1998).

Level One. Approaches to Land Conservation or Housing Development

This paper asserts that combination of economic, social, instrumental, financial, and environmental approaches needs to be considered when making a choice between land conservation or housing development planning by municipalities. Level of knowledge about the problem is very important for the decision-making process (White, 1969, p. 64). Land transaction for conservation has three very important measures: area size, "upfront acquisition cost" and "acquisition cost per hectare" (Davis et al., 2010). Land parcels that would be considered can have different size, location, and value.

Land use and housing development influence multiple processes in the city. Land represents a resource, a part of the local ecosystem, while housing represents an "urban service" that transforms the place into a living area (Ernston et al., 2010). Increase in "environmental awareness" can lead to "preservation of raw land and for high density urban development" (Gill-Chin, 2005, p. 25).

Drawing from the previously mentioned authors and models, respectively, the following model proposes to consider social, financial, economic, instrumental, and environmental approaches when deciding over conservation or land/housing development of a land patch. Part of "urban governance" is a "spatial distribution of ecosystem services" (Ernston et al., 2010). Sustainability means finding solutions through the "innovation in

urban systems", through the "collaboration between the society and the environment" (Ernston et al., 2010, p. 538). Following model represents the first level.

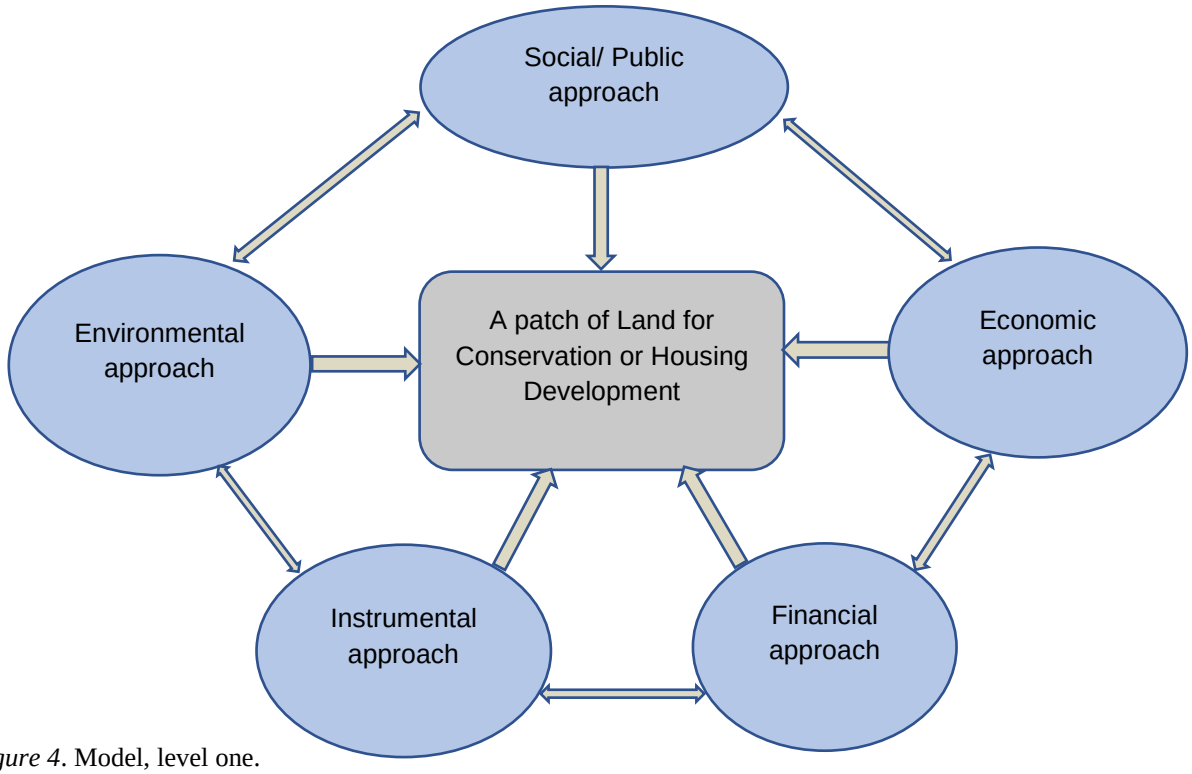


Figure 4. Model, level one.
This figure illustrates approaches. The arrows in the model represent directions of the relationships.

Level Two. Factors Involved into Land Conservation or Housing Development

Each approach in the model has different factors that can be represented and tested as variables. This model can be applied for both land conservation and land development. According to "decision theory", information can be "true" or "false" (White, 1969, p. 149). Data collection provides a source of information for the decision makers (White, 1969, p. 150). In other words, data needs to be reliable.

"Data-driven decision making" (Miller, 2019). Governmental decisions are influenced by data availability and data analysis (Kurian & Ardakanian, 2015). "Environmental and socio-economic issues" must be considered in the process of decision-making (Mannschatz, Buchroithner, & Hulsmann, 2015, p. 200). "Environmental and socio-

economic analysis" has to be based on data (Mannschatz et al., 2015, p. 200). "Data visualization" is another important tool that can help the government to make different decisions (Kurian & Ardakanian, 2015, p. 5). Especially for the land use decisions, "expert knowledge", scientific and visual data is required (Mannschatz et al., 2015, p. 201). "Social, economic and environmental" data is very important (Mannschatz et al. 2015, p. 204). Data is necessary to study different "environmental and socio-economic related processes" (Mannschatz et al., 2015, p. 193). Data analysis and evidence can influence the decision makers to "make political choices" (Kurian & Ardakanian, 2015, p. 11). Following model represents level two.

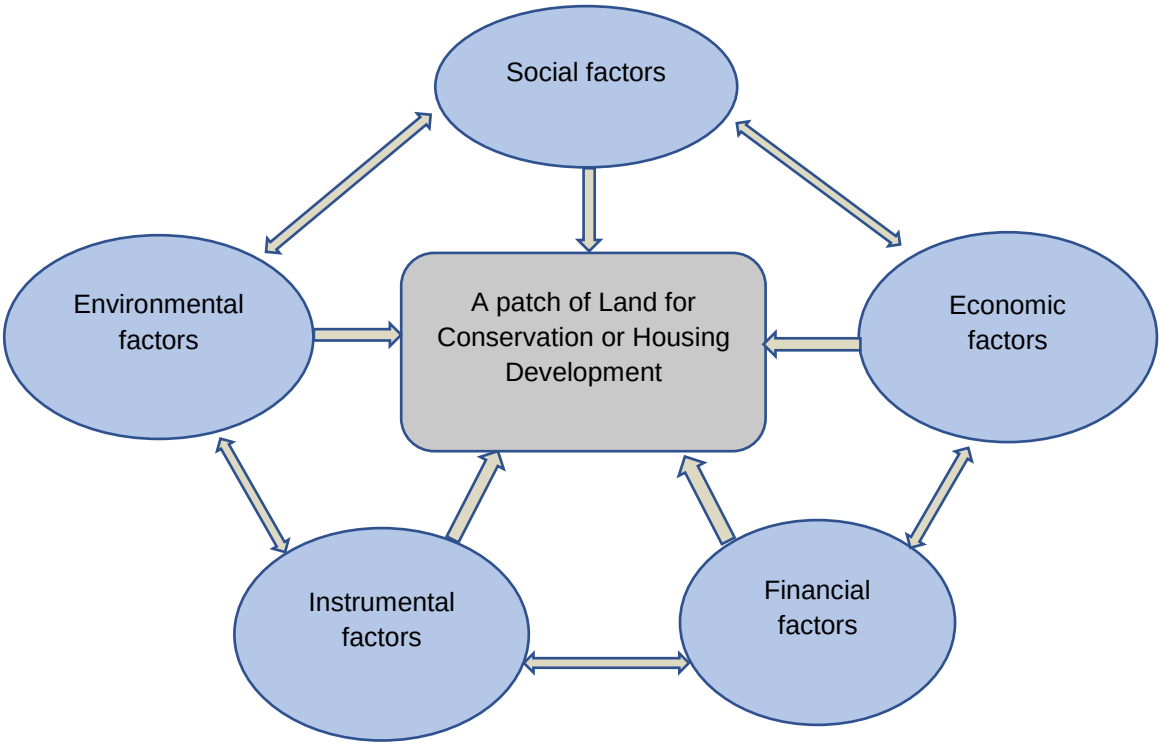


Figure 5. Model, level two.
This figure illustrates factors. The arrows in the model represent directions of the relationships.

Level Three. Costs and Benefits

There are always different types of costs and benefits involved in any decision (Ostrom, 2015). Assessing costs and benefits before the decision is made is part of a rational

behavior (Chhotray & Stoker, 2009). "A central concept in the decision theory" is "measurability" (White, 1969, p. 26). Value impacts the choice in the decision-making process (White, 1969).

An environmental approach adds additional costs, but at the same time provides benefits. For example, if the patch of land can be used for a park, then different recreation activities can be planned there (Bedimo-Rung et al., 2005). Following Figure 5 is Bedimo-Rung et al.'s (2015) "conceptual model", based on twenty-five years of research of benefits of parks and recreation services:

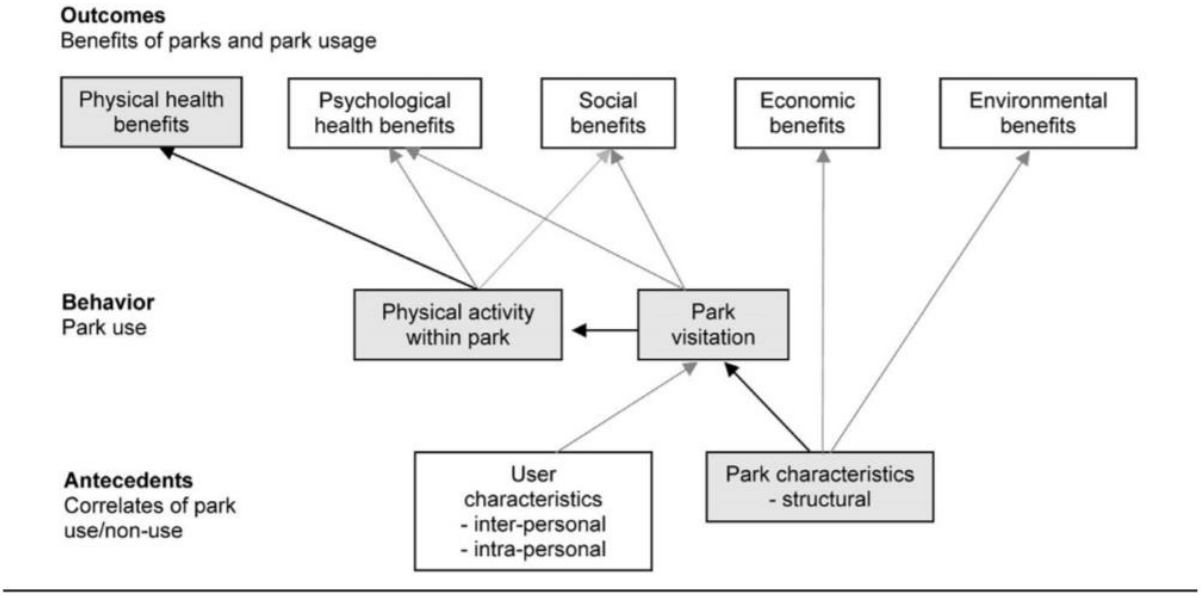


Figure 6. Bedimo-Rung et al.'s "conceptual model". Source: Bedimo-Rung et al. (2005, p. 160, as cited in Nourie, 2019).

Social benefits of parks include opportunities for social interactions and lower crime rates in the greener neighborhoods (Bedimo-Rung, 2005). Regarding the economic benefits, proximity of the properties to the park was "positively related to the housing value", but only on properties next to the park (Bedimo-Rung, 2005, p. 162). Environmental benefits include air pollution reduction, shade, and cooling effects (Bedimo-Rung, 2005).

It is necessary to "document public benefits" of green areas (McQueen & McMahon, 2003 p. 157). Wolf (2010) has done an extensive literature review and found out multiple measurable benefits of green areas for the city. Information for the following table (content: copy and paste) has been taken from Wolf's (2010, para. 6) research. Table shows price increase for development lots with trees or conserved forests. Developed patches that have trees sell faster (as cited in Wolf, 2010).

Table 1

Price Increases for Lots with Trees for Housing Development

Price Increase	Condition
"18%	building lots with substantial mature tree cover
22%	tree-covered undeveloped acreage
19-35%	lots bordering suburban wooded preserves
37%	open land that is two-thirds wooded"

Table 1. Price Increases for Lots with Trees for Housing Development. Source: Wolf (2010).

The following table (content: copy and paste) shows results from 30 studies (Wolf, 2010, para.7) that demonstrate price increases for the housing located next to open spaces. Also, houses that have an open space view have higher selling prices (Wolf, 2010).

Table 2

Housing Price Increases

Price Increase	Condition
"10%	inner city home located within 1/4 mile of a park
10%	house 2 to 3 blocks from a heavily used, active recreation park
17%	home near cleaned-up vacant lot
20%	home adjacent to or fronting a passive park area
32%	residential development adjacent to greenbelts"

Table 2. Housing Price Increases. Source: Wolf (2010).

A financial approach helps to calculate the costs of any project. Especially when it comes to land conservation, such factors as “area, naturalness, rarity” can create higher “conservation value” (Hambler & Canney, 2013, p. 109). A specific specie habitat or a wetland can also contribute to land conservation (Hambler & Canney, 2013).

An instrumental approach determines what rules and regulations need to be applied. In the case of housing development, the same analysis would provide valuable results by using variables. Very often an environmental approach (costs and benefits) are excluded due to the costs and market competition demands. Environmental benefits are not always easy to calculate.

The following model, level three, can be used in the cooperative market where all participants consider the environmental approach as well. Public costs would include costs of the infrastructure, including roads, trails, water, and sewer services. Land conservation would provide multiple environmental benefits such as clean air and recreation opportunity, while a new housing area would provide more houses, and revenue generation opportunities for land and house owners. Different instruments influence land development, with providing both costs to the residents and developers, and more living area for the residents. The following model (next page), represents costs and benefits analysis.

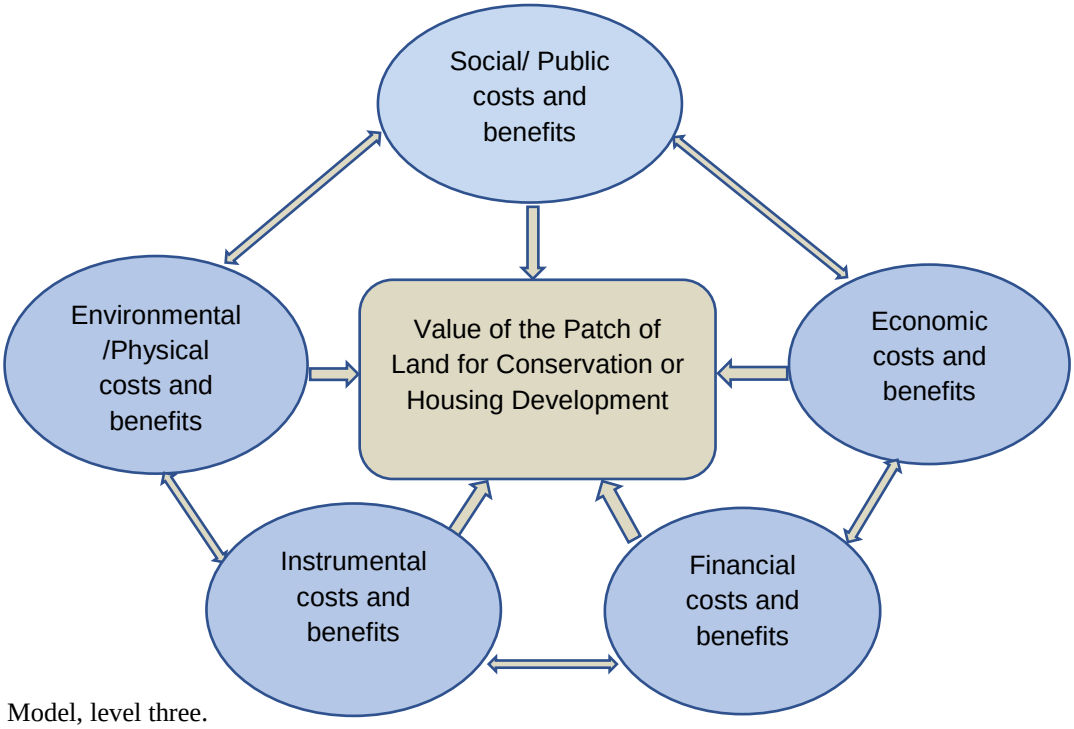


Figure 7. Model, level three.
This figure illustrates types of costs and benefits. The arrows in the model represent direction of the relationships.

"Unification of economic, environmental, and social benefits" would provide different levels of "intensive utilization" of land resources (Yang, 2015, p. 195). Instrumental benefits would come from using the right policy tool for the optimal land development in a specific area. Financial benefits would come from generated revenue by the land. In other words, there must be an "economic equilibrium" for the model to be effective (Debreu, 1959).

Level Four. Land Conservation or Housing Development Governance

Cities are complex "socio-ecological-technical systems" (Webb et al., 2018, p. 57). Local government can face sometimes difficult decisions, due to multiple issues in urban areas. Decision-making in an "urban context" can be influenced by the "social drivers" such as citizen behavior; "economic and financial drivers" such as economic development and housing availability; "institutional and organizational drivers" such as "political cycles and influence" (Webb et al, 2018, p. 65). An urban environment includes "complex urban

systems", "diversity of actors" and "multi-level governance", according to Neuman (2007), Loorbach (2010), Ostrom and Cox (2010) (as cited in Webb et al., 2018, p. 69). It is very important for the decision-makers to have a clear understanding of the "state of the system", and how their decision will impact the system (White, 1969, p. 142).

Multiple institutions are involved in the governance process (Chhotray & Stoker, 2009; Hooghe & Marks, 2003; Leon-Moreta, 2019b; Ostrom, 2015; Schechter, 2016). "Institutions", besides meaning "organizations", can also mean "set of working rules" (Ostrom, 2015, p. 51). "Formal law" is the source of "working rules" (Ostrom, 2015, p. 51). "Rules provide stability of expectations" (Ostrom, 2015, p. 53). Change or "transformation of rules" also involves costs (Ostrom, 2015, p. 140).

Different institutions, participating in governance, provide "flexible governance" (Hooghe & Marks, 2003). Especially at the local level, "type II governance" is present, with multiple flexible, "task- specific jurisdictions" operating at "numerous territorial scales" and "large number of levels" (Hooghe & Marks, 2003, pp. 237-238). Local government agencies, departments, and financial institutions make very important decisions of whether to invest or not in the housing development (Harvey, 2009). Business organizations supply different construction materials, while private actors such as residents will invest in the housing market.

"Effective conservation" can be achieved by collaboration of the "local and national government, business, civil society, local land-owners, farmers" (Hambler and Canney, 2013, p. 315). Land conservation can be "planned strategically" to combine "carbon storage" and species habitat (Hambler & Canney, 2013, p. 121). The following model (next page) depicts

"multi-level governance" (Hooghe & Marks, 2003; Zeemering, 2016) and interdependence of institutions.

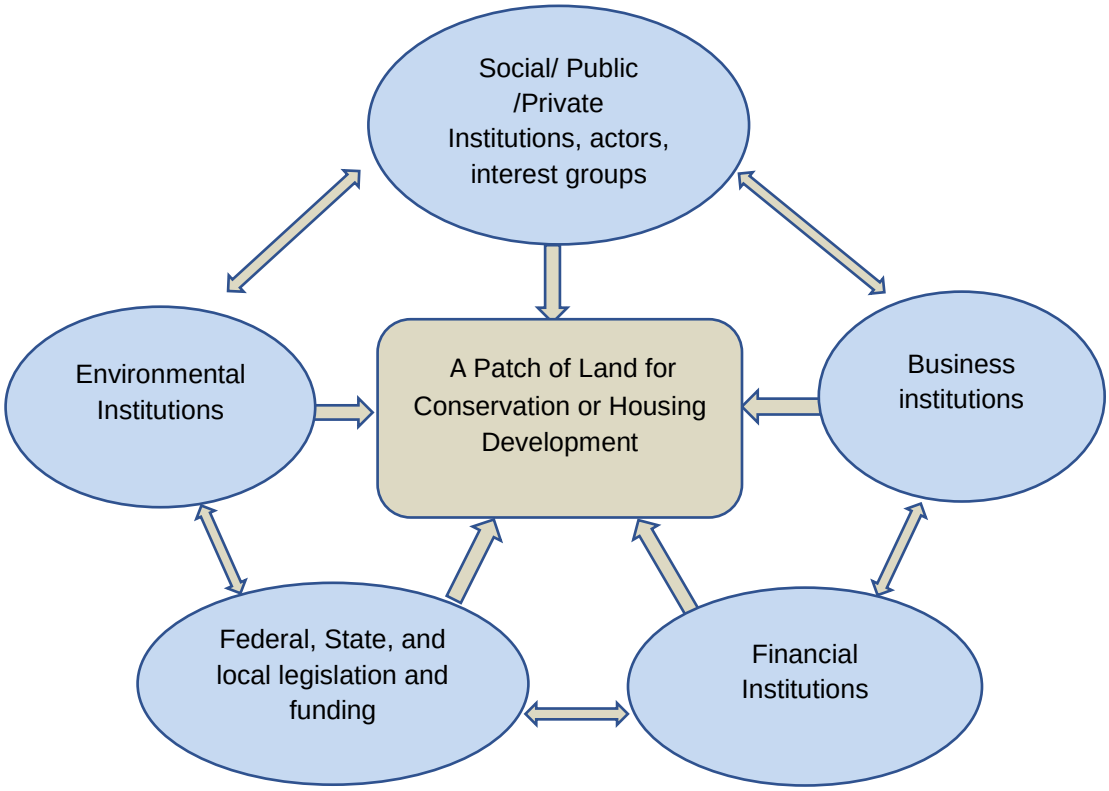


Figure 8. Model, level four. This figure illustrates institutions. The arrows in the model represent directions of the relationships.

Level Five. Market-Driven Decision Making

If a specific piece of the land would be developed or conserved, different markets would be involved. The "political market" (Lubell, Feiock, & De La Cruz, 2009; Leon-Moreta, 2019a) consists of multiple interests of local political stakeholders in either conserving or developing the land. According to Lubell et al. (2009), "political market framework consists of demanders such as interest groups and supplier- the government" (p. 708). The government needs to consider all implications of either developing or conserving land. Financial markets support both land and housing markets (Harvey, 2009; the World Bank and the Development Research Center of the State Council, P.R. China, 2014). Data

analysis and evidence can influence the decision makers, who will "have to make political choices" (Kurian & Ardakanian, 2015, p. 11). Especially "market-based instruments" can bring changes (Elkington, 1998).

The financial market supports all markets. Permit trading would be involved if the development would include pollution production (Elkington, 1998). Landowners can sell or donate their developmental rights "through conservation easements" (Leon-Moreta, 2019a, p.14). "Carbon pricing" or "carbon tax" is a new "policy instrument for climate change action" (MacKay, n.d.; World Bank & Ecofys, 2018, p. 12). It is an international "carbon-pricing mechanism" (World Bank & Ecofys, 2018, p. 24). It is a "market-based mechanism" (World Bank & Ecofys, 2018, p. 37). It is a "tool to mitigate climate-related financial risks", "discover new low-carbon business opportunities and prepare for a transition to a low-carbon economy" (World Bank & Ecofys, 2018, p. 55). Introduced *S.1128 American Opportunity Carbon Fee Act* proposes implementation of the "carbon dioxide emissions fee" (Congress.Gov, 2019b, sec. 4691).

There is a close relationship between all markets involved in the process. All "markets depend on predictable, effective, and cost-efficient regulation" (Elkington, 1998, p. 347). Especially, land use regulations can impact local development. "Developed and applied the right way, legislation helps business" (Elkington, 1998, p. 347). Markets depend on "social, environmental, and economic choices" that actors will make (Elkington, 1998, p. 354).

Certain "market forces shape urban land use" (Harvey, 2009, p. 162). Land and houses have "use and exchange value" (Harvey, 2009). According to the author, the housing market is influenced by many different actors. Real estate agents use housing value for profit

(Harvey, 2009). House owners can either rent the house out or occupy it. Developers create new value by using capital to produce profit. Financial institutions provide financial support, while government can "impose and administer a variety of institutional constraints" such as "zoning and land use planning control" (Harvey, 2009, p. 166). Following model, level five, represents market relationships.

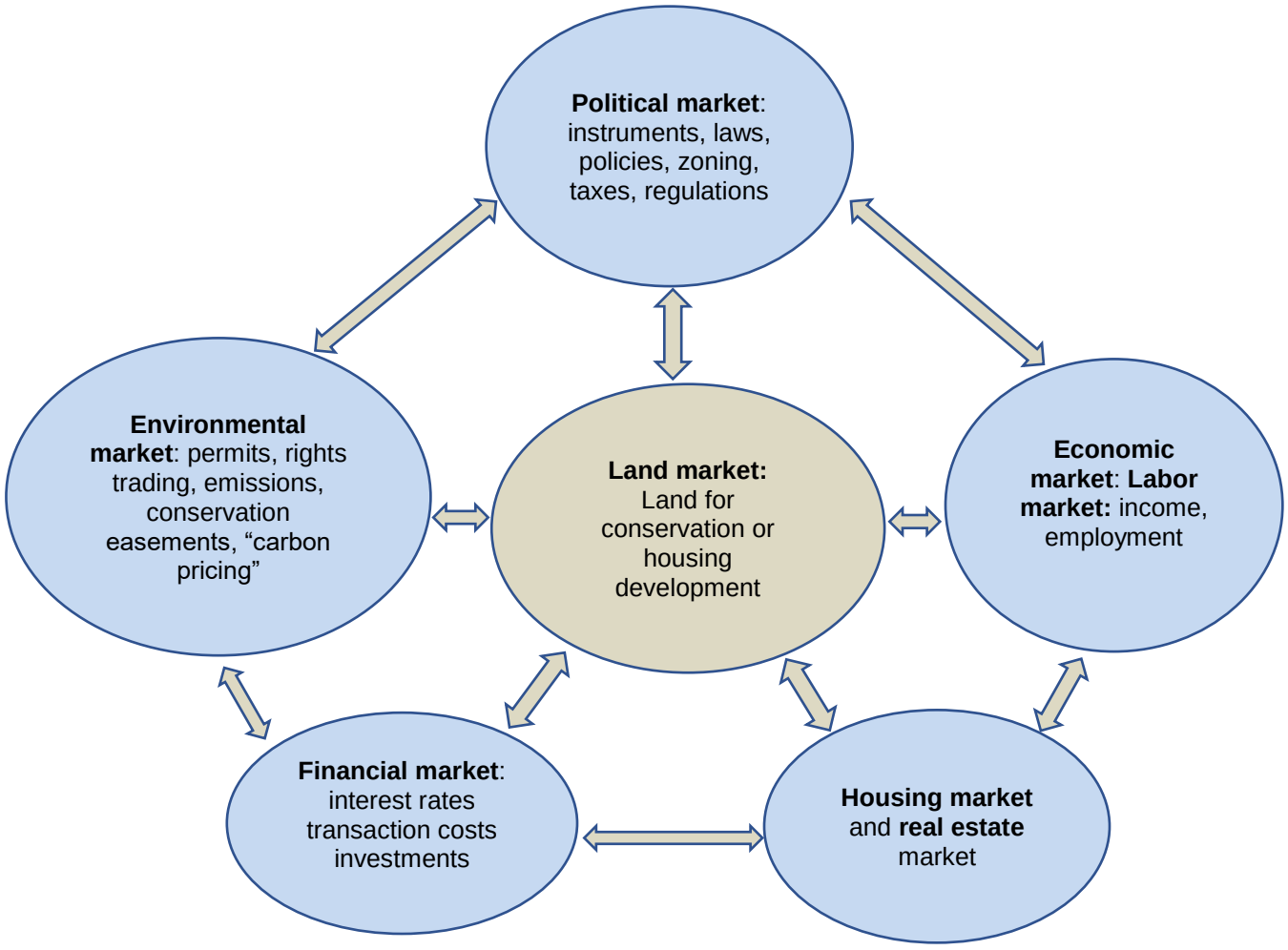


Figure 9. Model, level five. This figure illustrates markets. The arrows in the model represent directions of the relationships.

The proposed Hypothetical "Conceptual Model" of Land Conservation or Housing Development Governance offers five levels of analysis that are involved in the decision-making process. The final graphic representation of the proposed model would be:

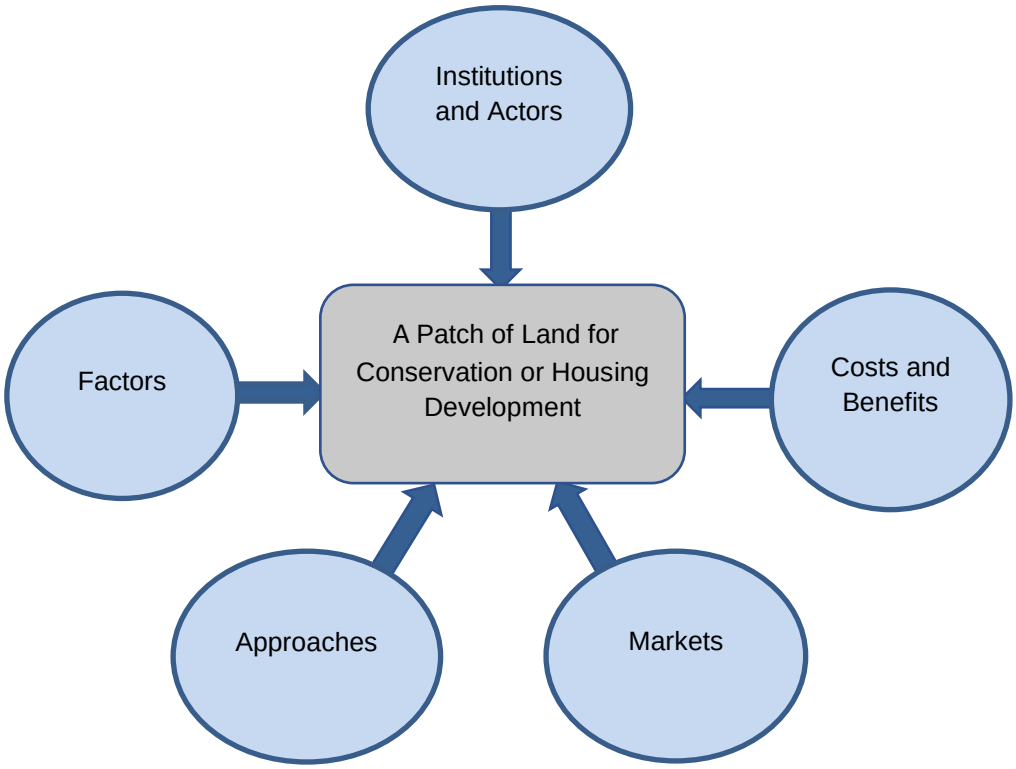


Figure 10. Proposed model. This figure illustrates the final model. The arrows in the model represent direction of the relationships.

Conclusion.

The proposed hypothetical "conceptual model" shows different levels of the decision-making process. Multiple institutions and stakeholders are involved. Although local government makes the final decision on land development or conservation, the influence of markets will always be present. If land conservation increases the amount of recreation area, reduces air and water pollution, preserves cultural heritage, protects natural environment, ecosystems, and wildlife, and increases the value of the surrounding areas, the decision will favor conservation. Such decision will provide "better outcomes" (White, 1969) for the community.

If land development for housing improves the state of housing in the city and reduces housing demand, there will be a "better outcome" (White, 1969) by developing the land. The

choice will depend on “knowledge”, “values”, “information” and “measures of uncertainty” (White, 1969, p. 80). Laws, “working rules”, and regulations (Ostrom, 2015, p. 51) guide the decisions of the local government.

Data analysis can be used to develop a better understanding of the processes in urban areas. Costs and benefit analysis would identify if proposed land development or conservation would be beneficial for an area. If a selected patch generates more benefits, it would be beneficial to implement the project. If it imposes more costs, than the project would cause losses. *Carbon pricing* would add additional value to the conserved land, if it could be used as a *carbon sink* to improve the environmental conditions in the area. This would include extra benefits of conserving urban forests, woods, trees, and *self-sustainable ecosystems.*

Since land conservation would impact land value, especially if there is land scarcity and demand for land development, land conservation can be considered as the price/value change mechanism itself. Different markets will influence the prices of remaining available land for development. Location, size, previous use, and neighboring patches will also influence decision on the patch use.

Chapter 7

The City of Albuquerque

To answer the main research and supporting questions, this paper investigates the process of land use governance in Albuquerque, New Mexico. The City of Albuquerque is one of 400 urban areas in the U.S., with 545, 438 people (U.S. Census Bureau, 2010). "Urbanization is generally associated with higher income and productivity levels" (World Bank & the Development Research Center of the State Council, P.R. China, 2014, p. 46). Albuquerque has been selected for this study, because it is a highly populated urban area in New Mexico. Urban areas have "more efficient labor markets, lower transaction costs and easier knowledge spillover" (World Bank & the Development Research Center of the State Council, P.R. China, 2014, p. 46). Since Albuquerque has industrial and agricultural land enclosed within the city limits, not only land, but also water conservation policies and plans play a very important role in urban growth and development.

Large metropolitan areas offer opportunities for different types of services, while industry usually moves to the suburbs (as cited in World Bank & the Development Research Center of the State Council, P.R. China, 2014, p. 47). Since the population of Albuquerque is growing, there is a need for both housing and recreation. This paper investigates what approaches have been taken in Albuquerque towards land and water conservation, housing development; what factors impact the decision-making process; what costs and benefits are involved, and what institutions and actors participate. How does the city meet the growing demand for recreation and housing?

Social Approach

History of land use. The City of Albuquerque was founded in 1706 by Spanish settlers and soldiers (The Albuquerque Museum of Art and History, 2011). Before they arrived in 1539, the territory of New Mexico was inhabited by Pueblo, Apache, Navajo, Comanche, Ute, and Shoshone native tribes (Price, 2011, p. 32). The native population had mostly agricultural land use in the area. Spanish settlers brought with them different plant and animal species that were new to New Mexico. They also started extensive farming. The Spanish settlers used native people as slave workers for agricultural work till Pueblo Revolt of 1680 (Price, 2011, p. 32). New Mexico Territory was annexed in 1846 by General Stephen Kearny (Price, 2011, p. 35).

As the population started to grow, the area around the Rio Grande and Albuquerque continued to be used mostly for farming. Especially in Albuquerque, there were many small and large farms, where farmers grew different types of fruits and vegetables. Trade with Mexico included movement of cattle, different types of materials, mining, manufacturing, and agriculture. In 1902 U.S. Reclamation Service, that became later the Bureau of Reclamation, was "formed to prevent deforestation and overgrazing" (Price, 2011, p. 36). "The Taylor Grazing Act" in 1934 regulated cattle grazing that have damaged public lands. Oil and gas, discovered in 1923-24, gave boost to industrial development. Historically, New Mexico has always been an agricultural, mining, and since 1943 the Manhattan Project, a nuclear research state (Price, 2011).

Land grants and land use. During Mexican and Spanish periods of New Mexico History, multiple land grants were issued to people and communities in New Mexico (New Mexico State Records Center and Archives, 2000) including Albuquerque. Since in 1848 when New Mexico became a part of the U.S., the U.S. government implemented two

mechanisms for recognition of land grants. In 1854 the Surveyor General of New Mexico assessed the origin and ownership of land in New Mexico. In 1891 the Court of Private Land Claims was established to resolve new and old claims (United States General Accounting Office, 2004). In 2014 the General Accounting Office issued a report on Land Grants in New Mexico. 295 land grants, including 154 community land grants, 141 individual and 23 for indigenous Pueblos, were issued by Spain and Mexico (United States General Accounting Office, 2004). They were "individual grants" issued to individuals, and "community grants", issued to communities that could not be sold (United States General Accounting Office, 2004, p. 14 & p.24).

The biggest and the oldest land grant in New Mexico, the Atrisco land grant, is in Albuquerque. 41, 533 acres of land were given to Don Fernando Duran y Chavez in 1692 by the government of Spain (Albuquerque Tricentennial, 2008). In 1703 Atrisco was a small community of settlers. It was recognized as a small town and supervised by Bernalillo County (Albuquerque Tricentennial, 2008). In 1706 Albuquerque took over the administrative supervision (Albuquerque Tricentennial, 2008). Another 70,000 acres Land Grant was given to Captain Diego Montoya in 1712. It was later divided between the heirs (Albuquerque Tricentennial, 2008). Other land grants were given to families that established farms in the North Valley, such as Los Griegos, Los Montoyas, Los Poblanos, and Los Gallegos (Albuquerque Tricentennial, 2008). Currently, the New Mexico Land Grant Council (NMLGC), a state agency that was created in 2006, supports community Land Grant claims in New Mexico (New Mexico Land Grant Council, 2018). Land Grants impacted land use in Albuquerque.

Social characteristics. The City of Albuquerque is a part of the Bernalillo county, located in the north central part of New Mexico, next to the Sandia and Manzano Mountains and the Rio Grande. It is the largest city in New Mexico (City of Albuquerque, 2018a). It has "an extensive network of railroads, airlines, and highways" (McNamee, n.d.). It is also a part of the highly populated Albuquerque Metro area that consists of Bernalillo, Sandoval, Valencia, and Torrance counties. In 2018, the population of the City was 558,545 people (City of Albuquerque, 2018a). The population of the county is projected to grow 46% by 2040, with major growth in the City of Albuquerque (City of Albuquerque, 2017b, p. 5-3). Albuquerque has a developed infrastructure and multiple social services. The City has modern and historical sites, unique culture and architecture. Museums in Albuquerque reflect the deep history of the city. Major reconstruction of the Central Avenue added a special touch to the historic Route 66. The City's bus services connect different parts of the city.

"Urban governance" (Broto, 2017; Raco, 2009). Albuquerque was chartered as a town in 1885 and became a city in 1891 (City of Albuquerque, 2018a). Since 1917, Albuquerque is a charter city with a "maximum local self-governance" (City of Albuquerque, 2018a). In 1974 the City established a "mayor-council form of government" with nine councils (City of Albuquerque, 2018a, p. 1). The "mayor-council form" has separated powers (Leon-Moreta, 2019a). "Mayors can be especially responsive to the public opinion; if constituents express preferences for conservation, a mayor will be responsive to them by promoting conservation plans" (Leon-Moreta, 2019a, p. 11). The City of Albuquerque has many parks and open spaces. City mayors "are more likely to set an agenda for conservation whenever the constituents attach value to the conservation of open space" (Leon-Moreta, 2019a, p. 11).

“Instrumental approach”

“Intergovernmental” relations (Leon-Moreta, 2019c). The City of Albuquerque has close relationships with Bernalillo County and the State of New Mexico. The relations between the four counties within the Albuquerque Metropolitan Area is organized through Mid-Region Council of Governments (MRCOG) which includes Bernalillo, Sandoval, Valencia, and Torrance counties to plan future development of the area (MRCG, n.d.). “The Comprehensive Plan”, in accordance with the State law, adopted by the City of Albuquerque and Bernalillo county in 1975, plans land use, land conservation, and urban development (Bernalillo County, 1992; Hess et al, 2014, p. 252). Other plans and policies, adopted by the City and the County are the “subordinates to the Comprehensive Plan” (City of Albuquerque, 2017b, p. 8). Zoning ordinance “is a vital tool” to accomplish the Plan (Bernalillo County, 1992). Thus, relations between the City and the County are guided by policies and plans.

The City of Albuquerque has over 1000 policies, plans, standards, and ordinances that guide and outline the City development since 1970 (City of Albuquerque, 2017b). Public administration participates in “multi-level governance for policy design and implementation” (Zeemering, 2015, p. 206). In the city government, “planning, environmental management, economic development, and social services” can form “different governance relationships to pursue local developmental goals“ (Zeemering, 2015, p. 209).

The map below in *Fig. 11* shows Albuquerque and Bernalillo county.

Figure 11. Albuquerque and Bernalillo county map. Source: Albuquerque/Bernalillo County Comprehensive Plan (City of Albuquerque, 2017b, p.1-5). City land is in blue color, green color highlights unincorporated areas, and grey color is other municipal, tribal, or federal land.

Plans and ordinances. The City of Albuquerque uses different instruments for city development and growth. The City has a "Code of Ordinances" where different social, environmental, economic, and financial aspects are outlined (City of Albuquerque, New Mexico, 2019). Local government controls "changes in local landscapes" with the help of ordinances (Koura, 2014, p. 209). The City of Albuquerque and Bernalillo County have revised a joint "Comprehensive Plan" in 1998 and updated it in 2017 as "Albuquerque-Bernalillo County (ABC) Comprehensive Plan" (City of Albuquerque, New Mexico, 2019; City of Albuquerque, 2019f; City of Albuquerque, 2017b). The City of Albuquerque (2008) *Urban Growth Management in Other Communities Plan* offers an analysis of growth management techniques in different cities across the U.S.

Zoning. The first zoning code in the City was proposed in 1928, adopted in 1959, replaced in 1965, and later in 1975 (City of Albuquerque, 2019p). Between 1976 and 2018 "Zoning code was amended nearly 200 times" (City of Albuquerque, 2019p). *Integrated Development Ordinance,* adopted by the City Council in 2017, focuses on land use, zoning, planning, different levels of residential housing development, and protection of parks and open spaces (City of Albuquerque, 2018f; City of Albuquerque, 2019p).

Laws, policies, acts, and regulations outline land use in Albuquerque, Bernalillo County, and New Mexico. *1971 City Charter Article IX* states that the City Council "shall protect and preserve environmental features such as water, air, and other natural endowments, insure the proper development and use of land, and promote and maintain an aesthetic and humane urban environment" (City of Albuquerque, New Mexico, 2019, Article IX). Major policies are provided in the "Albuquerque/Bernalillo County (ABC) Comprehensive Plan" (2017b): "Land use policies" 5.2.1., 5.3.7., "Urban design policies" 7.3.2 and 7.3.3., "Heritage Conservation Policy" 11.2.1., "Natural resources policy" 4.1.5., among others. The ABC Plan defines "Areas of Change" for redevelopment and growth, and "Areas of Consistency" for protection of neighborhoods and open spaces (City of Albuquerque, 2019p).

State and Federal legislature provides bills that impact land use in the state. HB 266 law "*Forest and Watershed Restoration Act"* "creates a mechanism for large scale forest restoration" to "protect critical watersheds and communities" (Stone, 2019a). Since Albuquerque is in the Rio Grande watershed area, water conservation is important. *"Soil and Water Conservation District Act*" from 1978 declares that "water, land, and other natural resources are the basic physical assets of New Mexico" (State of New Mexico, 2012). Land and soil must be "beneficially conserved and developed" (State of New Mexico, 2012). This law has different amendments that clarify the Act. New Mexico has six water and land conservation regions, that include 47 conservation districts (State of New Mexico, 2012).

"The Watershed District Act" enacted in 1978, "preserves and protects New Mexico's land and water resources" (New Mexico Department of Agriculture, 2018). There are seven watershed districts in New Mexico. They have been created as "sub districts of soil and water

conservation districts" to regulate water use and conservation, flood control and prevention (New Mexico Department of Agriculture, 2018).

New Mexico State governs the use of the underground water in the Underground Rio Grande Basin since 1956 (Bartolino & Cole, 2016, p. 65). In 1999 with the "*Ground Water Storage and Recovery Act*", the local governments could store the water underground by artificial recharge (Bartolino & Cole, 2016, p. 65) to prevent evaporation. Albuquerque relies on both the Rio Grande and the groundwater supply from the aquifer (U.S. Geological Survey, 2014). "*The Rio Grande Compact"* – an agreement between New Mexico, Colorado, Texas, and Mexico governs the flow of the Rio Grande since 1939 (Bartolino & Cole, 2015, p. 67).

Economic approach

Albuquerque's economy consists mostly of trade and services. There is a small amount of manufacturing. There are many small and medium sized tech companies and non-profit organizations as well. Governmental organizations are the biggest employers. The City operates multiple outdoor recreational facilities. Albuquerque focuses on being energy-efficient and transparent. Solar power companies offer an alternative energy source. The Economic Development Department works to increase city's economic development (City of Albuquerque, 2019b). The City is surrounded by land "owned by tribes, other municipalities and the federal government" (City of Albuquerque, 2017b, p. 5.3). Volcano Heights and Mesa del Sol areas are available for the development (City of Albuquerque, 2017b). The map below in Fig. 12 from the Albuquerque/Bernalillo County Comprehensive Plan shows land use classification.

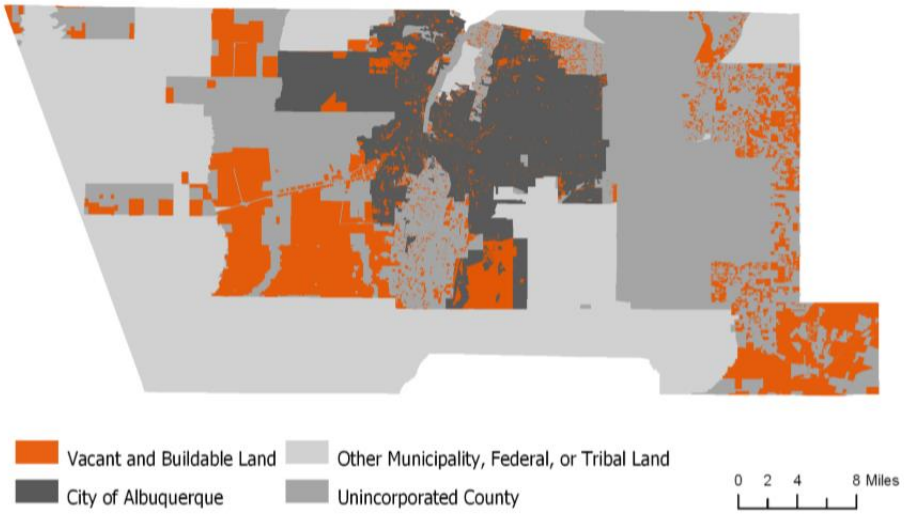


Figure 12. Land for development. Source: City of Albuquerque (2017b, p.5-6).

Land ownership. Land in Albuquerque and Bernalillo county is owned by the local government, tribal government, private owners, Bureau of Land Management, U.S. Forest Service, and the State Trust (New Mexico Land Conservancy, 2010). Historically, because of the land grants, land was considered more to be a part of the community, "rather than a commodity that could be exchanged or sold in a competitive market" (Albuquerque Tricennial, 2008). The Atrisco Land grant was incorporated as a private corporation, Westland Development Co., that manages about 57,000 acres of Atrisco land holdings (Albuquerque Tricennial, 2008). Albuquerque has more than 29,000 acres of open space land in and around the City (City of Albuquerque, 2019c). The City has multiple bike and hiking trails, parks and open spaces. All Albuquerque open spaces "are managed to conserve natural resources, for education, and for recreation purposes" (City of Albuquerque, 2019c).

New Mexico has over 77 million acres of land, with 25% of Federal land, 12% state land, 2% local government, 16% tribal land and 45% of land owned by farmers and ranchers (New Mexico Association of Conservation Districts [NMACD], 2018). The Albuquerque

map below in *Fig. 13* shows the current area of the city within neighboring towns and unincorporated areas. Appendix A also shows land use in the city.

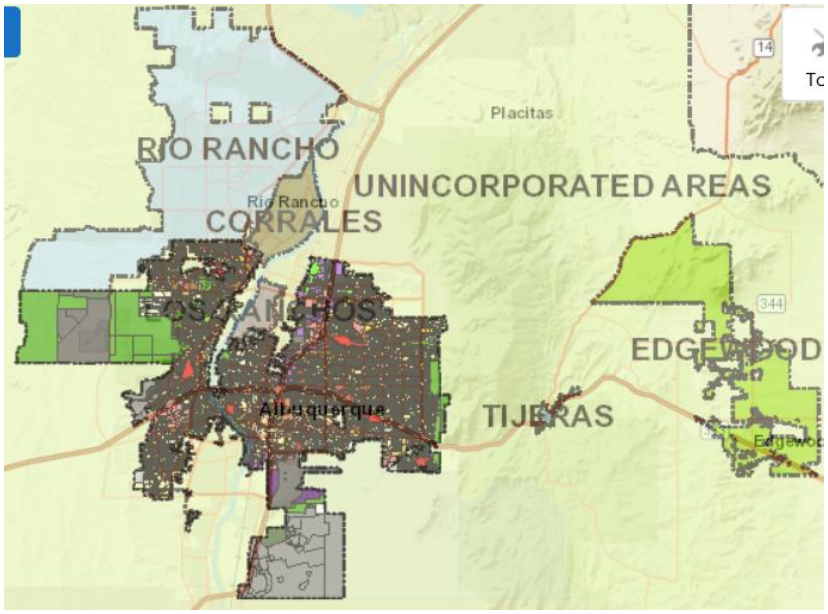


Figure 13. City of Albuquerque map. Source: City of Albuquerque (2018a).

Housing development. Albuquerque has been developing and growing from the time of its establishment. *Fig. 14* shows the map of the City in 1886.

Figure 14. City of Albuquerque map, 1886. Source: City of Albuquerque (2019e).

Kirtland Air Force Base boosted the housing development by bringing more people into the area. Unique nature, picturesque landscape, abundance of open space, and rich natural resources constantly have been attracting people from all over the world.

The City has a well-known Route 66 with preserved historic buildings (City of Albuquerque, 2019d). “Conservation of historical environment and culture is essential” for the “sustainable development” (Morishige, 2014, p. 216). “*The Landmarks and Urban Conservation Ordinance*” adopted in 1978 and amended in 1985 and 1991, impacted preservation of “structures and areas of historical, cultural, architectural, engineering, archeological, or geographic significance located in the city” (Albuquerque Code of Ordinances, 1991, p. 2). The City has developed “its own style”, “cultural and social norm of housing and local settings” (Koura, 2014, p. 210).

New housing development contributes to new job creation and revenue increase for the City “in the short term” (City of Albuquerque, 2017c, p. 9-1). “In the long term”, well-planned, affordable, and sustainable housing “can attract workers and employers to the region” (City of Albuquerque, 2017c, p. 9-1). Any “change in the landscape“ and land use is connected to development (Koura, 2014, p. 210). Location of the house also impacts housing value.

The map in *Fig. 15* shows historical perspective in the housing development (next page).

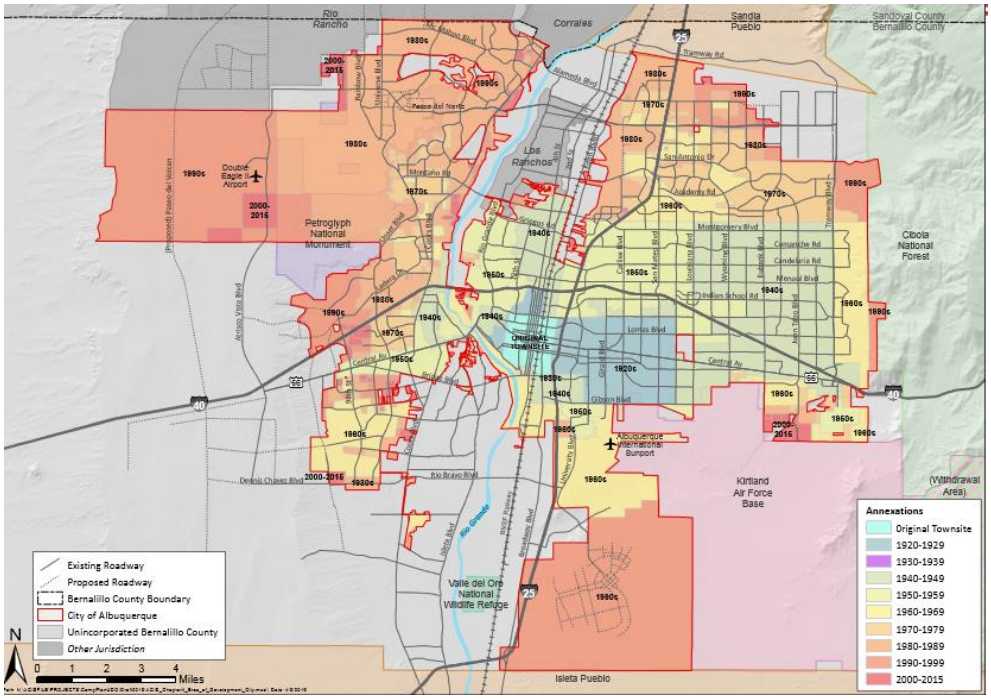


Figure 15. Housing development. Source: City of Albuquerque (2017b, p.4-8).

The map in *Fig. 16* shows current housing development areas and open spaces.

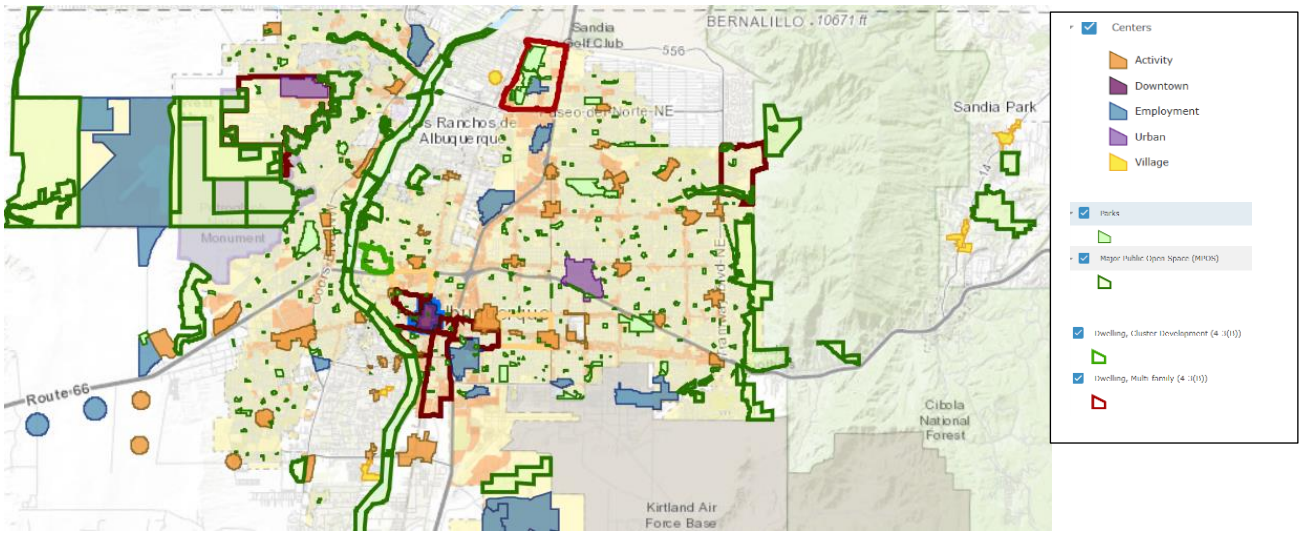


Figure 16. Development areas. Source: City of Albuquerque (2019o).

Such factors as “population increase”, “senior population increase”, “income”, and demand for different types of housing impact City’s housing development (City of Albuquerque, 2017c). U.S. Census tracts maps show distribution of household income (Appendix N) and monthly cost of the house (Appendix O).

City's Goals and policies address current and future housing development with special focus on "supply", "sustainable design", "density", "homelessness", "vulnerable population", "development process" and "partnerships" (City of Albuquerque, 2017c). The "County Affordable Housing Plan" focuses on "higher-density" housing development, "mixed-use units", and "transit-oriented development" (City of Albuquerque, 2017c, p. 9-14). One Albuquerque Housing Fund helps homeless people (City of Albuquerque, 2019q). The Sawmill Community Land trust together with the City of Albuquerque provides affordable housing (Sawmill Community Land Trust, 2019).

Financial Approach

Land conservation financing. Each year the City of Albuquerque publishes Comprehensive Annual Financial Reports (CAFR). This thesis looks at the CAFRs from 2003 to 2017. The economy in the City greatly influences the revenues that the City receives from taxes, especially "gross -receipt tax" and government "business-like" activities (City of Albuquerque, 2017a). Land is a part of the City's capital assets. It is an asset that is "not being depreciated" (City of Albuquerque, 2017a, p. 73). Land can depreciate due to chemical spills, pollution, and previous industrial use (Miyagawa, 2014, p. 261). Buildings and infrastructure can depreciate and need further maintenance. Many recreational facilities generate their own revenue.

Recreation is a part of the governmental activities. The proceeds from recreation activities include admission fees for the zoo, Albuquerque aquarium, gardens, swimming pools, and outdoor recreation fees (City of Albuquerque, 2017a). For the general city development, the city has "urban design and development" expenses (City of Albuquerque, 2017a). After a public park is established, the city usually provides financial support for its maintenance.

Mechanisms and sources of funding. The City has governmental, proprietary, and fiduciary funds (City of Albuquerque, 2017a, p. 14). Proprietary funds consist of Enterprise and Internal Service Funds. Fiduciary funds consist of Agency and Trusts Funds (City of Albuquerque, 2017a, p. 14). Property taxation has a limit of 20 mills in the State of New Mexico. Property taxes are influenced by the decisions of referendums, the City, the County, and the State. Currently, Albuquerque has a Capital Acquisition Fund that handles expenditures and acquisitions for Open Spaces, Park Management, and recreation purposes (City of Albuquerque, 2017a, p. 115)

The Culture and Recreation Projects Fund, the Albuquerque Biological Park Projects Fund, and the Urban Enhancement Expenditures Fund collect contributions and donations for various purposes (City of Albuquerque, 2017a). The Bio Park Gross Receipts Tax Capital Fund keeps track of grants and revenues. Other funds are agency funds, held by the City such as: “Adopt a Park”, “Trees and Shrubs”, “Outdoor Recreation”, and the “Bosque Restoration” (City of Albuquerque, 2017a, p.p. 188, 190). Another form of financial support are Federal grants, for example, “Cooperative Forestry Assistance Program” (City of Albuquerque, 2017a, p. 221).

Acquisition and Management of Open Space Permanent Fund has about 3,692 acres of land for sale in New Mexico that was received after the trade with the Federal Government in 1982 (City of Albuquerque, 2017a, p. 58). It can also fund purchase and management of open spaces. The City of Albuquerque also has restricted funds for the recreational purposes.

General Fund. Following information is retrieved from the City of Albuquerque CAFRs by the year and spending category: “Expenses”, “Actual”. Sources are referenced by years 2017-2003 (next page).

Table 3

Years 2017 - 2013

Expenses	2017 (p. 40)	2016 (p.41)	2015 (p.40)	2014 (p.40)	2013 (p.37)
Balloon Museum	1,160,457	955,737	1,071,663	990,637	969,102
BioPak	13,472,866	13,084,901	13,104,903	12,774,721	12,412,749
CIP BioPak	126,668	94,626	163,759	312,206	695,958
CIP Parks	516,778	537,187	530,304	2,410,486	2,722,703
Community Recreation	7,363,706	7,702,638	7,928,695	7,575,955	7, 283,732
Parks and Recreation Strategic Support	981,433	1,106,579	932, 258	836,330	752,004
Parks Management	16,886,385	17,719,027	16,737,600	17,450,076	15,998,563
Recreation/ Quality recreation	2,549,922	2,626,518	2,371,925	2,406,969	2,221,465
Open Spaces Management	3,977,767	N/A	N/A	N/A	N/A

Table 3. Years 2017 – 2013. Sources: City of Albuquerque CAFRs.

Table 4

Years 2012 - 2008

Expenses	2012 (p.36)	2011(p.37)	2010 (p.37)	2009 (p.38)	2008 (p.38)
Balloon Museum	896.462	875,049	914,590	980,000	1,323,588
BioPak	11.942.651	11,769,116	12,368,712	11,868,006	12,523,980
CIP BioPak	1,717.081	1,749,015	2,566, 456	1,771,830	859,087
CIP Parks	2.625.837	2,694,520	262,093	352,154	n/a
Community Recreation	7.427.690	7,514,839	7,766,305	n/a	n/a
Parks and Recreation Strategic Support	802.849	773,170	804,106	n/a	1,182,296
Parks Management	15,209,437	15,180,212	15,012,399	886,446	14,052,752
Recreation/ Quality recreation	2,159,262	2,278,563	2,206,084	2,437,823	5,657,623
Open Spaces Management	n/a	n/a	n/a	n/a	n/a
Urban forest management	n/a	66,576	98,684	106,181	n/a
Tourism	n/a	n/a	n/a	n/a	1,924,537

Table 4. Years 2012 – 2008. Sources: City of Albuquerque CAFRs.

Table 5.

Years 2007 - 2003

Expenses	2007 (p.38)	2006 (p.38)	2005 (p.45)	2004 (p.44)	2003 (p.41)
Balloon Museum	n/a	n/a	n/a	n/a	n/a
BioPak	12,223,277	11,441,759	9,848,603	8,202,718	8,899,684
CIP BioPak	1,324,137	1,769,551	1,482,603	1,461,275	n/a
CIP Parks	n/a	n/a	n/a	n/a	n/a
Community Recreation	n/a	6,327, 511	6.078,783	5,035,001	5,083,754
Parks and Recreation Strategic Support	1,093,105	923,531	883,397	695,821	751,873
Parks /land Management	14,250, 517	12.653,570	11,868,928	10,249,553	10,871,388
Recreation/ Quality recreation	7,304, 167	4,547,888	3.970, 415	3,337,475	3,218,304
Open Spaces Management	n/a	n/a	n/a	n/a	n/a
Urban forest management	n/a	n/a	n/a	n/a	n/a
Tourism	1,353,162	1,884,754	2, 308, 243	n/a	n/a
Quality parks and trail system	n/a	n/a	n/a	1,510,986	723, 376

Table 5. Years 2007 – 2003. Sources: City of Albuquerque CAFRs.

Spending analysis. City expenditures since 2003 till 2017 analysis shows how the city invests in different open space/ recreation opportunities. For example, although the Balloon Museum was opened in 2005 (City of Albuquerque, 2018c), it was included with other museums on the city expenditure until 2008. The Balloon Museum comes as a separate line item in the CAFR in 2008, after Capital Acquisition Fund appropriated about 22 acres of land near the museum. It was based on the City Council's decision to expand the Balloon Fiesta Park for balloon lending and to preserve open space (City of Albuquerque Eighteenth Council., n.d.). The City had funds for this purchase from 2005 and 2007 G.O. Bonds and 2007 state grant funds (City of Albuquerque Eighteenth Council, n.d.). This land acquisition was conducted with a purpose of preserving open space for different City recreation activities and social events. For a couple of years, the city had *Quality Parks and Trail System,*

Tourism and *Urban Forest Management* as the city expenses with the purpose of tourism promotion and parks management. *Open Space Management* is a new current expense.

Capital Implementation Program (CIP) is another mechanism of land conservation. It was created in 1975 by the City Council. This Program's focus is City's improvements, policies, and different projects implementation (City of Albuquerque, 2019g). From the CAFR we can see how CIP has financed the Bio Park since 2004 and City Parks since 2009. This program, in its turn, is funded by General Obligation Bond Funds, Enterprise Funds, Quality of Life Funds, Metropolitan Redevelopment Fund, Urban Enhancement Trust Funds, and Federal and state funds (City of Albuquerque, 2019g). There was also a "special limited duration sales tax that was authorized in 1987 until 1995" to improve culture and recreation in Albuquerque (City of Albuquerque, 2019g, para. 4).

City budget. The City of Albuquerque publishes annually the City Budget with a focus on City goals, objectives and achievements. One of the City's goals – the *Environmental Protection Goal* includes the protection and preservation of "Open Space, Bosque, the River, and Mountains" (City of Albuquerque, 2017a, p. 22). The City Budget is comprised of different programs. Some of the projects that the City runs, produce revenues that are collected in funds. For example, the Albuquerque Biological Park Projects Fund has both revenues and expenses as follows:

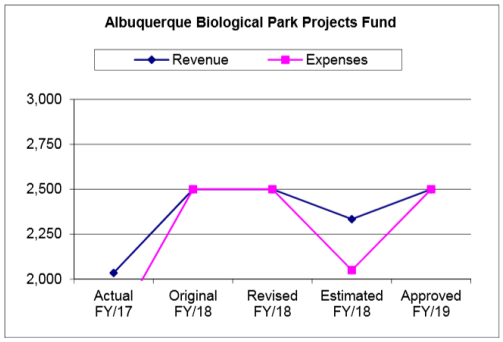


Figure 17. Example of revenues and expenses. Source: City of Albuquerque (2019h).

City parks and recreation areas. A city park can be municipal, county, regional, federal, or privately owned (The Trust for Public Lands, 2017a, p.3). Financial spending on parks and recreational areas includes maintenance of trees, grass, plants, and facilities; collection and removal of trash; and administrative functions (The Trust for Public Lands, 2017a, p.3). Different agencies can manage parks and recreation areas. The largest Federal Park with federal funding, Petroglyph National Monument (5,164 acres), is in Albuquerque (The Trust for Public Land, 2017a, p. 32). Shooting Range Park (4,596 acres) and the Rio Grande Valley State Park (3,186 acres) are some of the largest city parks in the U.S. (The Trust for Public Land, 2017a, p. 31).

Parks and recreation areas are very important for cities. Albuquerque has 23,6% of the parkland in the City (The Trust for Public Land, 2017a, p. 11). 82.5% of city parks area is accessible (The Trust of Public Land, 2018a). 87% of the city residents can walk to a park, (The Trust for Public Land, 2018a). In 2018 City Mayor Tim Keller joined the "10-minute walk to a park campaign" to support accessibility and healthy lifestyle for all city residents (City of Albuquerque, 2018d).

There are still areas in the city that lack green spaces. One of such areas that needs a park, is International district, that has been also identified as an "urban heat island" by The Nature Conservancy (Stone, 2019b, para. 9). The Nature Conservancy, in collaboration with local community, multiple organizations, and agencies organized a "pop-up park" in this area, as a part of their "Urban Conservation Program" (Stone, 2019b). The map in *Fig.18* shows parks and open spaces in Albuquerque with areas in red color that are in "high need" of parks (The Trust for Public Land, 2018b; 2018c).

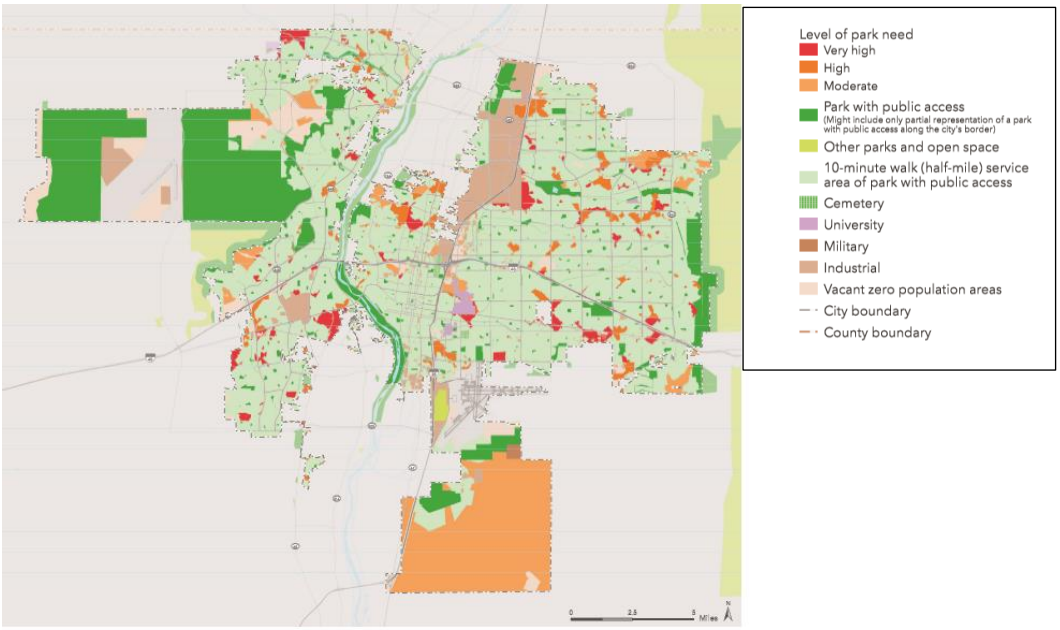


Figure 18. "High needs" for parks areas. Source: The Trust for Public Land (2018b).

Bernalillo county also supports land conservation. The Capital Projects Fund finances an Open Space program to support and buy open spaces (Bernalillo County CAFR, 2017, p. 128). On November 30, 2000 County voters approved a six year "property tax mill levy" to support the program (Bernalillo County CAFR, 2017, p. 128).

New Mexico offers "land conservation tax" credit for land or "an interest in land (conservation easement)", donated for conservation, according to *New Mexico Land Conservation Incentives Act* (Land Conservation Assistance Network, 2019, para. 1). New Mexico Energy, Minerals, and Natural Resources Department and the Natural Lands Protection Committee approve conservation tax credits (Land Conservation Assistance Network, 2019). To increase amount of public open spaces, New Mexico adopted a constitution amendment that allowed counties to borrow money to buy land (Conservation Almanac, 2016).

Environmental Approach

Land conservation in New Mexico. The state of New Mexico is famous for its land conservation initiatives. The first wilderness area in the nation was established in New Mexico - Gila Wilderness in 1924 (Price, 2011, p. 36). Another conservation initiative was the creation of Civilian Conservation Corps in 1930-1942 (Price, 2011). *The Wilderness Act,* adopted in 1964, "established a National Wilderness Preservation System" made of "federally owned areas, designated by Congress" (Public Law 88-57, 1964, p. 1). This act helped to preserve multiple areas of land in New Mexico.

The "*National Heritage Conservation Act"* became law in 2010 (Conservation Almanac, 2016). The "*New Mexico Land Incentives Act"* started in 2003 (Conservation Almanac, 2016). The "*John D. Dingell Jr. Conservation, Management and Recreation Act" (S47)* was signed into law on March 12, 2019 (Govtrack, 2019). It added 13 new wilderness areas to New Mexico, about 272,586 acres in total, with general protected area of "1,972,507 acres, or about 2.5% of our total land area" (Alison, 2019, para. 3). Bureau of Land Management manages wilderness areas. The "*National Wildlife Refuge System Improvement Act of 1997"* promotes wildlife preservation (U.S. Fish and Wildlife Service, 2016).

Land conservation in Bernalillo County. Bernalillo County "has 34,567 total acres of parks and open space and maintains 1,065 acres of parkland and 982 acres of open space" (The Trust for Public Land, 2017b, p. 23). The Open Space program started in 2008. In 2014 a mill levy tax was approved again (Bernalillo County, n.d., b). This program is very successful, because the "county continues to protect important lands through community support and funding from the approved 2014 mill levy tax" (Bernalillo County, n.d., b.). Bernalillo County also has "Parks and Recreation Management Ordinance" and "Bernalillo

County Open Space Management Ordinance" (Bernalillo County, 2010a; Bernalillo County, 2010b).

Land conservation in Albuquerque. The City of Albuquerque initiates or supports multiple land conservation efforts. The City of Albuquerque purchases land, issues bonds, initiates taxes, creates programs, and raises funds to finance land conservation projects. Following Table 6 has been made from multiple sources and explains the history of land conservation. Table shows the timeline of land conservation in the City. Appendix J shows how much land each park or open space has. Source: City of Albuquerque (2019j).

Table 6

Land Conservation in Albuquerque City.

Year	Event
1969 - 1975	Nature conservation support groups were formed and united into "citizens Open Space Task Force"
1975	City/County Comprehensive Plan Included Open Spaces Preservation initiatives
1970 ies	The City acquired: 5 volcanoes area 4,000 acres in the area 177 acres of Candelaria Farm 1000 acres in Sandia Foothills
1973-1983	All Open Space Acquisition Bonds were supported by the votes
1980 ies	The City imposed a "quarter cent tax", initiated by the public and purchased 640 acres mountain park side and traded 7 000 acres to the Forest Service Open Space Trust Fund established as a result of land trade
1982	7,761 acres of Captain Diego Montoya Land grant was purchased and given to US Forest Service to include in Cibola National Forest (Albuquerque Tricennial, 2008).
1983	Rio Grande Valley State Park created
1984	Open Space Division created
1989	Resource Management and Visitor Services created
1990 ies	Open Space Division and National Park Service joined to manage National Petroglyph Monument
1993	Bosque Action Plan was approved
1994	Trail Watch Volunteer Program was created
1995	City of Albuquerque purchased the Andersons' Field and renamed Los Poblanos Fields Open Space (Rio

	Grande Community Farm, 2018)
1996	Open Space Alliance was created
1997	Rio Grande Community Farm was established (Rio Grande Community Farm, 2018)
1997	¼ cent tax increase approved
1998-2000	36 million dollars were raised to purchase land for Major Public Space
1998	Los Poblanos Fields, Tres Pistolas, Atrisco Terrace, Hubbell Oxbow, Manzano/Four Hills and Alamo Farms were purchased by the City.
2006	Open Space Visitor Center opened
2017	Bond measure for parks and recreation areas was approved

Table 6 (cont.). Land Conservation in Albuquerque City. Sources: City of Albuquerque (2019i), Rio Grande Community Farm (2019), BallotPedia (2017).

Following *Fig. 18* is the map that shows parks and open spaces location in the city with smaller areas within the city limits.

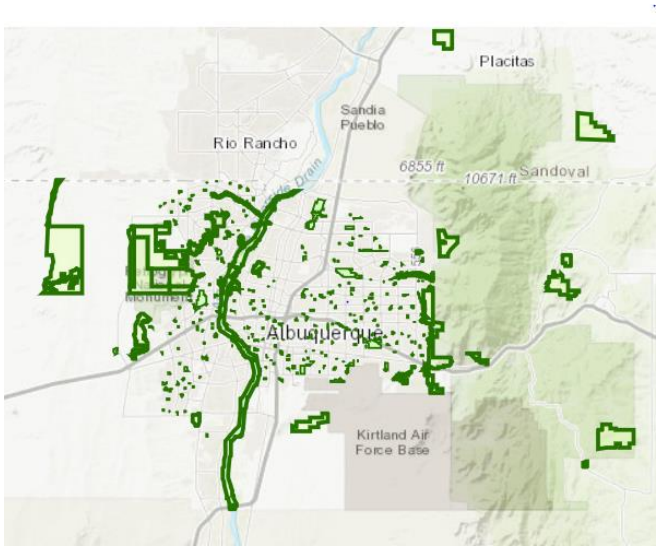


Figure 19. Parks and open spaces. Source: City of Albuquerque (2019n).

Following map in *Fig. 20* shows Cibola National Forest and Sandia Wilderness that are located next to the City of Albuquerque, beyond the city limits.

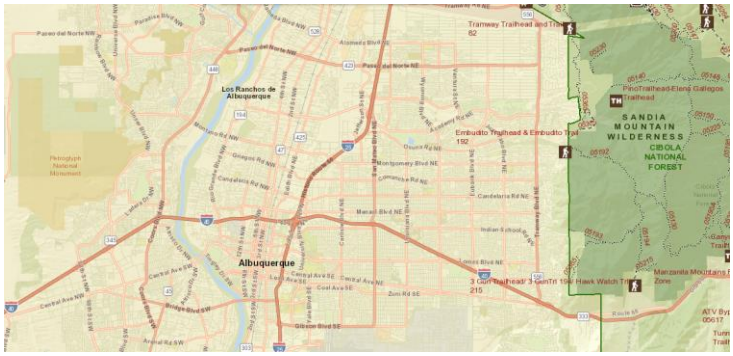


Figure 20. City of Albuquerque and Sandia Mountain wilderness. Source: U.S. Forest Service (n.d. c); Wilderness Connect (2019).

Urban forests. Different agencies, organizations, and private citizens work together in preservation of urban forests. Rio Grande Valley State Park was created in 1983 by the State legislature (City of Albuquerque, 2019k). It is a forest that provides habitat for multiple species. The Aldo Leopold Forest, created in 2009, consists of about 53 acres of protected area (City of Albuquerque, 2019k). Aldo Leopold inspired the creation of many parks and conservation areas in Albuquerque and New Mexico (City of Albuquerque, 2019k). Recently, City Mayor Keller announced the intent of the City to increase urban forests by planting more trees (City of Albuquerque, 2019l). Another area, Valle de Oro National Wildlife Refuge, provides habitat for wildlife and recreation for the city residents (U.S. Fish and Wildlife Service, 2019). U.S. Forest Service has an "Urban and Community Forestry Program" that supports growth and development of urban forests in collaboration with different agencies (U.S. Forest Service, n.d. b). In New Mexico, "Forest Legacy Program" protects local forests from development (New Mexico State Forestry, n.d.).

Federal and state agencies. The Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and U.S. Forest Service are the main Federal agencies that work with land conservation in New Mexico (New Mexico Wild, 2018b; Malcolm, 2019). The Energy, Minerals, and Natural Resources Division and the New Mexico State Parks Office work at the state level (New Mexico Wild, 2018b).

Conservation organizations in Albuquerque work to promote conservation and conservation education. The *Albuquerque Wildlife Federation,* created in 1914 by Aldo Leopold, is a volunteer organization that participates in multiple restoration projects on public lands **(**Albuquerque Wildlife Federation, n.d.). The *New Mexico Association of Conservation Districts (NMACD)* is a private, not for profit association. NMACD "provides support to the local Soil and Water Conservation Districts on state and national issues, working with the New Mexico Legislature, Congressional Delegations, and related governmental agencies" (NMACD, 2018).

The Nature Conservancy works to "conserve the lands and waters on which all life depends" (Miller & Hurteau, 2018). This organization supports multiple projects in New Mexico. Since Albuquerque is one of the fast-growing cities, one of the organization's projects is the "*Urban Conservation Program*" that aims to plant more trees in Albuquerque to reduce the heat and air pollution in the City (The Nature Conservancy, 2019).

The Trust for Public Land opened its office in New Mexico in 1981. Its first project was the Cibola National Forest in 1982. By 2017, this organization had completed 64 projects in New Mexico and protected 187,000 acres of land .The Trust for Public Land (2017b) focuses on three programs: "*The Upper Rio Grande Watershed*", "*Bernalillo County Agriculture and Open Space*", and "*Sky Island Grasslands*".

The *New Mexico Wilderness Alliance* focuses on the protection of wilderness areas and public lands in New Mexico (New Mexico Wild, 2018a). *Environment New Mexico* is a part of *Environment America* organization that takes "a strategic approach" to environmental protection, advocates and "builds coalitions" to protect clean water, public lands, and environment nation-wide (Environment New Mexico, n.d.).

Water conservation is necessary in the area due to arid climate, droughts, and climate change. Water scarcity might become a problem for a growing population and urbanization in Albuquerque and the Albuquerque Metro Area. This issue has been widely researched and multiple plans and assessments have been created and implemented in Albuquerque City, Bernalillo County, and the State of New Mexico. Unlike land, the drinking water amount is unpredictable (Ostrom, 2009) due to weather conditions, economic development, demand, and water prices. For urban areas to grow, they need resources, especially water. Some cities have good water supply, some have limited resources (Malloy, 2013a). "Like a living organism, without adequate water" cities "will not grow to their fullest potential" (Malloy, 2013b, p. 2).

The Rio Grande (Rio means river) at different times, had prolonged drought periods. The difference between past and modern droughts is the demand for water by the growing population and industries along the Rio Grande. While in the past people could migrate downstream to be closer to water during the drought (Thomas, 1963), today such an option would be impossible. The shortages of water need to be replenished with alternative water sources (Simon, 2018). As Conover (1956) suggests, the best option for the regional water supply is the combined use of surface and underground water, especially during drought times, as underground water has less evaporation than the surface (as cited in Thomas, 1963, p. D9). It would be very beneficial in case of the resource scarcity, to establish "conservation behavior as a norm" (Hansen, 2009). Albuquerque is the best example of such a norm, as the water use in the city had been reduced dramatically since the implementation of the water conservation program Albuquerque Bernalillo County Water Utility Authority, (ABCWUA) 2010).

Water governance in the area includes strategic management of water supply, quality, and conservation by creation of partnerships between different agencies, organizations, departments, and services (U.S. Environmental Protection Agency, [EPA] 2019). Many different laws, rules, acts, and regulations govern water use as well. "*The Clean Water Act"* regulates and protects water use in the U.S. (EPA, 2018). "The *Secure Water Act Report"* to Congress under the title of "*Secure Water Act Section 9503 (c) – Reclamation Climate Change and Water 2016"* indicates "climate change as a growing risk" for the water supply in Western states, including "temperature increase of 5-7 degrees Fahrenheit by the end of the century", and decrease of rainfall, snow, and stream flow (Bureau of Reclamation, n.d., para. 3).

The New Mexico Environment Department outlines the drinking water acts and rules in New Mexico, such as the "*Federal Safe Drinking Water Act* (1974)", the "*Ground Water Rule"*, the *"Surface Water Treatment Rules"*, and the *"New Mexico Sanitary Project Act* (1978)". The New Mexico Office of the State Engineer offers the list of rules, regulations and guidelines on water rights in New Mexico, issues permit and contracts (New Mexico Office of the State Engineer, n.d. a). The City of Albuquerque together with the State Engineer monitor underground water levels in the Middle Rio Grande Basin with 255 wells (Bartolino & Cole, 2016, p. 54). The Interstate Stream Commission investigates, protects and conserves water in New Mexico (New Mexico Office of the State Engineer, n.d. b). According to the "*State Water Plan Act"*, New Mexico Office of the State Engineer and Interstate Stream Commission updated State Water Plan in 2018. New Plan has policies, rules and regulations of water use in New Mexico (New Mexico Office of State Engineer,

n.d. c). Water management in the Albuquerque area is provided by the Albuquerque Bernalillo County Water Utility Authority (n.d. b).

Chapter 8

Interviews

A total of four interviews were conducted during this study. Two interviews with the representatives of Albuquerque Parks and Recreation Department and Open Spaces Division provided publicly available information on land conservation in Albuquerque City. Both interviewees explained financing of parks and open spaces. Finances are distributed by the needs of the park – the bigger the park or the activity in the park, the bigger maintenance cost (Interviewee One, personal communication, January 15, 2019). Regarding conservation or development of public land within the city limits, decisions are local, and parks remain for "the civic use" (Interviewee One, personal communication, January 15, 2019). Representatives from the conservation organizations were more focused on environmental factors that impact land conservation in an urban area. The coding in Table 5 explains the qualitative data. Interviews analysis were done by the coding sample table (Perlman, 2018). Appendixes K, L, and M provide Interview Questions.

Table 7

Interview One

	Code	Margin Note	Respondent	Date	Quote
1	**Number of recreation areas**	Parks and trails	One	01/15/19	"289 parks within the City limits and 147 miles of trails – off street paved trails for walking and riding bicycles".
2	**Number of parks and recreation department employees**	Park management and maintenance	One	01/15/19	"Park Management Division with about 230 employees, with more temporary positions hired through summer".
3	**Instruments of financing**	Gross Receipts tax GO Bonds State Grants 1/4 cent tax "Impact fee"	One	01/15/19	"Main source: operating budget annually by the City decision, from Gross Receipts Tax. For building and acquiring parks there are several sources: 1) General Obligation Bond (about 10-13 million), 2) State Grants –

					come from State Legislature. There is also "quarter cent" tax for trails and "impact fees" development fee charge on residential development".
4 **5**	**Maintenance cost** **Recreation activity type**	Soccer fields Pools Soccer Swimming Running	One	01/15/19	"Funds are distributed by the maintenance need and activity types. Bigger activity requires bigger maintenance, for example soccer fields and pools. Some parks require more care than other parks because of use."
6	**Factors impacting recreation**	Funding Political support Land resources	One	01/15/19	"Financial (having money); political will (having people in the policy position to support that); land base- availability".
7	**Factors of support**	Number of people in support of parks Funding Amount of limited resource	One	01/15/19	"Public support, financial resources, urgency. Very often we conserve if it is in danger, not before it is at risk".
8	**Park use**	Number of sold parks Number of repurposed parks	One	01/15/19	"Park use is decided locally. Historically some parks are being repurposed. Sometimes parks are taken off for other civic use"
9 **10**	**Number of conservation policies** **Percent of mental health cases**	Number of people supporting recreation Land used for parks and recreation Mental health problems	One	01/15/19	"Public demand, Available funding, Social well-being" "The greater good", "secondary effects" healthier communities", "more green space, lower rates of mental health issues". "These secondary effects make parks important".
11	**Park Water Use**	Number of irrigated parks Number of non-irrigated parks	One	01/15/19	"Parks' designs are very conscious of water use. Our irrigation system is very efficient, accurate. Due to the use of technologies, if it is raining, the irrigation will not go on".
12	**Types of parks**	Number of joint use parks Number of	One	01/15/19	"There are joint use parks". "There are three dozen parks that are APS property for school

		APS parks Number of state parks Number of Federal parks Number of city parks			use". "We have partnership relationships". "There is joint management, there is joint use with AMFCA use and the city".

Table 7 (cont.). Interview One.

Table 8.

Interview Two.

	Code	Margin Note	Respondent	Date	Quote
1	**Number of open space areas**	Open spaces	Two	01/18/19	"West Mesa/grasslands/shooting range, Petroglyph National Monument Area/ Escarpment, Bosque and farmlands, Arroyos such as Calabaciallas and Tijeras/Montessa, Foothills, Tijeras Canyon, East Mountains, and Sandoval Co properties"
2 **3**	**Financing programs** **Funding Sources**	Capital Improvement Program 10-year Capital Outlay Program Impact Fees General Fund General Obligation Bonds ¼ cent taxes Trust Fund Land money, Grants, Donations	Two	01/18/19	"Mainly from the City's Capital Improvement Program which includes CCIP (Impact Fees), General Fund (Mostly all from General Obligation Bonds), taxes other than bonds like ¼ cent taxes, trust fund, exchange land money, grants, state monies, donations, OSA non-profit". "Mainly from the General Fund, and the 10-year Capital Outlay Program".
4	**Factors of land conservation**	Cost of land Access to open land Natural and cultural resources Low impact recreation Private land for sale Surrounding land use Zoning	Two	01/18/19	"Cost of land mainly, access to open land that suits the Open Space Mission to protect, acquire, maintain and manage significant landscapes and natural and cultural resources while providing for low impact recreation for current and future generations. Property owners willing to sell or get rid of the land. Surrounding land use can impact conservation. Zoning can impact this in a similar way".

5	**Factors of support for land conservation**	Political citizen support Recreation needs	Two	01/18/19	"Politics and the citizens base". "Without the citizens base that supports open lands such as Open Space there wouldn't have this wonderful preservation of land, we have in ABQ".
6	**Land prices** **Conservation policies**	Policies Price of land Land for sale	Two	01/18/19	"Acquiring lands before the price is too high and they are available for purchase. Having the right policies in effect to purchase and acquire land".
7	**Accessibility policies**	Trails Parking Experienced staff	Two	01/18/19	"Ensuring you have access, trailheads, parking, amenities, and sustainable trails for people to use to see and experience the lands by utilizing hiking, horseback riding, jogging, running, etc."

Table 8 (cont.). Interview Two.

Table 9
Interviews Three and Four.

	Code	Margin Note	Respondent	Date	Quote
	Conservation programs **Environmental education programs**	Conservation and education programs	Three Four	01/30/19 2/13/19	"East Mountain Forest Health project", "Urban storm water runoff, "3rd and 5th grade environmental education", "Tree Stewards program", "Help for urban forest", "Backyard habitat". "Urban conservation", "Fresh water", "Urban forest".
	Factors of land conservation	Ecosystem damage Redevelopment Population Weather Urban sprawl	Three Four	01/30/19 2/13/19	"Uncontrolled development", "damage to ecosystem", "rehabilitation of downtown instead of new development", "uncontrolled urban sprawl". "Climate change", "heat islands", "population", "weather", "different environmental factors".
	Conservation projects	Restoration projects, Partnerships, Goals	Three Four	01/30/19 2/13/19	"Green infrastructure", "rebuild lost natural areas", "backyard habitats", "urban trees", "influence of local government". "Public and private partnerships", "conservation organization's goals".
	Conservation organizations	Conservation support,	Three	01/30/19	"Always support any initiative for urban environment",

	activity **Land ownership**	Funding sources, Land ownership	Four	2/13/19	"environmental education for owners", "funding", "ownership", "land grant sales for conservation"; "We implement policies"

Table 9 (cont.). Interviews Three and Four.

Results. All interviewees provided very interesting information regarding land conservation. By drawing conclusions, land conservation at the local level is impacted by the selected environmental, financial, economic, instrumental, and economic factors shown in Fig. 21:

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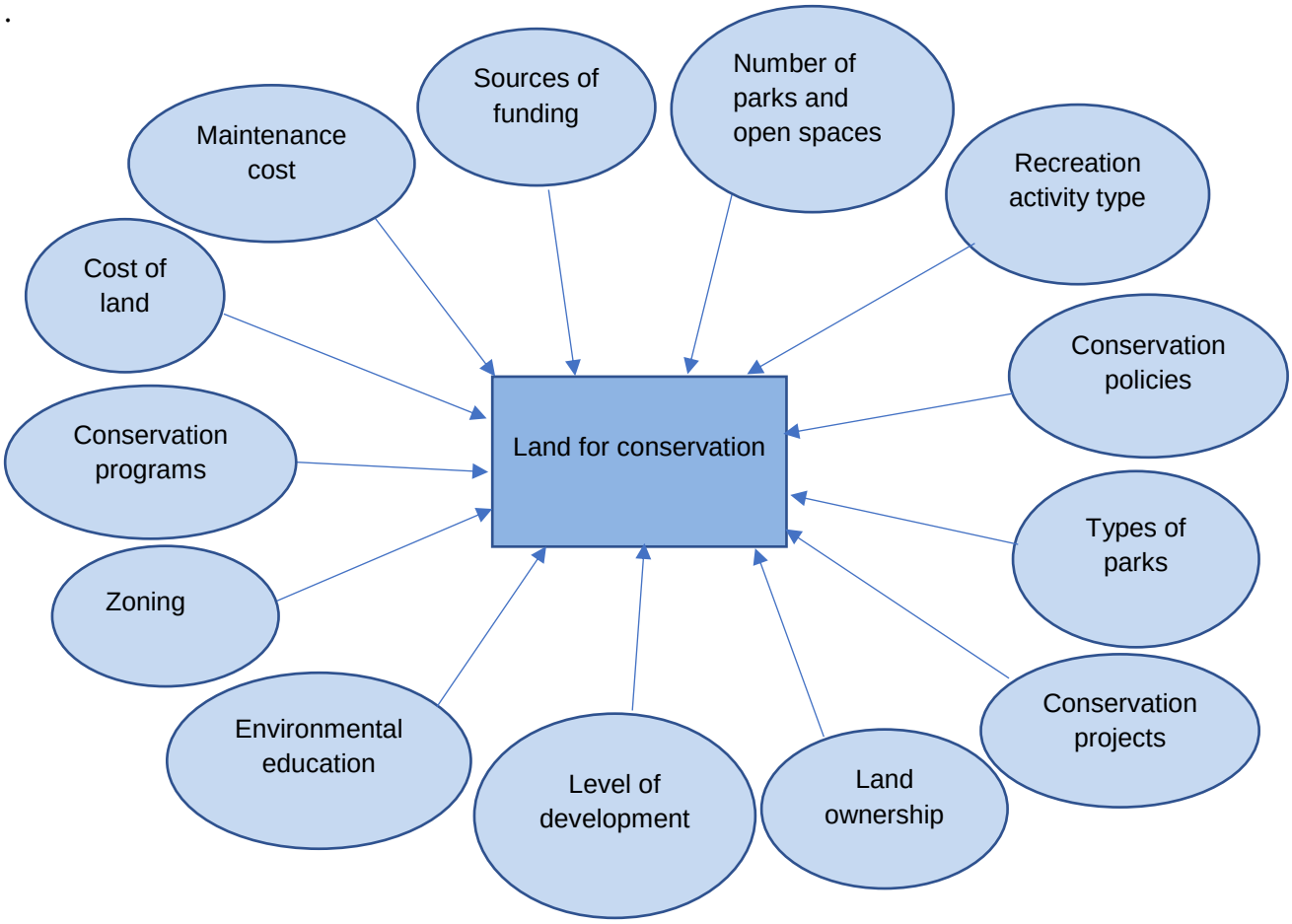


Figure 21. Factors of land conservation. This figure illustrates significant factors that impact land conservation at the local level. Arrows in the model represent relationships.

Chapter 9

Conserve or Develop? Local Land Use Case Studies

Project One Description. *Juan Tabo Hills Park***.** This is an interesting example where an open space area owned by the City, has been reconsidered for the development of a park. Following is the map from Environmental Planning Commission (EPC) (2018a) showing the location and change of zoning proposal from "Major Public Open Space" to "Parks and Recreation" (p.3).

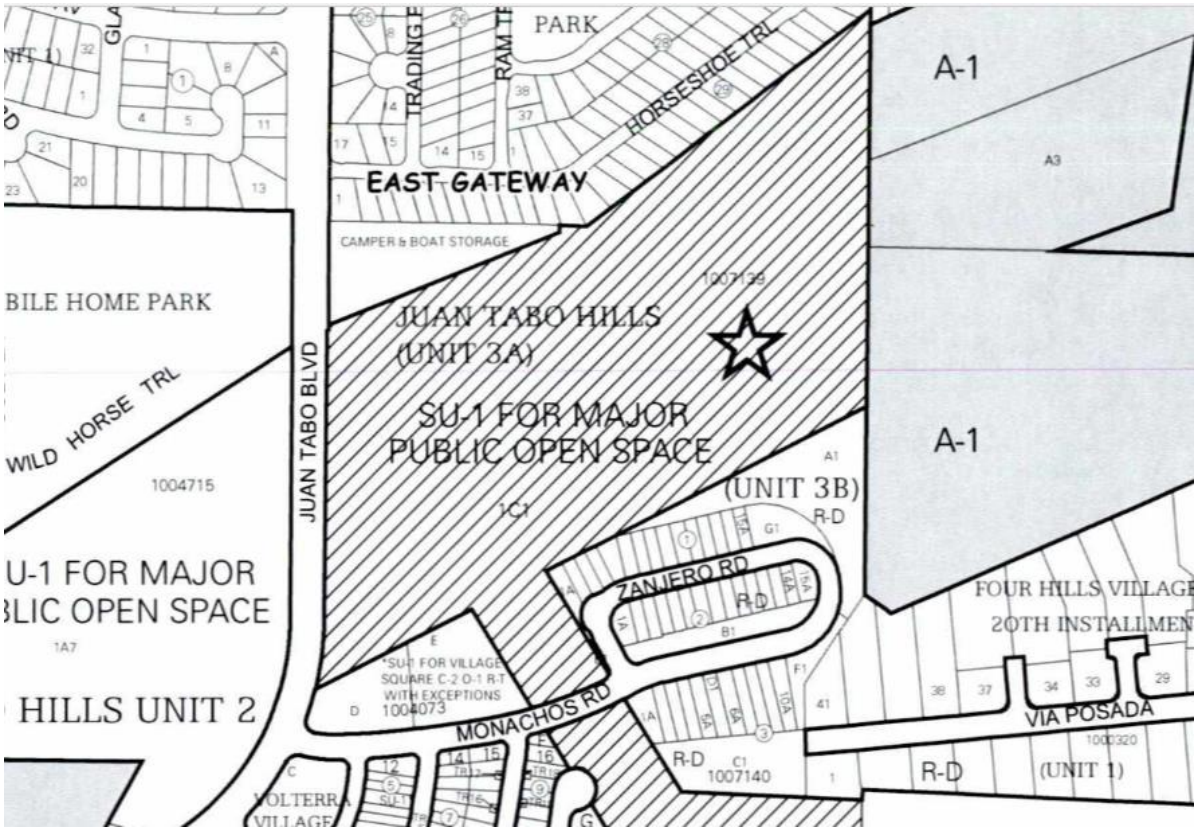


Figure 22. Project one map. Map source: Environmental Planning Commission (2018a).

Juan Tabo Hills area was annexed in 2004 by the City of Albuquerque (Environmental Planning Commission [EPC], 2018b). It is in a "developing single family area" next to Public Open Space (EPC, 2018b).

Project One Analysis. The following case is an example of land conservation vs. land development in the City of Albuquerque. Proposed hypothetical "conceptual model's "level 1, 3, and 4 are applied for analysis. *Social approach*: since the population in Albuquerque is increasing, there is a constant need for more recreation activities. *Costs*: land, infrastructure, and park structures development. *Benefits*: new park, accessibility to park activities and nearby open spaces for the residents in the area and interested citizens. *Economic approach*: park development will contribute to the job market and attract people to the area. *Costs:* land and park structures development. *Benefits*: land development, construction jobs, property value increase for nearby houses. *Financial approach:* spending of the City funds. *Costs*: land, infrastructure, and park development. *Benefits:* city Parks and Open spaces investments. *Instrumental approach. Costs to the city:* park development cost, zoning change. *Benefits:* new public playground, picnic area, paved path, new trails. *Environmental approach. Costs:* open space "low impact" development (Policy 10.3.3), "sensitive urban development" (Policy 13.4.4). (EPC, 2018b). *Benefits*: increase in green/planted area.

Institutions. Environmental Institution: Zoning change for park development was proposed to the EPC (2018b), which is the "final decision-making body" on zoning of this park (p. 1). The park is 7.3 acre in the Area of Consistency (EPC, 2018b, p. 12). *Local legislation*. The project complies with multiple policies, such as: Policy 5.2.1 "Land use"; 10.1.4, 13.2.2 "Water conservation", etc. (EPC, 2018b). *Public institutions.* The project has been agreed on by the City Departments, Bernalillo County, Albuquerque Metropolitan Arroyo Flood Control Authority, MRCG, MRGCD, others (EPC, 2018b). The park will contribute to the City recreation opportunities. *Business institutions*: Park developers. *Financial institutions.* City Financial department, Banks.

Factors that Influenced Park Development: zoning, employment, income level, housing value, land value, need for recreation opportunities.

Project Two Description. The following case is an example of land conservation vs. land development in Albuquerque City. Proposed hypothetical "conceptual model's" Level 1, 3, and 5 are applied for analysis of the project. This patch of land had been preserved since 1970 (Barber, 2019). Multiple environmental studies took place in the Rio Grande area. "22.75-acre site" at Namaste Road was requested to be developed with "76 single family lots" (EPC, 2019b, p. 2).

Subject Site

Figure 23. Project two map. Source: EPC (2019a).

Project Two Analysis: *Social approach*: since the population in Albuquerque is increasing, there is a constant need for housing development. Local government provides policies, rules, and regulation for the area. *Costs:* land, infrastructure, and housing development. *Benefits*: 76 single family houses, accessibility to open spaces for new residents in the area. *Economic approach:* housing development will contribute to the job and real estate housing markets. *Costs*: land and housing development. *Benefits:* 76 single family houses, construction jobs, and real estate sales. *Financial approach***:** land development financial decisions and investments *Costs:* land, infrastructure, and housing development. *Benefits:* real estate

investments, sales, mortgages, loans, credits, bank deposits, interests, and high housing value. "Selling housing value will be between $400,000 to $500,000" (Dyer, 2019).

Instrumental approach. Zoning requirements allow development, in compliance with the City's policies, rules, and regulations of housing development. The Development Review Board has approved the development project due to the zoning in the Integrated Development Ordinance from May 2018 (Barber, 2019). The Albuquerque City EPC approved development as well (Dyer, 2019). *Costs to the city*: infrastructure development and cost. *Benefits:* attraction of high-income residents to the area. *Environmental approach*: "floodplain development", "Bosque buffer strip", and proximity to open space (EPC, 2019b, p. 7). *Costs*: land development. *Benefits:* open space accessibility for additional 76 single family houses in the area.

This project had multiple discussions. On one side, neighborhood associations, homeowner's associations, and citizen activists try to influence the politics of land use (Lubell et al., 2005, p. 712). On the other side, developing groups' interests "are organized, well financed and represented by developers, realtors, contractors, construction companies, financial institutions" (Lubell et al., 2005, p. 712). Ownership of the natural resources is very important. The land owner can make a decision to develop or conserve the land. This is an example of land development decision.

Factors that Influenced Land Development: zoning, land/housing ownership, land value, housing value, property rights, employment, income level, location.

Conclusion: Application of different levels of the proposed hypothetical "conceptual model" allows to consider different levels of analysis. Both cases represent decisions made by land owners. In case one, the City decided to approve park development to increase public

outdoor recreation opportunities, housing value, and attractiveness of the area, thus provide more public benefits. In case two, private owners decided to develop the area. Land has high value due to proximity to open spaces and other housing areas. “Value” is the main factor of the decision-making process (White, 1969) by the land-owner.

Land ownership is a very important factor that impacts land conservation or land development decisions. Decisions over public land involves participation of multiple actors, while private property decision can involve sole owner or a group of owners, depending on the type of ownership and access to decision making. Zoning is another very important factor that allows different levels of development. Proximity to open space also impacts the value of nearby properties. Land and housing values depend on location and state of the nearby areas or neighborhoods, state of the local housing and land markets.

Chapter 10

Case Study Conclusion

The case study analysis showed that Albuquerque uses financial, environmental, social, economic, and instrumental approaches towards land conservation. Local, state, and federal legislation plays a very important role in the City's natural resources preservation. The City of Albuquerque follows land use policies, laws, rules, and regulations. Zoning is the main instrument that Albuquerque uses for decisions concerning development or land conservation. Planning and collaboration with Bernalillo County is another important strategic instrument. The City uses different financial mechanisms to fund land conservation projects. Areas that have been identified for recreation purposes within the city limit are accessible and have different levels of development. There are still areas in the city that need more recreation opportunities. The closest no-development recreation area is beyond the city limit. The biggest parks and recreation areas are located along the Rio Grande river and eastern and western areas bordering the city limits areas. They create natural buffer areas that allow wildlife to be close to water or bigger, wilderness areas.

Multiple factors impact land conservation in the city. Land conservation for recreation purposes has been focused on the preservation of historical and cultural heritage, nature, wildlife, and local ecosystems. Conserved land has multiple purposes. Urban forests are *working green areas*, used for recreation, to help replenish the aquafer, act as a flood mitigation, wildlife habitats, and air pollution reduction. Parks and recreation areas have deep historical and cultural meaning. Such factors as *land ownership, zoning, conservation programs* and *policies, environmental education, conservation organizations' activity, cost of land and maintenance,* impact land conservation in the city. Land conservation within the city limits involves at a minimum low level of development. Thus, land conservation is a

mechanism itself that restricts medium to high development. Open spaces, due to the size, attract housing development as a housing value increase mechanism.

Multiple agencies, departments, committees, conservation organizations, and services on local, state and federal levels participate in the process concerning land conservation or development. Local political, economic, financial, housing, and land markets influence the decision-making process. Higher density housing development allows to preserve open spaces by efficiently using available land resources. Efficient water use and conservation is coordinated by the use of conservation programs and plans at different levels. The city favors both land conservation and land development for housing to provide for the growing needs of the population, attract and support economic development, and protect open spaces for recreation purposes and natural wildlife habitat.

Chapter 11

Statistical Analysis

Every city has zoning requirements that would allow land development for housing or conservation. To gain better understanding of what factors impact housing development instead of land conservation, this paper investigates *housing value* as a dependent variable. This analysis answers the research question of *what factors increase/decrease housing value in cities*. This analysis also tests the proposed hypothetical "conceptual model's", Level 2, to see the gradual impact of social, environmental, economic, instrumental, and financial factors on the selected dependent and independent variables and find out the strongest predictor. The National data set and the Stata software processing program for this part were borrowed from Dr. Leon Moreta (2019a). Two variables of interest "unemployment rate" and "zoning" that could explain other variables were not available and can be added for an expansion of this data set and further studies.

Introduction/ Background. There can be multiple uses for an area of land in an urban setting (Malcolm, 2019). Many different factors can be considered during the decision-making process over that specific area. One of the most important factors is the demand for housing. Local government makes final decisions on public land conservation vs. land/housing development and uses different instruments to control development and growth.

When it comes to urban growth, housing areas serve as a great attraction point in the city (City of Albuquerque, 2017c). Affordable housing attracts people with different levels of income (City of Albuquerque, 2017c). Some people might be attracted by low housing value for their retirement or work plans, some people look for specific locations. Should the city provide enough housing for a growing population? Should the city keep developing more

land to attract more residents? How will population growth impact housing value? How fast can the city provide affordable housing?

Especially when it comes to urban areas, where population density is high, it is very important for the local government to consider how to use available land by applying different instruments. Conserved land would provide multiple opportunities for recreation, improve residents' accessibility to green areas by providing more space for recreation (Leon-Moreta, 2019b; Malcolm, 2019). Development of land for housing increases the level of economic development and provides additional housing for the city residents.

Urban population is one of the variables of interest in the current data set. As population of urban areas increases, so does the demand for consumption, employment, housing, and business opportunities (Renski, 2009). There is also growing need for recreation opportunities and a healthy environment. Some cities are very successful in becoming centers of different types of services, including financial, professional, entertainment, consumption, etc. (Brookings Institution, 2007, Florida, 2005; Glaeser & Gottlieb, 2006, as cited in Renski, 2009, p. 61). Some cities still struggle, trying to provide essential services with decreasing budgets (Glaeser & Kahn, 2001, as cited in Renski, 2009, p. 61). Recreation, among others, is a growing industry that provides opportunities for additional revenue generation, as Craighead writes (as cited in Malcolm, 2018). According to the Department of Commerce, "Outdoor recreation contributes $637 billion per year to the American economy" (as cited in Malcolm, 2018).

With a growing population there is a greater demand for land, especially in urban areas. Economic activity that leads to industrial growth, also affects land use, natural resources, and environment (Entwisle, B., Stern, P., & National Research Council, 2005).

One of the aspects of increasing land development due to population growth is its impact on economic development. Housing value is also impacted by the population growth. At the same time, the relationship between an increase of population and economic development "is controversial" (Birchenall, 2016; Peterson, 2017).

Many different scholars conducted studies and argued that population growth can either increase or slow down economic growth (Peterson, 2017). Thomas Malthus saw population growth as "barrier to economic development", while Boserupian saw population growth as a major reason for technological development (as cited in Birchenall, 2016, para. 1). There is need for further research on the relationship between population and development (Birchenall, 2016). On the other hand, especially in urban areas, there are multiple opportunities for innovation, since so many people interact and exchange information every day (as cited in Ernston et al, 2010, p. 539).

Besides population growth itself, what really matters, according to McCann (2017), is the rate of population growth and decline. Fast growth or decline can have different effects. Land use has to be planned accordingly to the population growth or decline (McCann, 2017, p. 552). If there is a fast population growth, the city might not always be ready to meet all the demands of the growing population (McCann, 2017). Population increase is very common for urban areas, since many people come to cities looking for economic opportunities.
Hypothesis 1. *As urban population increases, housing value will increase.*

*Senior urban population***.** U.S. population will increase to 400 million by 2050, with senior population 65 and older increase to 83.7 million (Ortman, Velkoff, & Hogan, 2014). Such demographic change will impact "economic, political, and social changes that will

require innovative policy approaches" (Varga, 2016, p. 125). There are many different discussions on how the senior population impacts local communities.

Urban population and especially aging population impact the city in many ways. There is not enough research on the economic models that would explain urban population structure and its impact on the local economy and financial state of the city (McCann, 2017). Especially the areas, that "face increased population ageing, the combined financial, fiscal and land-use planning challenges in localities facing both population ageing and population decline are especially difficult" (McCann, 2017, p. 553). There must be a "place-based approach" to land use planning and policy making to focus on local societal issues (McCann, 2017, p. 553). Local governments need to pay close attention to "demographic changes" (McCann, 2017). Since housing is a very important "store of wealth", according to The Economist (2015) (as cited in McCann, 2017, p. 551), some people will prefer to invest in the house.

Hypothesis 2. *As the number of urban senior populations increases, housing value will increase.*

Homeownership plays a very important role in the housing market development. Many different factors impact homeownership. Recently, the rates of ownership have been declining (Lijing, Huang, Singer & Torna, 2017), although ownership rate depends on the city. People who rent houses would like to invest into the homeownership, but they "need economic incentives to do so" (Lijing et al., 2017).

Government policies and programs impact rates of homeownership, but "there are limits to encouraging investing in housing by creating access to mortgage funds" (Lijing et al., 2017). Households that do not have mortgages, can use Federal, local or non-profit

programs that support homeownership (Lijing et al, 2017). Homeowners can be with or without mortgages. Homeowners and renters are mostly interested in housing value (Harvey, 2009). Housing value also depends on owner vs. renter occupation and "amenity value" (Lijing et al., 2017, p. 771).

Housing value is impacted by mortgage, credit, monetary policies, etc. (Ascheberg, Jarrow, Kraft & Yildirim, 2014). Different government programs are aimed to help the homeowners such as the *Home Affordable Modification Program* (HAMP) (Ascheberg et al., 2014). Ascheberg et al. (2014) find that monetary and easy credit policies can increase housing prices (p. 644). At the same time, "low interest rates and easy credit terms contribute to housing bubble" (Ascheberg et al., 2014, p. 647).

Homeownership includes multiple costs such as "debt service, property taxes, maintenance cost" (Guo & Hardin, 2015, p. 59). Homeownership has multiple benefits. "Homeowner is not forced to increase expenditures to acquire the equivalent amount of housing services because he/she has substantially hedged current and future expenditures through ownership" (Guo & Hardin, 2015, p. 60). Homeowners also do not have to pay rising rent (Guo & Hardin, 2015). As the number of homeowners increases, the housing prices will increase (Kiyotaki, Michelides & Nikolov, 2011). Homeowners are interested in the value and exchange value of the house (Harvey, 2009).

Hypothesis 3. *As homeownership increases, the housing value will increase.*

*Median Income***.** Income is a very "strong predictor of the housing price" (Glaeser et al., 2018). There are different employment opportunities in different cities. Organizations in some cities might be "more productive" than in others (Glaeser et al., 2018). Organizational activity might also impact general income level in the city. House is the "central unit" in the

housing market, that includes land and the building structure itself (Maattanen & Tervio, 2014). Many different components are included in the housing cost, including number of bedrooms and bathrooms, view, neighborhood, number of floors, street type and condition, house location (Glaeser et al., 2018).

Household income plays a very important role in what type of the house the family can buy. “If low income households have less income they bid less for low-quality houses” (Maattanen & Tervio, 2014, p. 382). In other words, an increase in income will lead to an increase in housing prices, while a decrease in income will decrease the prices, thus the housing prices will decrease with increase of inequality (Maattanen & Trevino, 2014, p. 382). Their model also includes houses that are occupied by the owners, who plan to stay in their houses. They suggest including “non-owner-occupied” housing into the model analysis (Maattanen & Trevino, 2014).

Hypothesis 4. *As median income increases, housing value will increase*.

Conservation organizations play a very important role in the conservation processes.. Local conservation organizations “always support any conservation initiatives for urban environment” (Interviewee Three, personal communication, 2019). They are very interested in the wildlife habitat and ecosystem preservation. Conservation organizations participate in the preservation of different land size areas, depending on their funds’ availability and constraints (Davies et al., 2010).

Conservation organizations and land trusts usually focus on lands that have a high chance of development to preserve the natural resources (Chamblee et al, 2011). Also, due to the costs and fund availability, land conservation organizations will approach the land that has lower prices in the area (Chamblee et al., 2011). As a result, land that is around the

conserved land, increases its value (Chamblee et al., 2011). An increase in land value will lead to an increase of the housing value as well. Regarding the land value, if a conservation easement is involved, then the decline in value with distance is lower, since it means that conservation is permanent (Chamblee et al, 2011).

Hypothesis 5. *As number of conservation organizations increases, housing value will increase.*

Barren Land. Since population densities increase in cities, there is a growing need for a good natural support system to provide water, food, and resources for growth. Multiple conflicts can appear in urban areas such as "water use between urban growth and agriculture", "challenges of energy use and urban sprawl" (Ernston et al., 2010, p. 532). City planning needs to take into consideration local ecosystem and habitat preservation with prevention of watershed fragmentation (Clifton et al., 2008, p. 37).

Since there is an increased need for natural resources, "about 60% of the world's forest ecosystems have been destroyed or unsustainably overused", as Brockhouse and Botoni (2009) write (as cited in Sen et al., 2018). Such an important factor as "land cover" (Sen et al, 2018; Leon-Moreta, 2019a) shows the "effects of change in land use" due to different types of human activities (Sen et al., 2018, p. 454). "Many local governments use data layers with information on taxes, land cover, land use, zoning, planning, wetlands, etc." (Clifton et al., 2008, p. 31).

Land use also depends on soil quality and location of the land. Soil quality is the ability of land to support growth of plants, water and air quality, and public health (Randolph, 2004). Land can be used for landfills and waste processing, agriculture, industrial, and recreation purposes. Industrial soil use and removal of vegetation will lead to

soil erosion (Randolph, 2004). To prevent soil erosion, “soil stabilization” with vegetation increases, “runoff control” for water, and “sediment control” with creation of pollution traps and buffers can be used (Randolph, 2004). “Urban agriculture” contributes to urban sustainability and consists of “backyard gardens”, “community gardens”, “farmers’ markets”, and “commercial farmers” (Randolph, 2004, p. 182).

“Barren land” is opposite to land that has been used for agricultural and recreation purposes. It can occur from deforestation and industrial use. It includes “thin soil, sand, or rocks” (Sustainable Development Indicator Group, 1996, para. 1). As an environmental or “land cover” factor, it usually shows the changes in land structure and vegetation growth, especially in urban areas, where population is high (Sen et al, 2018). “Urban forests” and “green spaces” contribute the general wellbeing and health of the city (Sen et al., 2018). They also have “ecological, environmental and social functions’ (Sen et al., 2018). Deforestation and increase of barren land will impact housing value as well.

Hypothesis 6. *As amount of barren land increases, housing value will increase.*

Statistical Analysis. There are 19, 548 units of observation in the borrowed data set, “nested” (Nezlek, 2015) within 34 “metropolitan area clusters”, within three-time levels: 2000-2001, 2005-2009, and 2010-2014. “For statistical significance, standard errors are estimated by clustering observations into metropolitan areas” (Leon-Moreta, 2019a, p. 16). The purpose of the statistical analysis is to analyze independent and control variables effects on the “housing value”.

“Pooled time-series analysis” (Leon-Moreta, 2019a). This statistical analysis has “multiple observations” across all variables (Day, 2018). Three time periods and 34 metropolitan clusters are being used for testing and analysis of five multileveled models.

Only one time-period (2010-2014) has been used to test Model 6 to see the impact of one time-period on the dependent variable.

Dependent variable. Housing value is defined as: "median value of owner-occupied housing units in a city" (Leon-Moreta, 2019a). Data for the dependent variable have been collected from the Bureau of Labor Statistics, the Census of Population 2000, and the American Community Survey 2005-2009 and 2010-2014 (house value) estimates (Leon-Moreta, 2019a). The dependent variable will be tested with the independent and control variables for three and one time - period.

Independent and Control variables. Appendix B provides detailed information on each variable in the data set. Variables description (copy and paste content) have been borrowed from Leon-Moreta (2019a).

Process and Analysis. Firstly, this paper divides the original variables in the data set into economic, social, financial, environmental, and instrumental (Appendix C). Then independent variables are selected, one from each group. Remaining variables, used as control variables, remain separated in five groups (Appendix D). Then, five models have been constructed (Appendix E). Each model shows what effects independent variables have on the dependent variable by themselves, and with a different set of control variables. Statistical tests and analysis have been modelled after Heaton, Mayson, and Stevenson's (2017) method of testing the gradual effects of the independent and control variables on the dependent variable. This thesis is incorporating elements of Heaton's et al.'s (2017) method to apply Level 2 of the proposed hypothetical "conceptual model" by testing the effects of the independent variables without any controls first, then slowly adding economic,

instrumental, financial, social, and environmental control variables and evaluate the effects. Table 10 shows the results of five models.

Table 10.

Regression Effects on DV "Housing Value" Without and With Control Variables.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Independent Variables	**No Control Variables**	**Add Social Control Variables**	**Add Economic Control Variables**	**Add Instrumental-Financial Control Variables**	**Add Environmental Control Variables**
	R^2 96%	**R^2 96%**	**R^2 97%**	**R^2 97%**	**R^2 97%**
Urban Population	-.96*** (.007)	-.98*** (.037)	-.96*** (.033)	-.98*** (.034)	-.98*** (.029)
Senior Urban Population	1.36*** (.205)	1.25*** (.229)	.61*** (.16)	.57*** (.16)	.44*** (.152)
Homeownership	-1.33*** (.158)	-1.18*** (.114)	-.96*** (.84)	-.99*** (.087)	-.87*** (.076)
Median Income	1.52*** (.075)	1.5*** (.06)	1.3*** (.06)	1.27*** (.05)	1.2*** (.039)
Conservation Organizations	.07*** (.011)	.06*** (.011)	.05*** (.01)	.05*** (.01)	.03*** (.009)
Barren Land	1.96*** (.784)	2.1*** (.662)	2.04*** (.662)	2.06*** (.617)	1.34*** (.502)

Notes. Coefficients and standard errors are included. Significance is defined by *p=0.10 to 0.05, **p=0.05 or less, ***p=0.01 or less.
*** Red highlights the strongest predictors.

Table 10. Regression Effects on DV "Housing Value" Without and With Control Variables.

Findings. The base line for all five models controls for time effects (Leon-Moreta, 2019a). All selected independent variables are significant. All five models show that selected independent variables have consistently strong effect on the dependent variable. R^2 for all five models ranges from 96% to 97% suggesting that selected set of independent variables represents strong predictors of change on the dependent variable. Linear regressions predict changes in the dependent variable when independent variables change one percent (Torres-Reyna, 2007). *Urban population* variable remains without changes, as the strongest predictor. *Median income* and *barren land* slightly change. The rest of the independent

variables have weaker effects with added control variables. They are “sensitive” variables (Leon-Moreta, 2019a).

A Multicollinearity test did not find any intercorrelation (Appendix G). The Variance Inflation Factor (VIF) has been performed to check for multicollinearity for the independent variables with the range of VIF > 10 or 1/VIF < 0.10 (Torres-Reyna, 2007). Scatter plot tests have been conducted to represent graphically how dependent and independent variables interact (Appendix I). In all models the F1 timeline (year 2000) is omitted because of collinearity, but instead is used as a constant (Leon-Moreta, personal communication, 2019).

Main Findings.

Hypothesis One. As urban population increases, housing value will increase.

Urban population is a significant variable in all five models. Confidence level is above 95%. Tests show that one percent increase of *urban population* will cause a decrease of *housing value* in percent: (-.96) (Model One), (- .98) (Model Two), (-.95) (Model Three), (-.98) (Model Four), (-.98) (Model Five). Adding control variables shows slight variation in effects. Thus, I reject Hypothesis One.

Hypothesis Two. As *number of senior urban populations increases, housing value will increase.*

Senior urban population is a significant variable in all five models. Confidence level is above 95%. Tests show that one percent increase of *senior urban population* will cause different level of increase in all models: (1.36 %) in Model 1, (1.25%) (Model 2), (.61%) (Model 3), (.57%) (Model 4) and (.44%) (Model 5). Adding control variables shows a weakening effect on the dependent variable. I fail to reject Hypothesis Two.

Hypothesis Three. As homeownership increases, the housing value will increase.

Homeownership is a significant variable in all five models. Confidence level is above 95%. Tests show that one percent increase of *homeownership* will cause (- 1.33 %) decrease (Model 1), (-1.18%) (Model 2), (-.95%) (Model 3), (-.97%) (Model 4), (-.87%) (Model 5) in the *housing value*. Adding control variables shows a weakening effect on the independent variable on the dependent variable. I reject Hypothesis Three.

Hypothesis Four. As median income increases, housing value will increase.

Median income is a significant variable in all five models. It is the strongest positive predictor in all five models. Confidence level is above 95%. Tests show that one percent increase of *median income* will cause (1.52 %) increase of *housing value* (Model 1), (1.5%) (Model 2), (1.3%) (Model 3), (1.27%) (Model 4), (1.2%) (Model 5). Adding control variables shows a weakening effect on the dependent variable. I fail to reject Hypothesis Four.

Hypothesis Five. As number of conservation organization increases, housing value will increase.

Conservation organizations is a significant variable in all five models. Confidence level is above 95%. Tests show that one percent increase of number of *conservation organizations* will cause (.07%) (Model 1), (.06%) (Model 2). (.05%) (Model 3), (.05%) (Model 4), (.03%) (Model 5) increase in the *housing value*. Although it is not a very significant increase, adding control variables shows a weakening effect on the dependent variable. I fail to reject Hypothesis Five.

Hypothesis Six. *As barren land increases, housing value will increase.*

Barren land is a significant variable in all five models. Confidence level is above 95%. Tests show that an increase of one percent in the number of *barren lands* will increase the *housing*

value for (1.96 %) (Model1), (2.1 %) (Model 2), (2.04 %) (Model 3), (2.06 %) (Model 4) and (1.34%) (Model 5). Adding control variables shows both increase and decrease in the effect. I fail to reject Hypothesis Six.

Discussion. Most of the independent and control variables in the final Model 5 appear significant proving that they all influence the *housing value*. All independent variables show changes in effects when control variables are added slowly, thus implying that other variables impact the *housing value* as well. There is no multicollinearity between the selected independent variables. Graphic representations of the relationships between independent variables shows different types of relationships (Appendix I). Graphic representation is based on model 5 with all independent and control variables (Appendix F). Relationship between *urban population* and *housing value* shows strong linear negative relationship with coefficient (-.97); positive relationship between *housing value* and *senior urban population* show coefficient of (.44); *homeownership* also has negative relationship with coefficient of –(.87); *income* has the strongest positive linear relationship with coefficient of (1.2); *housing value* and *conservation organizations* have weak relationship with coefficient (.034), while barren *land* and *housing value* have multiple outliers and coefficient of (1.33).

The relationship between *urban population* and *housing value* shows controversy, which has been supported by the research. It would make sense that with the increase of *urban population* the demand for housing will grow, which will lead to increase in the *housing value*. The relationship between *urban population* and *housing value* in all models is negative, which could be explained that the data set includes housing value data from 2000, 2005-2009, and 2010-2014 periods, when housing value was at its lowest in many cities due to the housing market crash. At the same time, the model from just one time-period of 2010-

2014 (Appendix H) also shows negative relationship, meaning that increase in *urban population* will cause *housing value* decline.

This relationship can be explained that different cities have different housing values at different time periods. Homes that were foreclosed during the housing market crash had general negative impact on the value of the houses in the neighborhoods as well, with that driving housing value for the whole area down (Jones, Gatzlaff, & Sirmans, 2016). This negative effect is defined as a "spillover effect of foreclosures", according to Ihlanfeldt, Mayock, and Li (as cited in Jones et al., 2016).

Another important explanation is level of land development. Urban areas are characterized by high level of land development. Although land development variables are control variables in this regression analysis, they are statistically significant in all models (Appendix E and Appendix F). An increase of one percent of *high development* decreases the *housing value* for (-1.6 %). An increase of one percent in "*low intensity development*" will decrease *housing value* for (-0.97 %). An increase of one percent in *middle* level of *development* increases *housing value* for (1.6 %).

In this dataset, all *population* variables impact *housing value*. All models show that *urban population* is a strong variable with a stable negative effect. Control variable *population density*, on the other hand, will cause slight increase in the *housing value*. This is especially important in urban areas, where population density is high, which leads to increase in demand for housing and housing prices, due to proximity to work, shopping, and recreation areas. One percent increase of *population density* control variable will lead to (0.007 %) increase of the *housing value* (Model 5). Population is spread unevenly in cities due to different levels of income and development.

One of the strongest predictors of *housing value* is *median income*. An increase of one percent of *median income* will increase *housing value* for (1.2 %). “Any increase in income level” will increase the housing prices, according to Maattanen and Trevino’s (2014) model (p. 404). Rising incomes can cause rise in the demand for housing with a following rise in prices (Ingram & Hong, 2007). “Any increase of income inequality will decrease housing prices, except for the top” (Maattanen and Trevino, 2014, p. 404). High income communities have higher housing value and better locations. Income level has a positive significant relationship with housing value.

Homeownership is negatively correlated with the *housing value* in this dataset, since as Li writes, homeowners reduce their investments in home improvements, if housing prices go down, and if there are more chances of foreclosures, which reduces prices even more (as cited in Jones et al., 2016). Some other negative factors of the reduction of housing prices are “unemployment rate” and “divorces” (Jones et al., 2016), that this data set does not have. Between 2004 and 2009 the unemployment rate grew from 6% to 10%, according to the Bureau of Labor Statistics (as cited in Jones et al., 2016). If a home owner cannot find the job, he or she will have a very hard time to pay off their mortgage debt, which will lead to foreclosure and housing value reduction, since the supply of the available houses will increase (Jones et al., 2016). This is especially important for the low-income neighborhoods (Sharma, 2016).

Senior urban population, will have positive effect on the *housing value*. This can be explained that an increase in demand for housing by the senior population will lead to more investments in the housing and real estate market. Some parts of the senior population will want to invest in the housing, some will prefer rent (McCann, 2017).

An increase of one percent of number of *conservation organizations* will increase *housing value* for (0.34 %). The presence of conservation organizations influences conservation measures in the city, according to Daley, Sharp, and Bae (2013) (as cited in Leon-Moreta, 2019). "Conservation activity" positively effects land prices (Chamblee et al., 2011). Price for vacant land that is located next to the conserved land is higher compared to the land further down (Chamblee et al., 2011).

Conservation organizations are very active. They participate in many different conservation programs (Leon-Moreta, 2019a). Conservation organizations have their own conservation programs that impact conservation measures in the city, or collaborate with local government programs (Interviewee Two and Three, personal communication, 2019). Conservation organizations organize or participate in different conservation events. They also spread information through social media to gain support of the communities for important environmental issues.

Conclusion: As all models show, social, economic, instrumental, financial, and environmental factors both increase or decrease effects on the *housing value*. Multiple factors impact housing value in this data set.

Factors that contribute to housing value increase (Model 5, Appendix F). An increase of one percent of the following factors would increase the housing value in the city for: "*conservation easements*" (0.01 %), "*state aid*" (0.01 %), "*population density*" (0.01 %), "*college education*" (0.49 %), "*manufacturing*" (0.02 %), "*economic development*" (0.16 %), "*inequality"* (0.54 %), "*senior population*" (0.44 %), "*median income*" (1.2 %), "*conservation organizations*" (0.34 %), "*developed open space*" (0.34 %), "*development middle intensity*" (1.6 %), "*barren land*" (1.34 %), "*evergreen forest*" (0.44 %), "*mixed*

forest" (0.11 %), "*emergent woody wetland*" (0.10 %), "*open water*" (0.22 %), "*citizen liberalism*" (0.003 %). Following *Figure 24* displays significant factors that increase *housing value* (Appendix F).

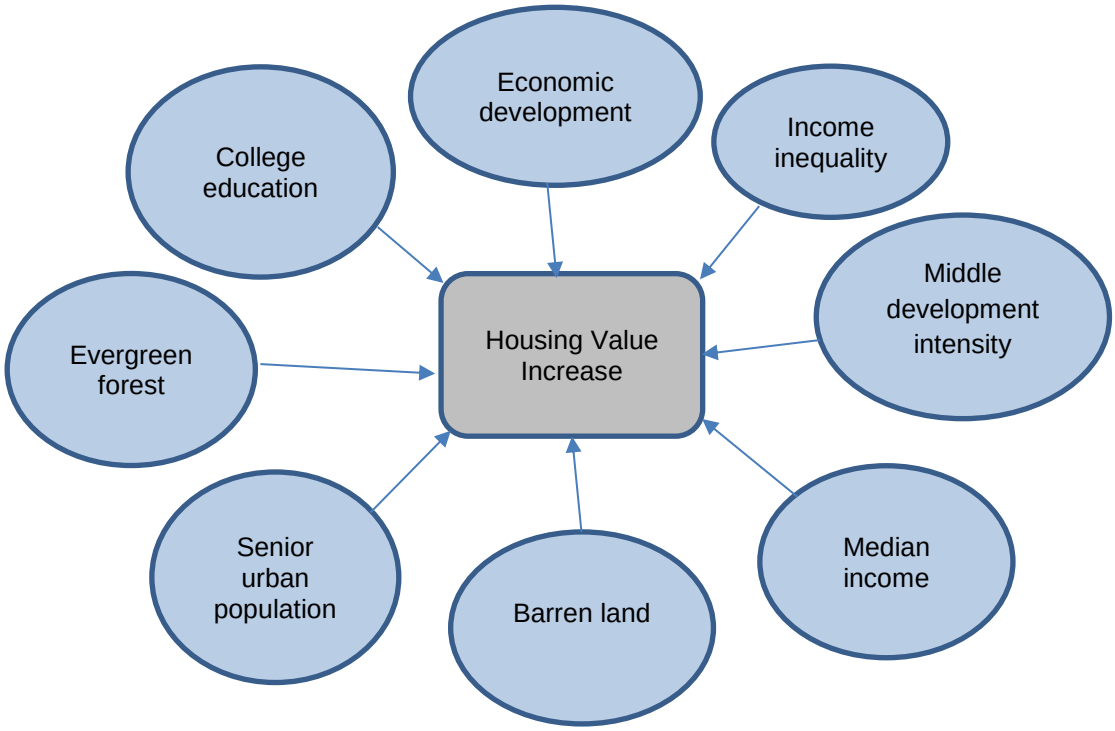


Figure 24. Significant factors that increase housing value. This figure illustrates factors that increase housing value. The arrows in the model represent relationships.

Factors that contribute to housing value decrease (Model 5, Appendix F). An increase of one percent of the following factors would decrease the housing value: "*years of incorporation*" (-0.0003 %), "*mayor council government*" (-0.02 %), "*Federal aid*" (-0.0002 %), "*urban population*" (-0.98 %), "*population squared*" (-0.0005 %), *"% children*" (-0.17 %), "*ownership*" (-0.87 %), "*low intensity development*" (-0.97 %), "*high development*" (-1.6 %), "*deciduous forest*" (-0.27 %) " *grass land* " (-0.15 %), "*pastureland*" (-0.2 %), "*cultivated land*" (-0.24 %), "*woody wetland*" (-0.22 %), "*perennial snow*" (-4.46 %), "*racial diversity*" (-0.07 %). Following *Figure 25* shows factors that significantly decrease *housing value* (Appendix F).

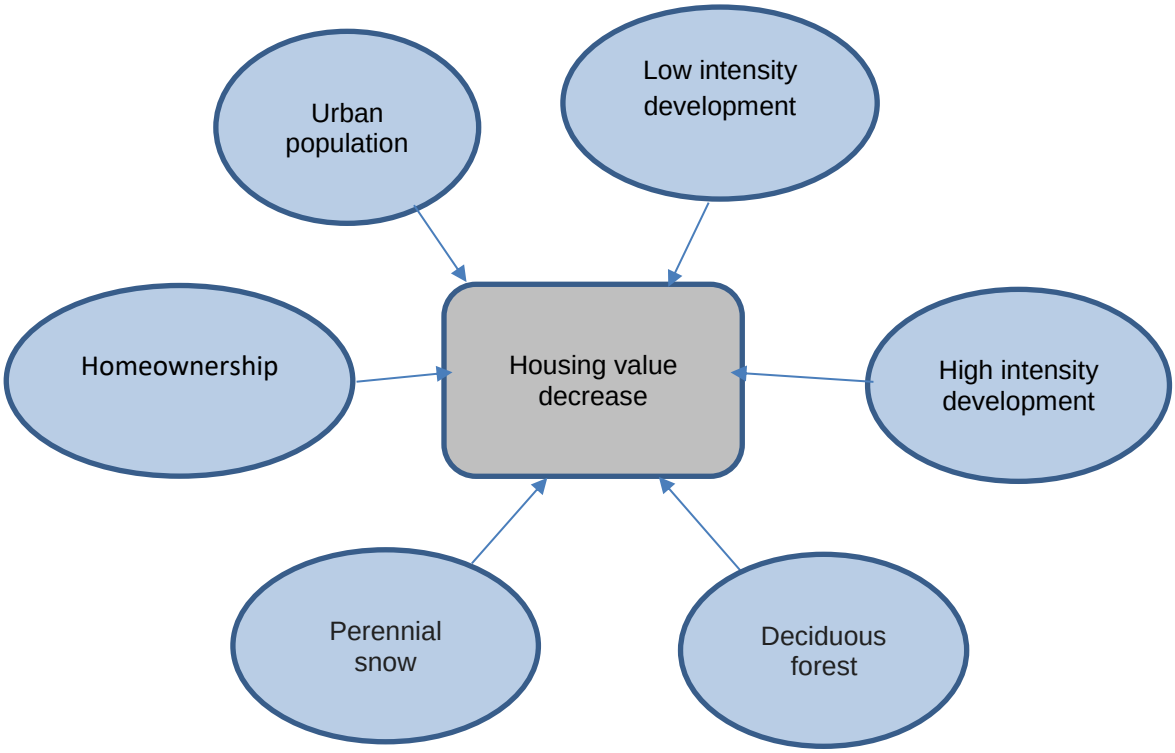


Figure 25. Significant factors that decrease housing value. This figure illustrates factors that decrease housing value. The arrows in the model represent relationships.

In conclusion, since level of development can increase or decrease housing value, it is a mechanism itself that can impact housing value and housing development.

Chapter 12

Thesis Conclusion

Land conservation plays a very important role in a city's development and growth. Expansion of urban areas puts pressure on land use decisions and infrastructure. Social, environmental, economic, instrumental, and financial approaches influence the decision-making process of whether to develop or conserve the land. Creation of land use policies, plans, ordinances, rules, and regulations focus on resources availability. Since urban areas are characterized by high concentrations of population, high levels of housing development, and a high need for economic development, an environmental approach can help to reduce pollution and emissions that urban areas produce. Due to high demand for green open spaces in cities, conserved land can be used for public recreation and wildlife habitat. It can also serve for flood, heat, and pollution mitigation purposes. Accessibility to public open green spaces provide opportunities for all city residents and communities to participate in recreation.

Land can be conserved or redeveloped for recreation purposes. Conserved public land for recreation purposes usually includes trails for walking and bicycling. The level of land development also depends on ownership and zoning type. Decision-making is another important factor. Since land can be in private or public ownership, a landowner can choose to develop or conserve a patch of land without any development at all. Thus, ownership is one of the most important factors of land conservation. Zoning is another very important factor that defines the level of land development in the city. It is the result of a decision-making process of the local government. Both public and private decisions impact city development.

Housing development can improve housing availability, but at the same time provide additional emissions. An increase in urban areas is the result of high-density development

and population growth. An increase in high levels of land development and urban population can decrease housing value if there is an income and economic development decline. Increases in income and economic development will increase housing value. Since a patch has a fixed location, its value will be impacted by its location, and decision to develop or conserve it. It will be also impacted by the type of development of the neighboring patches and its previous state. Especially, housing development can increase or decrease the value of the land.

Land development for housing provides opportunities for people to invest their money in the housing market by buying and selling houses. If there is need to redevelop the area, a change of zoning regulation is required. Local government can decide to expand housing areas and increase housing supply in the city, with a further possible housing price reduction (depending on housing type, location, income, and economic development level in the city). Land can also be conserved for recreation and to increase surrounding housing values. Thus, land conservation is a mechanism itself that influences land and housing value, and restricts levels of development. Economic development is also a mechanism that can influence housing value. Another important factor is the need for housing or recreation.

Housing value in the city can be significantly impacted by such economic factors as *economic development, income inequality, median income, middle intensity development, college education*; social factors such as *senior population,* and environmental factors such as *evergreen forest* and *barren land*. An increase of one percent of these factors can increase housing value. Thus, mostly economic and environmental factors impact housing value. An increase in economic factors such as *low and high intensity development, homeownership*; social factor *population* and environmental factors of *perennial snow* and *deciduous forest*

can decrease housing value. Since levels of development impact housing value, it can be considered a value change mechanism as well.

Decisions about the development or conservation of the patch of land in an urban environment is influenced by local institutions, stakeholders and actors; social, environmental, economic, instrumental, and financial factors; costs and benefits; choice of an instrument, and market conditions. Urban areas provide a convenient and favorable environment for markets with multiple exchanges of goods and services every day. Political, financial, environmental, housing, and real estate markets influence decisions about the land use in urban areas, since every patch of land provides opportunities for economic development or recreation.

In conclusion, social, environmental, economic, financial, and instrumental approaches need to be included in the decision-making process for a sustainable development at the local, state, and federal levels. Local government needs to consider on a large scale a balanced combination of land conservation and land development for housing, to create a favorable environment for local markets and prevent overdevelopment. Considerations of preservation of local ecosystems, especially those including water, is essential for making decisions in land conservation. Land location, demand for housing, and housing value – are factors important for decisions in housing development. Urban areas, as modern "economic engines" (Carbonell & Yaro, 2005), need to have balanced, *environmentally sensitive*, innovative, and financially efficient land use governance.

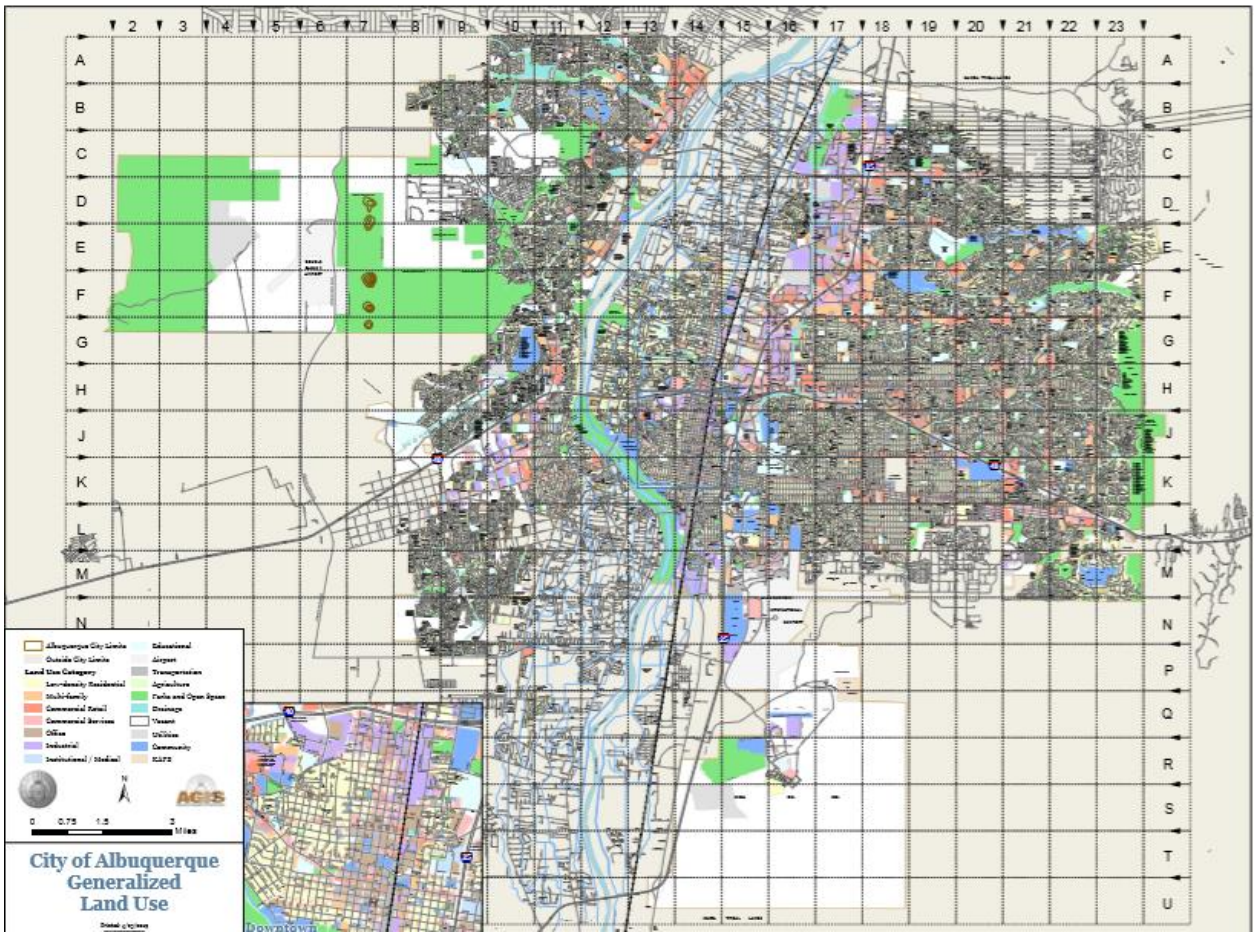
Further studies and more research can be done by adding more social, environmental, instrumental, economic, and financial variables to the data set. This study can be expanded to

a comparative study and analysis of cities from different geographical regions within the United States to test all levels of the proposed hypothetical “conceptual model” further.

Appendices

Appendix A

Land Use Map, City of Albuquerque



Source: City of Albuquerque (2019m).

Appendix B

Variables Description

The following dependent and independent variables and their description for the statistical analysis have been borrowed from Dr. Leon-Moreta's dataset. Data for all variables are "assembled as well to their corresponding time set" (Leon-Moreta, 2019a). "Unless noted otherwise, the unit of observation is a city" (Leon-Moreta, 2019a). "All variables are time-variant" (Leon-Moreta, 2019a).

Dependent Variable:

Housing Value **is** a variable that describes median value of owner-occupied housing units in a city, deflated for comparability by the consumer price index and transformed into the natural log. Sources for this variable include Bureau of Labor Statistics (consumer price index), American Community Survey 2005-2009, Census of Population 2000, and American Community Survey 2010-2014 (house value) estimates.

Independent Variables:

Urban Population is a variable that describes city population transformed into the natural log. Sources for the variable include Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

Conservation Organizations is a variable that describes number of nongovernmental organizations performing conservation programs in the city's county area, weighted to per-capita levels and transformed into the natural log. Sources for the variable: National Center for Charitable Statistics 2000, 2005, 2010.

Senior Urban Population is a variable that describes fraction of the city population aged 65 years and over. Sources: Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates"

"Income" is a variable that describes median household income in a city that is deflated (in dollars) for comparability by the consumer price index and transformed into the natural log. Sources for the variable: Bureau of Labor Statistics (consumer price index), Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 (income) estimates".

"Homeownership" is a variable that describes fraction of housing units occupied by their owners in a city. Sources: Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

"Barren land" is a variable that describes fraction of the county area covered by bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, dunes, strip mines, gravel pits and other accumulations of earthen material. Vegetation accounts for less than 15% of the total cover. Sources: NHGIS 2001, 2006, 2011.

Control Variables.

Economic Factors

"***College Education"*** is a variable that describes educational attainment; fraction of the city population having a college degree or higher. Sources: Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

"***Economic Development"*** is a variable that describes real gross economic product of the metropolitan area weighted to per-capita levels and transformed into the natural log. Sources: Bureau of Economic Analysis 2001, 2006, 2011 as compiled by Woods & Poole.

"Manufacturing" is a variable that describes fraction of manufacturing workers in the working population aged sixteen years and over in the city. Sources: Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

"Developed, Open Space" is a variable that describes fraction of the county area covered by spaces developed for parks, recreation or aesthetic purposes. Sources: NHGIS 2001, 2006, 2011.

"Developed, Low Intensity" is a fraction of the county area covered by a mixture of vegetation and built surfaces. Built surfaces account for 20 to 49% of the total cover. Sources: NHGIS 2001, 2006, 2011.

"Developed, Medium Intensity" is a variable that describes fraction of the county area covered by a mixture of vegetation and built surfaces. Built surfaces account for 50 to 79% of the total cover. Sources: NHGIS 2001, 2006, 2011.

"Developed, High Intensity" is a variable that describes fraction of the county area covered by a mixture of vegetation and built surfaces. Built surfaces account for 80 to 100% of the total cover. Sources: NHGIS 2001, 2006, 2011.

Social Factors

"Population Squared" is a variable that describes square of the preceding variable. 60.098 (32.942) Density Ratio of population to squares miles in a city. Sources for the variable include Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

"Under 18" is a variable that describes fraction of the city population aged under 18 years. Sources for the variable include Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

"Citizen Liberalism" is a variable that describes index of citizen ideology in the state. A higher score indicates a more liberal ideology; a lower score indicates a more conservative ideology. Please see Berry et al. (1998) for additional discussion regarding this index. Sources for the variable include Berry et al. 2000, 2005, 2010.

"Racial Heterogeneity" is a variable that describes probability that two residents, when randomly drawn from the city population, will belong to different racial groups. More formally, p=1−$\sum RR2\ rr$. In the formula, RR is the percentage of the city population that belongs to racial group r. This Herfindahl index incorporates information from each of the racial groups reported by the Census. Please see Jimenez (2014) for literature employing this index. Sources for the variable include Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

"Population Density" is a variable that describes ratio of population to squares miles in a city. Sources for the variable include Census of Population 2000, American Community Survey 2005-2009, and American Community Survey 2010-2014 estimates.

Instrumental Factors (Related)

"Years of Incorporation" is a variable that describes years from municipal incorporation to the present. It equals the year of each time set minus the year of incorporation: thus, years to 2000 equal 2000 minus the year of incorporation, years to 2005 equal 2005 minus the year of incorporation, and years to 2010 equal 2010 minus the year of incorporation. Sources for the variable include Census of Governments 1987 and Boundary and Annexation Survey 1988-2010.

"Mayor-Council Form" is a variable that describes dummy variable for mayor-council governments, classified by the score of 1 for these governments and zero otherwise. Data are pooled as follows. First, data are compiled from the 2011 ICMA Form of Government Survey. Subsequently, if any data is missing from the most recent source, the next preceding ICMA Form of Government Survey is used. Finally, data not collected by the ICMA (such as cities with a population under 2,500) are compiled from the 1992 Census of Governments—the last Census that reported data on forms of government. Sources for the variable include Census of Governments 1992 and ICMA Form of Government Surveys 1996 to 2011 as compiled by the Local Governance Research Laboratory.

Financial Factors.

"Conservation Easements" is a variable that describes number of land conservation easements in the city's county area, transformed into the natural log. Sources for the variable include National Conservation Easements Database 2000, 2005, 2010.

"***Federal Grants"*** is a variable that describes general funding from the federal government to cities. The grants (in historical dollars) are deflated for comparability by the consumer price index, weighted to per-capita levels, and transformed into the natural log. Sources for the variable include Bureau of Labor Statistics (consumer price index) and Census of Governments (grants) 2002, 2007, 2012.

"State Grants" is a variable that describes general funding from the state government to cities. The grants (in historical dollars) are deflated for comparability by the consumer price index, weighted to per-capita levels, and transformed into the natural log. Sources for the variable include Bureau of Labor Statistics (consumer price index) and Census of Governments (grants) 2002, 2007, 2012.

Environmental Factors

"Deciduous Forest" is a variable that explains fraction of the county area covered by trees greater than 5 meters tall. Trees account for more than 20% of the vegetation cover. Sources for the variable include NHGIS 2001, 2006, 2011.

"Evergreen Forest" is a variable that explains fraction of the county area covered by trees greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage. Sources: NHGIS 2001, 2006, 2011.

"Mixed Forest" is a variable that explains fraction of the county area covered by trees greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover. Sources for the variable include NHGIS 2001, 2006, 2011.

"Grassland or Herbaceous" is a variable that describes fraction of the county area covered by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management, such as tilling, but can be utilized for grazing. Sources: NHGIS 2001, 2006, 2011.

"Pasture or Hay" is a variable that describes fraction of the county area covered by grasses, legumes, or grass legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation. Sources: NHGIS 2001, 2006, 2011.

"Cultivated Crops" is a variable that describes fraction of the county area used to produce annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and perennial woody

crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled. Sources: NHGIS 2001, 2006, 2011.

"Woody Wetland" is a variable that describes fraction of the county area where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated or covered with water. Sources: NHGIS 2001, 2006, 2011.

"Emergent Wetland" is a variable that describes fraction of the county area where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water. Sources: NHGIS 2001, 2006, 2011.

"Open Water" is a variable that shows fraction of the county area covered by open water. Sources: NHGIS 2001, 2006, 2011.

"Perennial Ice" is a variable that shows fraction of the county area covered by perennial ice or snow. Sources: NHGIS 2001, 2006, 2011 (Leon-Moreta, 2019a).

"Panel controls"

"**Time effects".** "This data set has three sets of dummy variables classifying observations by period: thus 2000 observations take the score 1 and zero otherwise, 2005 observations take the score of 1 and zero otherwise, and 2010 observations take the score of 1 and zero otherwise" (Leon-Moreta, 2019a).

Appendix C

Variables Classification

Economic Factors	**Instrumental Factors**	**Financial Factors**	**Environmental Factors**	**Social Factors**
College education	Years of incorporation	Conservation easements	Barren land	Urban population
Homeownership	Mayor council government	Federal aid	Evergreen forest	Senior urban population
Median income		State aid	Mixed forest	Conservation org.
Manufacturing			Grassland	Racial diversity
Economic development			Pasture land	Citizen liberalism
Income inequality			Cultivated crops	Population squared
Developed open space			Woody wetlands	Population density
Developed low intensity			Emergent woody wetland	Under 18
Developed medium intensity			Open water	
Developed high intensity			Perennial snow	

Appendix D

Control Variables Classification

Economic Factors	**Instrumental- Financial Factors**	**Environmental Factors**	**Social Factors**
College education	Years of incorporation	Barren land	Population density
Manufacturing	Mayor council government	Evergreen forest	Under 18
Economic development	Conservation easements	Mixed forest	Population squared
Income inequality	Federal aid	Grassland	Racial diversity
Developed open space	State aid	Pasture land	Citizen liberalism
Developed low intensity		Cultivated crops	
Developed medium intensity		Woody wetlands	
Developed high intensity		Emergent woody wetland	
		Open water	
		Perennial snow	

Appendix E

Models Description

Following tables show five models with independent and control variables. Dependent variable is *housing value.*

Model One

Independent Variables	**Coefficient**	**Standard Error**
Urban population	-.96***	(.007)
Senior urban population	1.36***	(.205)
Homeownership	-1.33***	(.158)
Median income	1.52***	(.075)
Conservation organizations	.067***	(.011)
Barren land	1.96***	(.784)

Note: R^2 = 96%. Coefficients and standard errors are within 95% confidence interval. Significance is *p = 0.10 to 0.05, **p = 0.05 or less, ***p = 0.01 or less.

Model Two
Add social variables (control).

Social Variables (Control)	**Coefficient**	**Standard Error**
Racial diversity	.251***	(.068)
Citizen liberalism	.004**	(.002)
Population squares	.001	(.002)
Population density	-.01	(.014)
Under 18	-.29	(.20)

Note: R^2 = 96%. Coefficients and standard errors are within 95% confidence interval. Significance is *p = 0.10 to 0.05, **p = 0.05 or less, ***p = 0.01 or less.

Model Three
Add economic variables (control).

Economic Variables (control)	**Coefficient**	**Standard Error**
College education	.382***	(.099)
Manufacturing	-.126	(.130)
Economic development	.110	(.075)
Income inequality	.586***	(.040)
Developed open space	-.453	(.452)
Developed low intensity	-.677***	(.201)
Developed middle intensity	1.87***	(.510)
Developed high intensity	-1.606***	(.410)

Note: R^2 = 97%. Coefficients and standard errors are within 95% confidence interval. Significance is *p = 0.10 to 0.05, **p = 0.05 or less, ***p = 0.01 or less.

Model Four *Add instrumental and financial variables (control)*		
Instrumental and Financial Variables	**Coefficient**	**Standard Error**
Years of incorporation	-.001***	(.000)
Mayor-council government	-.033**	(.016)
Conservation easement	.002	(.008)
Federal aid	-.001	(.002)
State aid	.007***	(.002)
Note: R^2 = 97%. Coefficients and standard errors are within 95% confidence interval. Significance is *p = 0.10 to 0.05, **p = 0.05 or less, ***p = 0.01 or less		

Model Five *Add environmental variables (control).*		
Environmental Variables (control)	**Coefficient**	**Standard Error**
Deciduous forest	-.27**	(.110)
Evergreen forest	.44***	(.149)
Mixed forest	.111	(.270)
Grassland	-.149	(.112)
Pasture land	-.198	(.133)
Cultivated crops	-.240**	(.117)
Woody wetlands	-.222	(.179)
Emergent woody wetland	.101	(.187)
Open water	.225	(.311)
Perennial snow	-4.46**	(2.34)
Note: R^2 = 96%. Coefficients and standard errors are within 95% confidence interval. Significance is *p = 0.10 to 0.05, **p = 0.05 or less, ***p = 0.01 or less		

Appendix F

Model 5

List of All Variables

Dependent Variable: Housing Value *List of coefficients (marginal effects) of all independent and control variables*		
Independent and Control Variables	**Coefficient**	**Standard Error**
College education	.489***	(.078)
Racial diversity	-.071*	(.038)
Manufacturing	.016*	(.116)
Economic development	.164**	(.071)
Years of incorporation	-.000**	(.000)
Mayor-Council government	-.020	(.013)
Conservation organizations	.034***	(.009)
Conservation easements	.007	(.007)
Federal aid	-.000	(.001)
State aid	.008***	(.002)
Citizen liberalism	.003***	(.001)
Urban population	-.980***	(.029)
Population squares	-.000	(.002)
Density	.007	(.013)
Under 18	-.172	(.148)
Senior urban population	.443***	(.152)
Median income	1.204***	(.039)
Income inequality	.545***	(.041)
Homeownership	-.875***	(.076)
Developed open space	.020	(.320)
Developed low intensity	-.970***	(.203)

Developed middle intensity	1.595***	(.508)
Developed high intensity	-1.608***	(.382)
Barren land	1.338***	(.502)
Deciduous forest	-.267**	(.110)
Evergreen forest	.441***	(.149)
Mixed forest	.111	(.269)
Grassland	-.148	(.112)
Pasture land	-.198	(.133)
Cultivated crops	-.240**	(.117)
Woody wetlands	-.222	(.179)
Emergent woody wetland	.101	(.187)
Open water	.224	(.311)
Perennial snow	-4.456	(2.338)
Note. R^2 is 97%. Coefficients and standard errors are within 95% confidence interval. There are 19,548 units of observation with *p = 0.10 to 0.05, **p = 0.05 or less, ***p = 0.01 or less.		

Appendix F (cont).

Appendix G

VIF Test

```
Linear regression                               Number of obs     =     19,548
                                                F(8, 33)          =    4578.66
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9628
                                                Root MSE          =      .3269

                                   (Std. Err. adjusted for 34 clusters in sfips)
------------------------------------------------------------------------------
             |               Robust
         hvl |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      logpop |  -.9613023   .0085993  -111.79   0.000    -.9787977   -.9438068
    r_senior |   1.364798   .2363827     5.77   0.000     .8838735    1.845722
     ownship |  -1.333775   .1706249    -7.82   0.000    -1.680914   -.9866359
     logmedy |   1.521229   .0658876    23.09   0.000      1.38718    1.655278
      lognpo |   .0665011   .0181399     3.67   0.001     .0295951    .1034071
       bar_l |   1.964077   .9127509     2.15   0.039     .1070709    3.821082
          f1 |          0  (omitted)
          f2 |    .391087   .0348898    11.21   0.000     .3201032    .4620709
          f3 |   .3059282   .0205219    14.91   0.000     .2641761    .3476802
       _cons |  -5.316678   .6579612    -8.08   0.000     -6.65531   -3.978046
------------------------------------------------------------------------------
```

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
     ownship |      1.96    0.509059
     logmedy |      1.76    0.569623
      logpop |      1.50    0.667830
          f3 |      1.39    0.720116
          f2 |      1.36    0.733963
      lognpo |      1.11    0.899319
    r_senior |      1.06    0.945224
       bar_l |      1.02    0.979287
-------------+----------------------
    Mean VIF |      1.39
```

Appendix H

2010-2014 Time-Period Regression

6,516 observations, R^2 is 0.97%

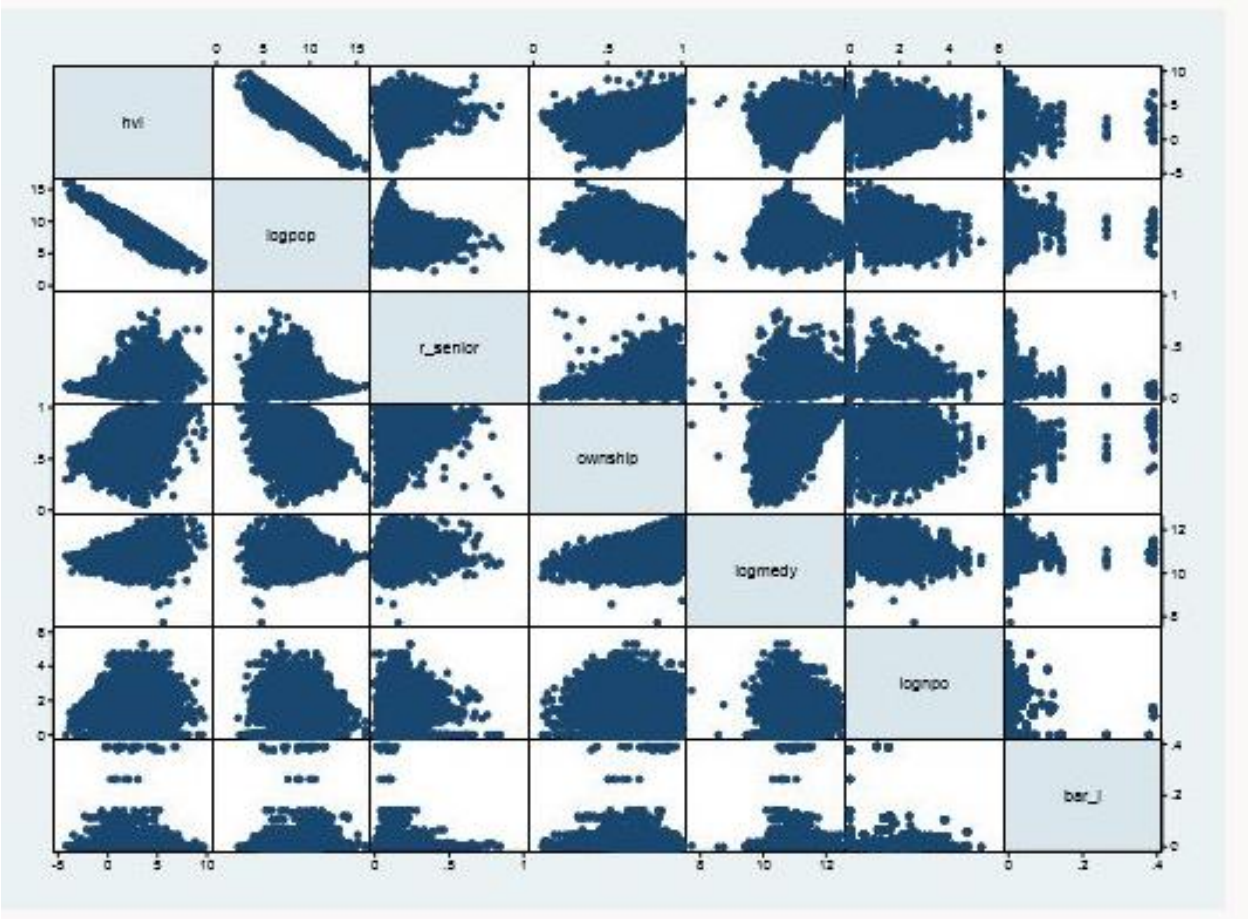
(Std. Err. adjusted for 34 clusters in sfips)

hvl	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ref_pss	.0191831	.0300574	0.64	0.528	-.0419691	.0803353
college	.6414783	.1459243	4.40	0.000	.3445932	.9383634
hhr	-.0089097	.0582383	-0.15	0.879	-.1273964	.109577
r_man	-.0911388	.1623717	-0.56	0.578	-.4214865	.239209
logmp	.1622669	.0702948	2.31	0.027	.019251	.3052827
yr_inc	-.000415	.0002824	-1.47	0.151	-.0009895	.0001594
mayc	-.0166332	.0175756	-0.95	0.351	-.052391	.0191246
lognpo	.0324527	.0082384	3.94	0.000	.0156916	.0492138
lneas_c	.0044029	.010387	0.42	0.674	-.0167296	.0255355
lnfaid	.0019865	.002078	0.96	0.346	-.0022412	.0062141
lnsaid	.0049848	.0029012	1.72	0.095	-.0009177	.0108874
ideo	.0042417	.0021631	1.96	0.058	-.0001592	.0086427
logpop	-.971668	.0407846	-23.82	0.000	-1.054645	-.8886912
logpop2	-.0010651	.0023951	-0.44	0.659	-.0059381	.0038079
logdens	-.0088892	.0162669	-0.55	0.588	-.0419846	.0242061
r_child	-.3220374	.2207767	-1.46	0.154	-.7712109	.1271362
r_senior	.4571815	.2675369	1.71	0.097	-.0871263	1.001489
logmedy	1.143654	.0680782	16.80	0.000	1.005148	1.28216
ineq	.526009	.0888862	5.92	0.000	.3451687	.7068493
ownship	-.8961059	.10957	-8.18	0.000	-1.119028	-.6731841
d_os	.3427924	.4177521	0.82	0.418	-.5071306	1.192715
d_li	-.728412	.4889611	-1.49	0.146	-1.723211	.2663869
d_mi	1.46034	.5236789	2.79	0.009	.394907	2.525773
d_hi	-1.547562	.2936083	-5.27	0.000	-2.144913	-.9502116
bar_l	1.339444	.6628388	2.02	0.051	-.0091112	2.688
dec_f	-.263174	.1723876	-1.53	0.136	-.6138991	.0875512
everg_f	.3880555	.202033	1.92	0.063	-.0229838	.7990949
mix_f	.3160626	.2034047	1.55	0.130	-.0977673	.7298925
grass	-.1298509	.1383358	-0.94	0.355	-.4112973	.1515954
past	-.2567522	.1819462	-1.41	0.168	-.6269246	.1134203
cultiv	-.2156247	.1521797	-1.42	0.166	-.5252366	.0939873
w_wet	-.3122358	.2465289	-1.27	0.214	-.8138026	.1893309
em_wet	.3958401	.3207091	1.23	0.226	-.2566476	1.048328
o_wat	.1555751	.3658964	0.43	0.673	-.5888468	.899997
isnow	-6.457715	4.379243	-1.47	0.150	-15.36735	2.451921
_cons	-3.441741	1.146336	-3.00	0.005	-5.773979	-1.109502

Appendix I

Scatterplot Graphs

First column (Vertically) variables: 1. “Housing value” – “urban population”. 2. “Housing value” – “senior urban population”. 3. “Housing value”- “homeownership”. 4. “Housing value” – “median income”. 5. “Housing value” – “conservation organizations”. 6. “Housing value” – “barren land”.



Appendix J

List of Open Spaces and Acreage in Albuquerque

List of Open Spaces and Acreage in Albuquerque

“LOCATION	**ACREAGE**
Westside	
Shooting Range	5285
Volcanoes	4209
West Mesa	3651
La Boca Negra Park	1528
Boca Negra Canyon	138
Piedras Marcades	793
Atrisco Terrace	675
Paseo del Volcano	525
Black Ranch	200
La Cuentista	59
	Total - 17,063
Bosque / Valley	
Rio Grande Valley State Park	4027
Graham Property	126
San Antonio Oxbow	59
Candelaria Farm	176
Los Poblanos Fields	138
Hubbell Oxbow	87
Visitor Center Wetland	49
Alamo Farm	20
Alameda / Rio Grande	9
	Total - 4,691
Arroyos	
Montessa Park	577
Calabacillas Arroyo	110
Bear Canyon	115
Pino Arroyo	18

	Total - 820
Sandia Foothills	
Foothills	1059
Elena Gallegos	640
Rounds Estate	324
Manzano / Four Hills	306
Tijeras Gateway	327
	Total - 2,656
East Mountains	
Juan Tomas	1455
Golden	1180
Placitas	560
Gutierrez Canyon	301
San Antonio	169
Tres Pistolas	106
Carolino Canyon	30
	Total - 3,801
	Aggregate Total - 29,031”

Appendix j (cont.). Source: City of Albuquerque (2019j, para.16).

Appendix K

Interview One Questions

January 15, 2019

No personal opinions or personal information were requested, only publicly available information.

1. How many parks and recreation areas are in Albuquerque?
2. Who maintains all parks and recreation areas in the City?
3. How does Albuquerque City finance conservation programs and initiatives?
4. What are the mechanisms of fund distribution for the support of parks and recreation areas in Albuquerque?
5. Are there any fiscal and policy conditions underlying inequities and differentials in fund allocations?
6. Are there any inequities and differentials in access of parks and recreational resources in Albuquerque?
7. What factors impact urban land conservation?
8. What land conservation policies, laws, rules, and regulations does the City of Albuquerque have?
9. What land conservation programs does the City have?
10. What factors influence the support by the local government of urban land conservation?
11. What approaches work best to preserve City's parks?
12. What factors lead to successful policies and increasing opportunities for recreation and outdoor activities?

13. How can water shortage impact parks and recreation areas in the City?

Appendix L

Interview Two Questions

January 18, 2019

No personal opinions or personal information were requested, only publicly available information.

1. How many open spaces areas are in Albuquerque?
2. Who maintains open spaces areas in the City?
3. How does Albuquerque City finance conservation programs and initiatives?
4. What are the mechanisms of fund distribution for the support of open spaces in Albuquerque?
5. Are there any fiscal and policy conditions underlying inequities and differentials in fund allocations?
6. Are there any inequities and differentials in access of open spaces in Albuquerque?
7. What factors impact urban land conservation?
8. What land conservation policies, laws, rules, and regulations does the City of Albuquerque have?
9. What land conservation programs does the City have?
10. What factors influence the support by the local government of urban land conservation?
11. What approaches work best to preserve City's open spaces?
12. What factors lead to successful policies and increasing opportunities for recreation and outdoor activities?
13. How can water shortage impact open spaces in urban areas?

14. What is an impact of land grants and land ownership on urban land conservation?

15. How do intergovernmental relations impact decisions on urban land conservation?

16. How do conservation organizations impact urban land conservation?

17. Who makes a final decision on land conservation in the City?

Appendix M

Interview Three and Four Questions

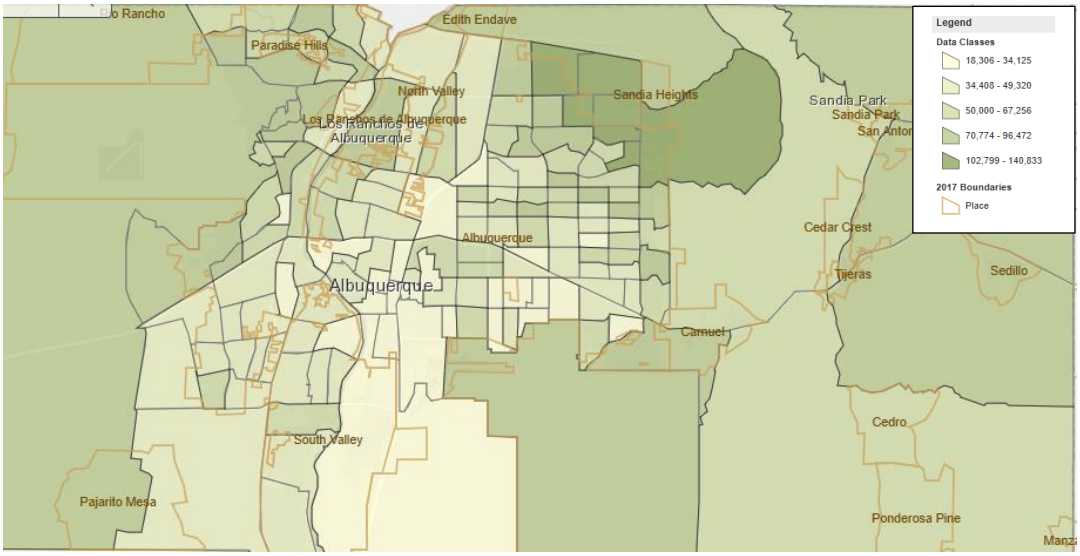
01.30.2019 and 02.13.2019

No personal opinions or personal information were requested, only publicly available information.

1. Does your organization always support land conservation in the City?
2. What conservation programs do you have?
3. What conservation programs do you support?
4. What factors impact urban land conservation?
5. What factors influence the support by your organization of urban land conservation initiatives?
6. What approaches work best to preserve City's natural environment?
7. What factors lead to successful urban land conservation policies?
8. How can water shortage impact protected urban areas?
9. What is an impact of land grants and land ownership on urban land conservation?
10. How do conservation organizations impact urban land conservation?
11. What are the major sources of funding for your organization?
12. What conservation programs do you have?
13. What conservation programs do you support?

Appendix N

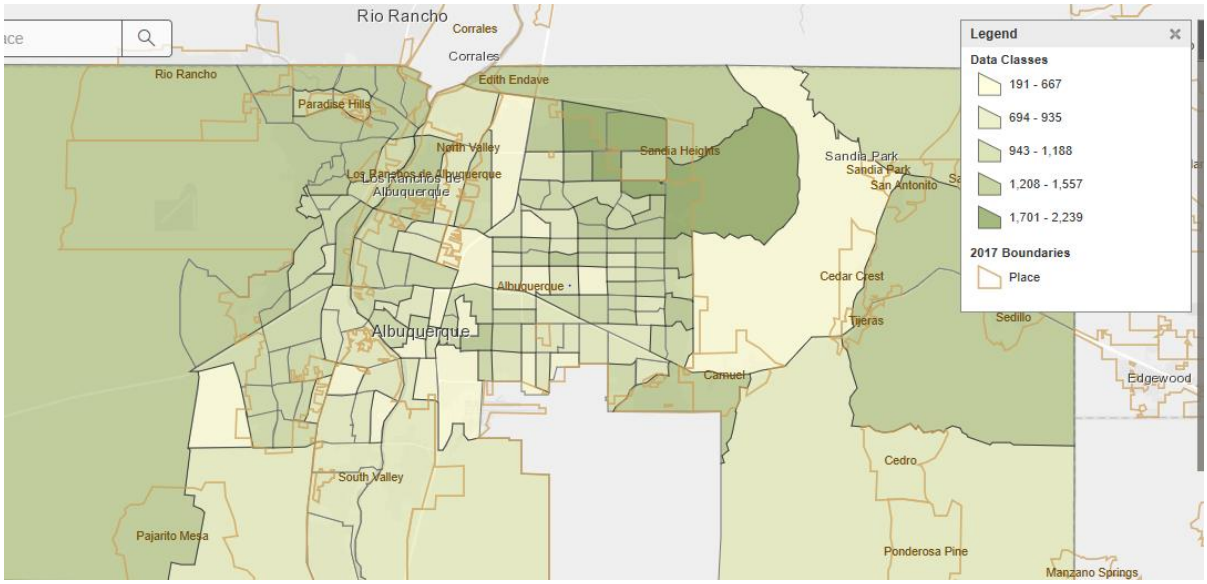
Map of Median Income, Albuquerque City, by Census Tracts



Source: U.S. Census Bureau (2017a).

Appendix O

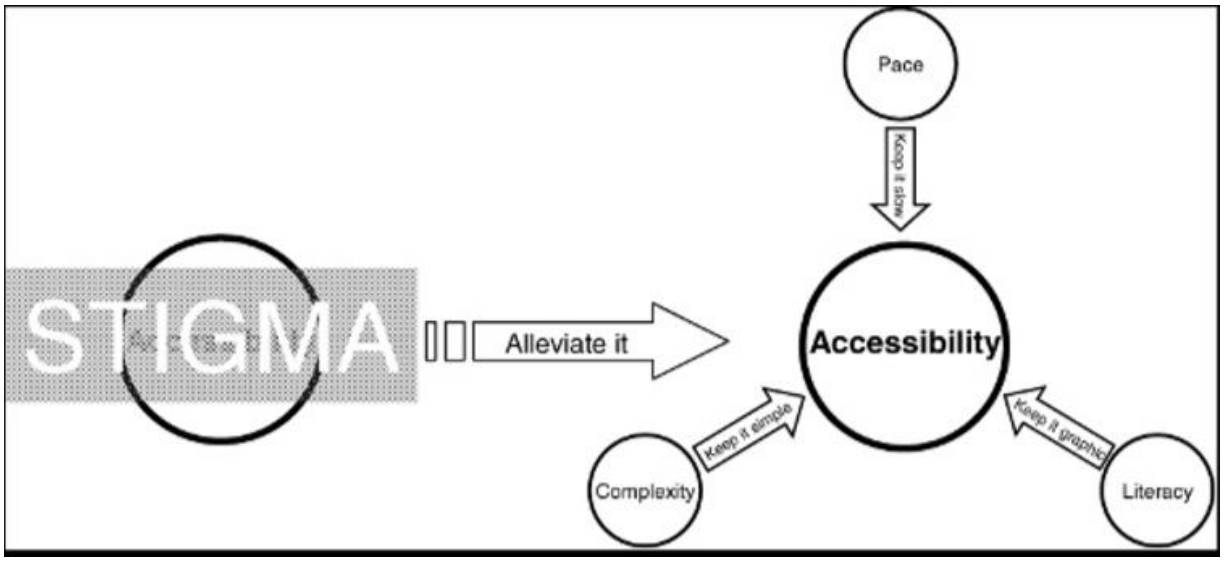
Map of Monthly Housing Costs in Albuquerque City



Source: U.S. Census (2017b).

Appendix P

Yalon - Chamovitz' "Conceptual Model"



Source: Yalon - Chamovitz (2009) (as cited in Nourie, 2019).

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