ECONOMIC RESILIENCE, DISASTERS, AND GREEN JOBS: AN INSTITUTIONAL

COLLECTIVE ACTION FRAMEWORK

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Dissertation Prepared for the Degree of

DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

December 2017

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Ismayilov, Orkhan M. *Economic Resilience, Disasters, and Green Jobs: An Institutional Collective Action Framework.* Doctor of Philosophy (Public Administration and Management), December 2017, 121 pp., 14 tables, 4 figures, references, 208 titles.

The objective of this dissertation is to examine the bouncing forward approach of economic resilience in local governments during and following natural disasters. Specifically, the dissertation argues that climate change related natural disasters create a window of opportunity for local governments to attract green jobs. The dissertation adopts two studies to examine green job growth in local governments in Florida. The first study investigates local government collaboration for creation of green jobs. The survey data was collected from local governments and nonprofit organizations in the South Florida region between June and September 2017. The findings for the study indicate that local governments' unity and closeness plays an important role in creation of green jobs. The first study highlights that working with others has a positive and significant effect on the creation of green jobs.

The second study investigates to what extent natural disasters affect the creation of green jobs. This study uses secondary data collected from the National Establishment Time Series, National Climate Data Center, Federal Emergency Management Agency, and United States Census Bureau datasets. The findings of the second study indicate that natural disasters, depending on type and lagged time, have a positive and significant effect on green jobs. On average, two years after natural disasters, green jobs increase by three percent. Hydrological type of disasters has the most significant effect on green jobs. Findings for both studies are consistent with the bouncing forward approach for economic resilience, which argues that in order to enhance economic activity following disasters, it is important to invest in industries that are disaster resilient.

ACKNOWLEDGMENTS

In memory of my brother Raul Ismayilov. I dedicate this dissertation to you. The hardest part of healing after losing you is recovering me that went away with you. Memories of you have become a treasure that I shall cherish forever. Your passion for economics and finance inspired me to pursue this degree. Your dedication to lead and help others is the path I have chosen. Your idea of the quintessential world will never die. After all this time, I still miss you every day.

I am most grateful to Dr. Simon A. Andrew for the mentorship he has given me in the last four years. Dr. Andrew, your passion and dedication for research inspired me to work hard. Good mentorship is not one single big thing, but rather a million little things. I am thankful for everything you have done for me. A special thank you to Dr. Skip Krueger and Dr. Gary Webb for the direction and guidance they have provided me. I am grateful to Dr. Abraham Benavides for providing me support in the doctoral program. I also want to thank Dr. Richard Feiock from the Florida State University for his help. This research would have not happened without the datasets you kindly provided me.

Last, but most importantly, I am thankful to my family for always believing in me and pushing me to work harder. To my parents Mahir Ismayilov and Nushaba Nadirova—everything I have accomplished in my life is because of you. I am grateful for your decision to allow me to move to the United States and pursue the American Dream. Your vision for your children has become my mission in life. To my wife Judith Nicks—I am very thankful for your love, care, and encouragement. Even in times of despair and hopelessness, you have always reminded me of my purpose. I thank you all for the care, inspiration, strength, encouragement, and unconditional love you have given to me.

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CHAPTER 1

INTRODUCTION

The purpose of this dissertation is to study factors that explain how local governments come together to create green jobs. According to the Bureau of Labor Statistics (2011), green jobs are defined as employment whereby the output of production conserves natural resources and does not affect the environment. Green jobs are attributed with having zero effect on the environment. While green jobs are encouraged by national governments, there are few approaches that have been adopted to help understand the logic of creating green jobs at the local and regional levels. Therefore, this dissertation investigates the collaborative mechanisms for green job creation at regional and local government levels, specifically examining the relationship between natural disasters and the creation of green jobs.

Lack of knowledge on (1) the relationship between natural disasters and green jobs, and (2) local collaboration for green job creation are the two gaps that this dissertation is investigating. In order to fill the gaps in knowledge, this dissertation examines two empirical studies. The purpose of the studies is to investigate the relationship between natural disasters, climate change adaptation policies and green job creation. Hence, this dissertation asks two questions: (1) *Is green job creation influenced by climate change adaptation policies and regional collaboration;* and (2) *What effects have climate-related weather events and disasters had on green jobs.* Theoretically, this dissertation argues that local governments will invest in disaster resilient green jobs because they are interested in surpassing normalcy of economic output prior to disaster occurrence. It is argued that regional collaboration can lead to the creation of green jobs, because local governments share information regarding the success of their community resilience. The objectives of this dissertation are to (1) provide understanding

for the collaborative mechanism adopted by local governments to help create green jobs; and (2) provide theoretical and empirical evidence of the effect of natural disasters on types of green jobs in local governments. These objectives are met through a set of two studies. While the first study discusses how working together helps create green jobs on a community level, the second study discusses comprehensive green job creation in local governments in Florida.

To explain the dissertation objectives, this chapter is structured in the following way: First, this chapter provides examples of climate change adaptation frameworks on national and local levels. Second, a definition and explanation of green jobs is provided. Third, the chapter provides an explanation of two common forms of economic resilience following disasters. Fourth, the gap in knowledge is highlighted. Fifth, data collection methods and summaries for two studies are provided. Lastly, theoretical and practical contributions of the dissertation are highlighted.

1.1   Climate Change Adaptation Frameworks

In 1988, the intergovernmental body of Intergovernmental Panel on Climate Change (IPCC), under the supervision of the United Nations, was developed to provide solutions for the political and economic impact of climate change (IPCC 2014). The reports produced by the panel highlight that industries that produce carbon dioxide into the atmosphere warm the climate (IPCC 2014). Warmer climate, in the long-run, generates catastrophic natural disasters (Arctic Climate Impact 2004). Changes in the climate are argued to shift population from coastal regions inland costing local governments billions of dollars in damages (Palut et al. 2007). It is estimated that by 2100 in the United States, over 13 million residents will have to move inland, leaving most coastal cities due to a permanent increase in sea level (Hauer et al. 2016).

Environmental scientists argue that climate change is a global disaster that threatens the future of the world (Parry et al. 2005). At the global level, frameworks have been adopted to help governments reduce their influence on climate change, through the provisions of solutions to change economic behavior, job creation and production. For example, Australia, Canada, Ireland, Finland, and Netherlands all have adopted national strategies to adapt to the effects of climate change.

However, working together to address climate change at the local level is not an easy process. This is because local governments experience the effects of climate change differently. For instance, coastal cities experience changes in the climate differently than cities located in inland. Adapting to climate change requires a regional and community effort, but it is difficult to attract local governments to create a joint effort. In order to create a joint effort, it is important to understand the interactions and the relationships local governments have with each other that contribute to successful collaboration. Furthermore, it is difficult to create a framework at the local level because of various local government characteristics, such as policies related to employment training, tax abatement, political party of elected officials, government size, revenue base, established industries, and demographics of the population (Adger et al. 2005).

At the global level, several frameworks have been adopted that involve collective action. The United Nations Framework Convention on Climate Change (UNFCCC 2017), formed by 165 countries, reached an agreement to reduce the effects of greenhouse emission. Under the framework, an international treaty signed by 85 countries, the Kyoto Protocol, binds governments' emission reductions (Protocol 1997). One of the objectives of the treaty is to help countries shift their economic behavior by investing in areas such as green economy. Recently, within the UNFCCC, the Paris Climate Accord was ratified by 169 countries serving mitigation

purpose against climate change. The objective of the agreement is to help governments mitigate and adapt to change in climate (Davenport 2015). Starting in 2020, every government will have to make annual reports on the progress of greenhouse gas reduction. In relation to resiliency, the Sendai Framework for Disaster Risk Reduction has been adopted to help governments become disaster resilient. The goal of the framework is to help governments provide social and financial preparedness plans against extreme disasters (Kelman 2015). According to Kelman (2015) one of the objectives of the Sendai Framework is to reduce disaster-related economic losses of governments by providing strategies to help invest in disaster resilient industries.

Application of frameworks developed within the United Nations for mitigation and adaptation provide solutions at a national level. Adaptation and resilience in local governments, however, are usually performed at community and regional levels. The argument is that the effect of climate change is more devastating in regions vulnerable to disasters than it is to the country as a whole. For instance, a coastal region is far more likely to be upset by disasters than a region located inland, which is why some regions adapt to changes in the climate faster than other regions do. Mitigating, responding and adapting to disasters have been argued to have successful consequences when local governments collaborate (Kapucu 2008).

With regard to climate change, local governments create a collaborative mechanism with others due to a lack of resources and information. This information is necessary to adapt to changes in climate and reduce the effects of disasters on the economy. Reducing effects on the economy can be achieved by attracting disaster resilient industries, such as green and clean businesses. However, there is no research on the investigation of regional collaboration following disasters and its effect on green jobs. More importantly, a gap in the literature

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suggests that there is a lack of knowledge on local government climate change strategies, especially in the form of attracting green jobs.

1.2   Defining and Explaining Green Jobs

The United Nations Environment Program defines green jobs as "agriculture, manufacturing, research and development, administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution" (Renner et al. 2008). The United States description for the green jobs is defined and explained by the Bureau of Labor Statistics (BLS). According to the BLS (2011), green jobs are either: (1) "Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources"; or (2) "Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources."

The traditional rationale for job creation can be traced back to the classical economic growth theories. They argue that government attraction and creation of employment help the economy. At the most general level, when a government invests in physical and human capital, the investment generates the multiplier effect in the economy (Barro 2001; Benhabib and Spiegel 1994; Schumpeter and Backhaus 2003). The multiplier effect in one area of the economy influences economic activities and growth in other areas (Leigh and Blakely 2016; Porter 2000). A good example of the multiplier effect is the "broken window fallacy." The broken window fallacy has been used to explain positive effects of crises and catastrophes on economic growth

and development (Albala-Bertrand 1993). The argument is that following crisis, during the recovery stage, production increases and jobs grow in order to repair damages (Hazlitt 2010). For example, following a crisis, damaged buildings require windows and repairs that provide jobs for construction workers and window repair men. This explains how investing in one area generates growth in another.

Following disasters, economic activity in disaster affected areas begins when the government stimulates growth by investing in public works and physical capital. For instance, governments spend resources to jump-start the economy following disasters through the creation of jobs necessary to increase the economic output in disaster-affected areas. Yet, the main misconception of the multiplier effect is its inability to generate a long-term economic growth. Another misconception is that investing in short-term jobs, such as construction, does not foresee long-term economic growth.

Additionally, scholars argue that investing in physical capital is sufficient for short-term growth, but not for long-term economic growth (Becker 1994; Porter 2000). The argument is that generating long-term economic activity can be also be achieved through the adoption of strategies and policies that attract modern industry jobs, such as green employment. The notion is that green jobs are crisis resilient and require less aid to recover after disasters, unlike manufacturing industries which usually face total shutdown as a result of natural disasters. Considering that more than half of corporate tax income in the United States comes from nonmanufacturing and production industries (Tax Policy Center 2017), it is rational to invest in areas that attract non-traditional industries. The justification is that in the age of technology, investment in human capital is essential for long-term economic growth (Barro 2001; Becker 1994).

Non-traditional jobs are commonly known as environmentally friendly, eco-friendly, clean, green collared, or sustainability jobs. Based on the Bureau of Labor Statistics description of these jobs, they are also called green jobs. The financial sector, technology, research, and renewable energy are common examples of green jobs. Green jobs have been argued to attract individuals from younger generations and are associated with higher income (Engel and Kammen 2009). Green jobs are also considered trendy and modern, and attract younger generations than traditional jobs do. Many local governments have already taken steps to brand themselves as business clusters for green jobs, and production of eco-friendly products (Smith 2012). It is estimated that by 2050, green jobs will be almost half of the workforce in the United States (Krugman 2010). Investing in green jobs has been argued to be the future of businesses and mass-production. While governments have taken initiatives to attract green jobs, very few studies have looked at the effect of past and ongoing disasters on the creation of green jobs (Augustine 2011).

1.3   Gap in the Literature

There are two gaps in knowledge on the relationship between disasters, collaboration, and green jobs. The first gap is the lack of knowledge on how natural disasters affect the creation of green jobs. The literature argues that following crises, governments either invest in public works or incentivize the private sector in order to create jobs and increase economic growth. The argument is that natural disasters create a window of opportunity for governments to reinvest in its own economy. Reinvesting in one's own economy is explained by the Keynesian economic theories, which argue that government involvement in the economy is necessary for recovery (Hallegatte and Ghil 2008). Previous studies highlight that during and after a disaster, investing

and attracting retail, manufacturing, real estate, medical and health, and travel industries help governments become economically resilient (Benson and Clay 2004; Paton and Johnston 2017). Yet, the literature on economic resilience has a lack of sufficient empirical findings on the growth of green jobs following natural disasters.

The second gap is lack of knowledge on regional collaboration for green job creation. The literature on resiliency argues that the best form of economic resiliency occurs at community and regional levels (Christopherson et al. 2010; Hill et al. 2008). In the regions that frequently experience disasters, economic resiliency requires the attention of more than one government. Particularly for local governments, regional resiliency is necessary because state and federal governments do not have a unified approach to local government economic growth following disasters. Though theoretically, scholars have argued that local needs have to be resolved on local and regional levels (Martin 2012), none have studied the government collaborative mechanism among local government for the creation of green jobs.

1.4   Methods of Data Collection

In order to answer the research questions, this dissertation investigates green job creation in local governments in the State of Florida. Florida is considered to be one of the most disaster susceptible states in the United States, with reports including it in the top five most disaster vulnerable states in the United States (RealtyTrac 2015). Florida is affected by both short and long-term disasters. Recently, Hurricane Irma devastated the state by temporarily displacing hundreds of thousands of residents and costing billions of dollars in damage to public and private properties (Rodriquez 2017). In addition, recent reports show that Florida has begun experiencing adverse effects of climate change (Stanton and Ackerman 2007). One of the

catastrophic changes in the climate is an increase of sea level, which is already affecting local governments in coastal regions of Florida. Various scientific reports indicate that by the end of the 21st century, most of the local governments in the coastal region of Florida will be underwater (Spanger-Siegfried et al. 2017). This makes Florida an ideal state to answer the research questions, because theoretically local governments would have already taken an initiative to adapt to future disasters by investing in disaster resilient jobs.

In addition to being affected by current and future disasters, Florida has a diverse economic base that will be affected by future disasters. The state's economy is driven by tourism, manufacturing, financial, research, and technology industry jobs (Beacon Council 2017). Most of the tourism and manufacturing industry jobs are vulnerable to natural disasters. Investing in disaster resilient green jobs is a logical solution for local governments in Florida that are facing the devastating effects of climate change caused disasters. Theoretically, by advocating, supporting, and incentivizing the creation of green jobs, local governments will be able to become economically resilient, so that future disasters will not have a catastrophic outcome for local governments and regional economies (Pearce and Stilwell 2008).

The report by Florida Department Economic Opportunity (2011) highlights that the state has an above-average level of increase in green jobs. The ability to adopt economic strategies without the intervention of the state government allows local governments to adopt policies and plans in order to attract green jobs. Specifically, following disasters, there is an opportunity for local governments to invest in disaster resilient green jobs. Hence, along with disaster vulnerability, local government autonomy to adopt policies on local and regional levels makes Florida an excellent state to answer the research questions asked in this dissertation.

This dissertation uses two procedures to gather data to study the effects of climate change and natural disasters on green job creation. The first procedure adopts the survey method. An economic development survey was developed and distributed to local government and nonprofit organizations in the South Florida region. The total number of participants was 122, including local governments, counties, and nonprofit organizations. Out of 122 participants, only 48 responded to the survey. In addition to the survey, the dissertation uses data gathered on socioecnomic and demographic characteristics and number of natural disasters that occurred in participating local governments. The second method of data gathering is the use of secondary data from national, local, and private sector reports. This dissertation uses five different data information sources gathered between years 2000 and 2011. The information sources are: (1) National Establishment Time Series (NETS) database−to establish annual number of green jobs (Walls and Associates 2012); (2) United States Census database−to establish socio-demographic and economic characteristics (US Census 2017); (3) National Climatic Data Center database−to establish types, number and cost of natural disasters (National Oceanic and Atmospheric Administration 2017); (4) Federal Emergency Management Agency database − to establish county level disaster declarations (FEMA 2017); and (5) individual local government public records to establish form of government.

1.4.1   Study I

The first study investigates the collaborative mechanism of local governments in the South Florida region. The objective of the first study is to find closeness and betweenness measures in networks for green jobs creation. Scholars have argued that during times of crises and disasters, local governments work together to provide services due to a lack of independent

assets and limited information (Andrew and Carr 2013; Kapucu 2008). The logic is that local governments come together in times of crisis to gain access to resources that would otherwise be unattainable. Using this logic, this study investigates local governments' collaborative mechanisms in their efforts to create employment, especially green jobs. The literature on networks highlights that persistence of a network is dependent on trust, respect, reciprocity, rewards, and punishment (Weber and Khademian 2008; Uzzi 1997); this is why the position of an organization within a network can be determined by its influence over others. Specifically, the positioning of an organization predicts traveling speed and credibility of information. This study examines how local governments working with each other in social networks helps to create green jobs.

Local governments that are centrally located in networks will almost always have access to more information and resources because they are playing the role of "brokers." This means that a central organization may not want to collaborate with others because information is always passing through the central organization. In addition, if an organization is on the outskirts of the network, then it is dependent on others for information. The organizations that are dependent on others will almost always consider collaborating due to limited access to information. In the first study, local government centrality and betweenness in the regional network for green job creation are measured to examine how sources and forms of collaboration help local governments share resources and information needed to create green jobs.

This study used electronic and paper survey procedures. The survey was prepared to gather information on two sections. The first section asked questions on local government incentives and strategies for green job creation, and the relationship between climate change adaptation policies and the creation of green jobs was also examined. The second section of the

survey asked participants to name cities, counties, local nonprofit organizations, and federal

organizations that they collaborate with to create green jobs. The survey was distributed to 122

participants—local government city managers, county government economic development

directors, and nonprofit organization presidents. Participants were contacted by electronic and

paper mail. Out of 122 participants, 48 responses were gathered in four months. Unfortunately,

data gathering was put on hold due to the devastating consequences of Hurricane Irma in the

South Florida region.

The findings of the study indicate that closeness and familiarity of local governments

with each other, and togetherness within the network, have a positive and significant effects on

the creation of green jobs in the South Florida region. The study provides evidence indicating

that local government unity and density of the regional network lead to the creation of green

jobs. Consistent with the argument, the findings highlight that local government collaboration

helps create green jobs.

1.4.2   Study II

The purpose of the second study is to find the relationship between natural disasters and

economic resilience, specifically green jobs. The objective of the study is to provide empirical

evidence of the effect of natural disasters on green jobs in local governments. Although studies

highlight that natural disasters have positive and negative effects on local government economies

(Hallegatte and Dumas 2010; Toya and Skidmore 2007), a limited number of studies have

analyzed the relationship between disasters and green jobs. Local governmental concern in

investing in green jobs is not only a moral issue, because green jobs produce an environmentally

friendly outcome, but also it is also an economic issue, because green jobs are disaster resilient.

Studies have highlighted that major disasters can produce colossal costs on manufacturing and production (Park 2013). In some cases, it has been argued that natural disasters create poverty traps in disaster areas (Carter et al. 2007). In the United States, this behavior was noticed in New Orleans following Hurricane Katrina, where population emigration and slowdown in traditional industries pushed the city's economic activity to the level it was a decade prior to the hurricane (Vigdor 2008). It is logical that investing in areas that are disaster resilient is necessary for local governments due to the uncertainty of future disasters.

This study uses data gathered from four databases available to the public. The first dataset contains the number and types of green jobs created by all local governments in the State of Florida between the years 2000 and 2011. A panel dataset was adopted for this study, in which types and number of jobs were identified. To identify the green jobs, this study uses a list of codes for all types of jobs, provided by the Bureau of Labor Statistics, which were used to determine green jobs. Moreover, data on types and severity of disasters for counties and local governments were gathered between years 2000 and 2011. Lastly, socioeconomic characteristics of local governments gathered from public records were also included in the panel dataset.

The findings of the study indicate that natural disasters have positive and significant effects on the creation of green jobs in local governments. Weather-related natural disasters have the most significant effect on green job creation. As expected, population, form of government, and income all have positive and significant effects on the creation of green jobs. Moreover, the study highlights that professional and technical types of green jobs experience growth following disasters.

1.5   Contributions to Theory and Practice

This dissertation makes several contributions to theories and practices. This dissertation applies the "bounce forward" approach of resilience to understand the ability of local governments to respond to disasters. The approach argues that the return to normalcy following disasters is not the primary objective of economic resilience, but it is an important factor to consider in the policies' response to extreme events (i.e., adaptation to increase key economic indicators). By applying the logic of "bouncing forward," we can understand how an increase in population over time is related to policies adopted by local governments. Practical contribution of this study is on the investigation of the effect of policy adaptation on economic growth and development. The concept can also broaden our understanding of economic resilience at the local and regional levels.

Much can be learned about community resilience from the "bouncing forward" approach. While the "bouncing back" approach helps understand strategies applied by local and regional governments for immediate economic recovery, the approach encourages old practices. A bouncing back approach suggests economic dependency, i.e., that local governments are dependent on a particular type of industry (Simmie and Martin 2010), making communities more vulnerable to future disasters (Hill et al. 2008). The adaptability of a community should not be an immediate response, but rather a process that takes place over time through the adoption of new policies and innovative strategies (Martin 2012).

The framework adopted by this study can also integrate climate change literature and the creation of green employment. The framework highlights that local political institutions and their key actors are motivated to improve their future economic standing and thus aim to achieve the best possible outcome for themselves. Given the potential conflicts over the distribution of

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benefits, local political actors designed institutions that could allow them to gain the best possible outcomes. However, given the nature of economic development policies, actions taken by one jurisdiction often have an effect on the others, leading to what Feiock (2013) referred to as the "institutional collective action dilemmas." The problem is particularly acute in the context of natural disasters. Local governments may be reluctant to share resources with other jurisdictions if, by doing so, it would prevent them from investing in other services (Andrew et al. 2016). Local governments may think they are better off if they free-ride on the effect of the collective and receive assistance from higher level governments. This research investigates how local governments working with each other affect green job creation.

Another theoretical contribution is analysis of local governments' job creation to achieve economic resilience. Specifically, this study examines local government motivation to adopt economic resilience practices related to green employment. Previously, researchers found that investment in the green industry leads to an increase in revenue (Hall et al. 2006), an increase in the techno-related industries, and spillover effect in other sectors (Hill et al. 2013). A gap in the resilience literature can be found on the lack of examination of factors influencing resilience at the community level (Hassnik 2010). The examination of resilience at the local level also is the main gap in the resilience literature (Hassnik 2010).

Moreover, few have examined social, institutional, and economic factors leading to green job creation. This dissertation examines natural disasters as a causal driver to study economic resilience at the local and regional levels. By applying institutional and adaptability factors at the local and regional levels, the motivation of local governments to adopt policies to enhance regional resilience can be examined (Martin and Sunley 2006). Local and regional examination of economic growth path, diversification of new pathways, and the structure of networks are all

important factors to take into account when studying policy adoption and regional resilience (Boschma 2015).

In the following chapters, an in-depth discussion of the material discussed in this chapter will be provided. Therefore, this dissertation is structured in the following way: The next chapter, Chapter 2, reviews literature on the effect of natural disasters on green job creation and climate change adaptation policy. The Institutional Collective Action theoretical framework is also explained in the next chapter. The third chapter examines local government collaborative mechanisms adopted for green job creation. The fourth chapter examines the effect of green jobs in local government following natural disasters. The last chapter, Chapter 5, highlights theoretical and practical implications, and limitation of this research.

CHAPTER 2

RECENT LESSONS IN EFFECT OF NATURAL DISASTERS ON GREEN JOB

CREATION AND CLIMATE CHANGE ADAPTATION

The literature on economic resilience highlights two dominant approaches: bounce back and bounce forward. However, the literature seems inconsistent (Clark et al. 2010; Martin 2009, 2012). Resilience also varies by time (fast and slow) and scale (local to global), making it difficult to capture empirically. Moreover, the concept of resilience—bouncing forward—has been criticized for being "fuzzy" due to lack of maturity of concept (Pendall et al. 2009). The notion of the transformation of a local economy implies a dependency of local governments on regional influence, institutional factors, and achievement of perseverance through resistance and struggle (Simmie and Martin 2010).

Common resilience indicators, such as social factors (social networks, demographics, faith-based organizations) and economic factors (employment, the value of the property, municipal revenue) continue to be under-investigated (Cutter et al. 2008). This is surprising because community resilience can be enhanced through collaboration between private and public sectors (Hill et al. 2008). Boschma (2015) also notes that there is a need to examine local and regional economic growth paths, the diversification of new pathways, and the structure of networks, when studying policy adoption and economic resilience.

This chapter examines the literature on climate change adaptation, economic resilience and green jobs. The purpose of the chapter is to provide an overview of literature on green job creation explained by climate change adaptation and collective action. The chapter is structured in the following way: The first section provides an overview of literature on climate change adaptation and collective action. In the second section, the definition and description of

economic resilience is provided, and in the third, benefits and difficulties of green jobs are discussed. In the last section, regional collaboration is explained by the Institutional Collective Action theoretical framework.

2.1   Climate Change Adaptation and Collective Action

Adaptation policy is defined as the process of adapting to changes in policies due to sudden or long-term changes in social, health, environmental and economic behaviors (Intergovernmental Panel on Climate Change 2014). More commonly, adaptation policy is referred to as adjusting government strategy according to changes in the environment, mainly the climate. The goal of adaptation is to protect and enhance human well-being by slowly changing the environment. Climate change adaptation strateges are an immediate and long-term response to climate change, by decreasing risks posed by climate change (Intergovernmental Panel on Climate Change 2014). Common climate change responses are: (1) changes in land use; (2) natural resource protection; (3) infrastructure updates; (4) business continuity planning; (5) health programs, etc. (EPA 2017; UN Foundation 2009). Recent studies, however, argue that due to the high cost of adaptation responses, local governments do not engage in revision of existing policies and strategies (Parry et al. 2009). Because climate change does not pose a direct and rapid threat, many local governments lack an interest in adaptation.

In order to exploit beneficial opportunities created by climate change, a collective response is necessary. The collective response helps overcome issues, such as the lack of appropriate resources required for adaptation purposes. The collective response also helps local governments that are unable to take the independent risk of investing in adaptation. In the past, it has been noted that local governments collaborate during and after disasters because they share

a common interest, which is helping the region to overcome economic losses. For example, Hurricane Rita (in 2005) caused excessive damages in southeast Texas, where the City of Beaumont and neighboring organizations worked together to overcome disaster produced damages (Ismayilov and Andrew 2016). Scholars argue that climate change adaptation requires collective action, because disaster caused damages are a collective action problem (Adger 2003).

Collective action refers to action taken by a group to achieve a common outcome (Olson 2009; Ostrom 2014). Collective action problems occur when one actor shares a common interest with the group, while seeking to fulfill various individual interests. With regards to institutions, governments participate in collective efforts to reach a common outcome or produce a common purpose. If costs outweigh benefits, then governments do not participate in the collective action. In addition, governments choose to participate in collective action at the expense of others. Non-excludability of governments participating in collective action allows for free-riding behavior to occur. The rational choice theory argues that governments will seek opportunistic behavior at all times (Feiock 2009). To control for this behavior, supply-side economics is adopted, whereby goods (outcome) are not shared by all members, even if participation is encouraged. Put simply, participation alone is not enough, and governments must contribute equally if they want to achieve the desired outcome.

Climate change adaptation is a common good that requires regional attention because climate change poses a regional problem for communities (Adger 2003; Adger et al. 2009). Environmental scholars are calling climate change "the most dangerous" event of our lifetime, whereby its effects will last for centuries (Dessai et al. 2004). Climate change also poses financial problems. For example, many governments do not have the appropriate financial resources to change their current economic actions in order to become greener (UN Foundation

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2009). This creates a collective action problem, where an individual government's actions create worse outcomes for the region. For example, if governments decide they will change policies to benefit themselves in particular, then this can create a problem for the overall region.

2.2   Scholarship on Economic Resilience

Traditionally, the term resilience has been studied as an engineered resistance through immediate action (Drobniak 2012; Pendall et al. 2009; Pike et al. 2010; Simmie and Martin 2010). Resilience has also been examined as being an engineered environmental and ecological system. The term can be examined through four main approaches (Simmie and Martin 2010): (1) the General Darwinism, which argues that, for survival, businesses and industries need to readjust to post-disaster economy; (2) the Lock-in approach, which argues that a disaster creates an environment for the creation of new paths for communities to attract new and different businesses; (3) the Complexity approach, which argues that a community will eventually return to normalcy even if no immediate action is taken; and (4) the Panarchy approach, which argues that resilience is an adaptive cycle, forcing a community to adopt policies and strategies to overcome economic losses (Simmie and Martin 2010).

According to Hill et al. (2008), there are three major frameworks to study resilience: (1) the equilibrium framework (immediate involvement), (2) the path-dependence framework (negative or positive effects of immediate involvement), and (3) the systems framework (change policies incrementally). Economic resilience of a community has been investigated as economic performance of a region is measured in its growth rate. Shock resistance study of resilience is measured in comparison of employment in particular industries before and after disasters (Hill et

al. 2008; Martin 2010; Simmie and Martin 2010). A community can be economically resilient, shock resilient, or simply nonresilient.

Global economic costs of natural disasters between 1900 and 2005 have accounted for over $7 trillion (Karlsruhe Institute of Technology 2016). Natural disasters are becoming costlier, not only because they are more devastating, but because natural disasters strike areas that are highly populated and vastly developed. For example, after a hurricane, an underdeveloped area of a local government will have lower property damages in comparison to an area that contains a shopping center. Using this logic, one would argue that it is essential for local governments to prepare themselves for disasters by attracting businesses that are disaster resilient.

During and after disasters, economic resiliency takes two forms. The first form of resilience takes place when a local government returns to the level of economic output that occurred prior to the occurrence of a natural disaster (Manyena 2006). This approach of returning to normalcy is known as the "bounce back" approach. The second form of resilience takes place when a local government exceeds the level of economic output that occurred prior to a natural disaster (Clark et al. 2010). This approach is known as the "bounce forward" approach. Scholars argue that the bounce forward approach to resiliency is more desirable and beneficial for local governments because they have a chance to change strategies to attract businesses and invest in new areas. This allows them to exceed the previous level of economic growth (Manyena et al. 2011). In short, local governments perceive disasters as windows of opportunity to re-strategize their industry and business attraction (Ismayilov and Andrew 2016). Changing policies and strategies, however, is difficult and may require the attention of local communities in disaster-affected regions. Regional collaboration is necessary for communities that do not

have the capital and information to invest in disaster-affected areas. A regional response is argued to be the best approach for community-level resiliency, because resiliency may become a difficult task to achieve for local governments that lack proper resources (Chang and Shinozuka 2004; Cutter et al. 2014).

Community-level resilience requires the collaboration of local governments, which is a difficult procedure because alignment of the desired outcome can be uncertain. To correct for uncertainties, sets of formal and informal arrangements are adopted to reward and punish behavior (Feiock 2007). The Institutional Collective Action (ICA) framework argues that collaboration can be successful if local governments understand two important factors in collaboration (Feiock 2013). These factors are (1) attraction of local governments for collaboration purpose, and (2) management of uncertainty and free-rider problems while collaborating (Andrew 2009; Feiock 2009; Feiock and Scholz 2009). Arrangements required to encourage neighboring governments to collaborate is the first step in creating collaborative governance. The second, and most important, step is managing uncertainty and opportunistic behavior of local governments. Managing opportunistic behavior is often halted by setting much needed rules to make sure that non-collaborating members are not receiving incentives at the expense of others. Collaboration has also been praised by scholars, because smaller governments that lack proper resources for development can advance by working with neighboring governments (Andrew et al. 2016). Past studies indicate that regional collaboration has been adopted during emergencies (Edwards et al. 2008). Scholars argue that during disasters, local governments are able to achieve an outcome if they engage in collective response and recovery (Andrew and Carr 2013).

Within the context of economic resilience, the perspective on "bouncing forward" can be extended to the adoption and implementation of climate change policies and the creation of green jobs (Hughes et al. 2003; Johnson and Blackburn 2014; Leichenko 2011; Tompkins 2004). This is essentially restructuring of the economy by investing in new capital infrastructure and employment. The strategy has several economic and social advantages, such as the creation of clean energy jobs and the increase of population and life expectancy in local governments. One of the advantages is to examine whether local government economies are resilient within a cluster of industries in a region (Rosenfeld 1997), such as the creation of green industry, technology-oriented business clusters as witnessed in the Silicon Valley. Furthermore, the local resilience that is created by an agglomeration of economies allows industries and businesses to benefit collectively by moving into certain regions (Duranton and Puga 2004; Guimaraes et al. 2000; Ottaviano and Puga 1998).

2.3   Benefits of Green Jobs

The traditional argument for green jobs is that they lack the harmful consequences that traditional industries have on the environment. By 2050, green industries are estimated to contribute between 1.1 percent and 3.4 percent of the total employment to the overall economy in the United States (Cai et al. 2011; Krugman 2010), making economic sectors related to the creation of green jobs a crucial engine for future growth. Recent research shows that information and communication technology is 23 percent more likely to bring in economic growth, and the high-tech sector is 48 percent more likely to grow the region that adopts innovative policies to attract green employment (Hathaway 2013).

Studies have also shown that, for every one million dollars spent on job creation, the green economy produces 17 jobs, which is much higher than traditional oil, gas, and nuclear energy industries (Edwards et al. 2013). Yi (2013) estimated that investing in a green job can create 1 to 2 percent growth in the local economy. Examples of top green cities in the United States are San-Francisco, Houston, New York, Washington D.C., Los Angeles, Chicago, Philadelphia, Denver, and Dallas (Smith 2012).

At the most general level, the employment category of "green jobs" includes jobs that preserve and restore environmental quality" (UNEP 2008; Bruvoll et al. 2012). Kolev (2013) explains green jobs as a "rapidly growing billion-dollar sector that includes renewable energy sources, organic produce and products, green buildings, alternative fuel vehicles, and more." Defining green jobs is very important because it is used: (1) as a means of achieving ends, such as government subsidies, (2) as a measurement tool for research, and (3) politically, to gain constituency support over innovative policies.

2.4   Description of Green Jobs

The description of a green job is unclear in the United States. Most employment categories defined by the US Bureau of Labor Statistics (2010) as "green jobs" require usage of material and products produced by industries that are not environmentally friendly. Many of the green products are made by materials produced by fossil fuels. Yet, the common characteristics of the green job—as defined by the Bureau of Labor Statistics—are jobs that have the least impact on the environment. The US Bureau of Labor Statistics (2010) defines "green businesses" based on the following criteria and a "green business" should fall in one of the following categories: (1) energy from renewable sources, (2) energy efficiency, (3) pollution

reduction and removal, (4) natural resources conservation, or (5) environmental compliance, education, training and public awareness. That is, if an area of employment is research-oriented, energy efficient, and uses energy from wind power, then it is considered a green job.

At the state level, the term "green job" has been defined using the US Bureau of Labor Statistics categories. Most states define **GREEN** jobs as **G**enerating and sorting renewable energy, **R**ecycling existing materials, **E**nergy efficient product manufacturing, distribution, construction, installation, and maintenance, **E**ducation, compliance, and awareness, and **N**atural and sustainable product manufacturing. Florida defines jobs that use energy sources other than traditional as green jobs (Workforce Florida 2008). For example, according to Workforce Florida (2008, p. 3), a "green job is a job that directly produces green products or provides green services by using renewable energy, conserves natural resources, prevents or cleans pollution, and produces clean transportation."

2.5   Greeen Jobs and Climate Change Adaptation

The creation of green industries and thus green employment can be regarded as climate change adaptation strategies, and thus contribute to economic resiliency for several reasons. First, green jobs, such as high-tech and communication jobs, do not require physical labor. Most green jobs require education that many young individuals have already obtained, making the hiring process relatively easy. Moreover, green jobs are often linked to a higher-earning workforce. Higher income individuals are more likely to shop and spend money (Wagnild 2003), which helps local governments with revenues. In order to sustain and respond positively to short-term shocks, local communities will be better off by moving away from one primary

industry and diversifying, providing opportunities for human capital to cross over to other industries within the region.

Second, local governments are motivated to create a green economy as a means to combat negative externalities in the environment produced by traditional manufacturing industries (Jackson and Victor 2011; Lowe 2007; Nair and Rutt 2009;). Birmingham, Alabama and Boston, Massachusetts, for example, have reduced their reliance on manufacturing and heavy industries. They have, instead, moved to all green employment and a green economy, which are in the areas of scientific research and medical research.

Third, green industry-friendly policies leading to an increase in opportunity for green employment creates competition among businesses and pressures others to create new products (Bell 2012). For example, high-tech companies, Google and Apple, both categorized as green industries, are competing against each other in the Silicon Valley. Cai et al. (2011) also made similar observations arguing that the investment made by local governments in medical research institutions can create significant multiplier and spillover effects on other sectors, i.e., hospitals and medical equipment businesses.

2.6   Difficulties in Creating Green Jobs

According to Krugman (2010), public investment in the green economy is justified by ensuring future economic growth. This is associated with a decrease of reliance on traditional industries, moving toward energy saving and green industries. This occurs, for example, when a government witnesses a slowdown of businesses in a particular sector, then it is motivated to encourage employment growth in another. Research has also shown that green jobs are likely to grow if the government encourages innovation, especially policies that encourage innovation in

high tech and communication industries (Alic et al. 2003; Hathaway 2013; Yi 2013;). Research indicates that consumers generally prefer green industry generated products because they are environmentally friendly and generate new employment, requiring less physical labor (Manaktola and Jauhari 2007).

According to Hall et al. (2006), although the green industry has been growing in the US, the growth pattern depends on politicians who decide whether to push, or not to push, for changes in policy. For instance, elected politicians adopting policies to make their jurisdiction a business-friendly environment can also face political opposition (Cai et al. 2011). Policies related to employment training, tax abatement, and subsidies also depend on the political party of elected officials, government size, revenue base, oligopoly of established industries, vulnerability of government, and demographics of the population (Leigh and Blakely 2013; Wei et al. 2010; Mattera et al. 2009). The unwillingness of local governments to invest resources and attract green industries can be attributed to the risk-averse nature of local governments (Baron and Bielby 1985; Lowrey 2011). Rapid changes in technology development make payoffs on green job investments uncertain at the expense of the existing economic base. Local political institutions also create institutional barriers to adopt and implement policies favoring financial incentives to businesses linked to the creation of new industries and green employment (Braun 2008).

2.7   Theoretical Framework: Explaining Elements of Regional Collaboration Mechanisms

In order to understand community and regional level resilience to disasters, it is essential that research examines institutional factors, locked-in economies of the region, and technological capacities of the region (Clark et al. 2010). Institutional factors, such as a strong leadership, help

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diversify the economic base by selecting nonmanufacturing businesses as means to help increase resilience in local governments (Cowell 2013). Locked in industries are claimed to have positive and negative solutions for local governments (Crespo et al. 2014). This means an industrial cluster can be disaster-resilient, meaning it can withstand a shock, or fail altogether creating a regional economic crisis (Allison and Hobbs 2004; Crespo et al. 2014; Martin 2010; Simmie and Martin 2010).

With regard to climate change, disasters have been argued to create windows of opportunity for local governments to adopt policies that promote innovation and departure from existing industries (Shaw 2012). Therefore, strategies and policies that encourage small businesses lead to a stronger and more resilient regional economy by creating innovation and high-tech sectors (Clark et al. 2010).

Theoretically, the argument is that local governments will be motivated to adopt policies in order to avoid future losses, especially in regard to the economic crisis and recovering from natural disasters. For instance, in order to avoid loss of revenue immediately following a natural disaster, a local government will adopt policies to attract businesses that are not affected by natural disasters, such as green jobs (technological). Moreover, local governments will try to collaborate to create regional growth and policy adoption. However, scholars have yet to empirically test motivation of local governments to collaborate with each other in order to adopt climate change policies.

Adoption of policies at regional and sub-regional levels leads to informal networks that help local regional governments tackle problems that otherwise cannot be handled independently (Shaw and Maythorne 2013). However, for the networks to become effective, professional development and training, and trustworthy relations are necessary to help implement successful

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policies (Shaw and Maythorne 2013). Appropriate planning through the use of existing

resources leads to the creation of trust among local authorities and creation of networks for the

resilient economic region (Shaw and Maythorne 2013). Creation of collaborative networks help

create economic clusters to attract jobs, such as green jobs. Hence, the multiplier effect of

climate change policies, such as green jobs, extends to the regional economy. Researchers argue

that policy change on a regional level is more effective in the long run because it creates

agglomeration of economies that is a long-term economic growth solution (Porter 1996).

Natural disasters that cause long-term damages, such as drought, pressure governments to

rethink established strategies in order to become resilient. Effects of severe and long-lived

disasters require regional and community level policy responses (Adger 2010). Collective action

dilemma occurs when local governments attempt to free ride on each other instead of investing

in mutual growth and regional resilience (Adger et al. 2005; Ostrom 1998;). To overcome the

uncertainty of collaboration, it is necessary to understand the motivation of local governments.

Local governments that are motivated to generate growth locally, theoretically, will comply with

collaboration terms to adopt policies that help the region.

2.8   Explanation of Collaboration by the Institutional Collective Action Framework

In events of crises, disasters, and catastrophes, local governments are left with a choice to

collaborate with each other in order to reach an outcome that helps recover disaster affected

areas, or take the risks of navigating the disaster without collaboration (Kapucu 2008). The best

outcome is measured in accessing information and resources or simply connecting with others to

share and pool redundant resources. During emergencies, local governments work

collaboratively with others to gain access to information and produce an effective and efficient

response (Andrew and Carr 2013; Kapucu and Augustin 2009). Collective action problems, however, are inherent in collaboration. Collective action problems are uncertainties (such as free-riding), the selfish and opportunistic behavior of collaborating actors, and information asymmetry (Feiock 2008; Ostrom, 2005; 2010). The uncertainties arise because some actors will attempt to receive incentives at the expense of others (Feiock 2008). According to Feiock (2013), to overcome collective action dilemmas, local governments must adopt mechanisms and strategies that help overcome selfish interests.

The purpose of collaboration is to overcome internal limitations and strengthen the organizations' capacities. The Institutional Collective Action (ICA) framework highlights that local governments can achieve the best outcome and overcome conflicts when preferences of the collective integrate (Andrew and Kendra 2012; Feiock 2007). By adopting the ICA framework, this dissertation investigates collective action problems at the organization level. The actor-centered approach of the ICA framework is based on Ostrom's (2007) Institutional Analysis and Development (IAD) framework. The IAD framework argues that collective action limitations occur at the organizational level. By adopting this approach, the ICA framework highlights that local governments conduct a risk assessment before entering an agreement with other local governments. Risk assessments consist of evaluating incentives and transaction costs that a collaborative agreement produces (Feiock 2008; 2013).

According to Feiock (2007), barriers to interlocal collaboration are information costs, agency costs, negotiation costs, and enforcement costs. Information costs occur when local governments are not aware of collectively desired outcomes. Agency costs occur when local governments are not accurately representing the wishes of their voters. Negotiation costs occur when governments do not apply a small portion of resources, and that leads to more division.

Enforcement costs occur when the costs of monitoring and enforcing agreements are high. To overcome the ICA dilemma, Feoick (2013) argues that the characteristics of communities, characteristics of institutions, and the structure of policy networks have to be studied systematically. Benefits of collaboration include reputation building and an increase of trustworthiness among local governments. This, of course, leads to future collaboration among local governments.

During and following disasters, if a local government anticipates depleting resources due to crisis or competition with neighboring governments, then there is a tendency for developing a strategic decision to collaborate (Feiock et al. 2009). The ICA framework argues that local governments determine economies of scale and collaboration if gains through collaboration exceed gains of individual 'self-interested' actions. This could occur when a local government that collaborates collectively absorbs economic recovery costs with other local governments, whereby the individual action of a local government would have depleted local government's' individual resources.

In the context of green jobs, local governmental collaboration and ability to respond to changes in the climate is contingent upon local governments' willingness to incorporate costs related to forming a unity as an adaptation strategy. Forming regional unity for adaptation purposes requires local governments to collaborate with each other to minimize future economic losses. Yet, the main flaw in the collaborative mechanism is understanding the motivation of local governments to collaborate. The question that needs an answer is: "With whom do local governments collaborate in order to improve their chances of bouncing forward from climate change-related disasters?" The argument is that a local government can position itself close to central actors to gain access to resources and information that are not available locally. Hence, a

local government bridges itself to others, and a local government can work closely with other local governments that they are connected with in order to unite and share resources. Consequently, local governments bond with others to pool resources.

One of the main arguments against cooperating and collaborating in economic growth is the formal and informal spillover effect of positive outcomes (Porter 2000). It is almost illogical for a government to cooperate with neighboring jurisdictions by sharing its own resources, and creating a competitor in the region. Yet, increasing economic activities in neighboring jurisdictions and local spillovers help overcome possible future regional problems, such as unemployment, poverty, and loss of wealth (Porter 2000; Topa 2001). The argument is that engaging in joint ventures and working together with neighboring jurisdictions would help deter spreading problems from jurisdiction to another. Overcoming competition in local governments is difficult, but can be achieved when localities' business practices normalize across the region (Ostrom et al. 1961; Tiebout 1956).

However, the necessary condition for collaborating with neighboring jurisdictions for economic growth and development is an increase in benefits. Put simply, larger gains often mean it is more likely they will weigh transaction costs associated with collaboration. In addition, it is important to examine the economy of localities in order to determine their likelihood to collaborate for economic development. Local governments that face economic hardships are likely to engage in cooperation and collaboration in order to increase economic growth (Porter 2000). Similarly, wealthier local governments are also interested in collaboration because some project may require aid of neighboring jurisdictions. At the most basic level, building a large manufacturing plant requires workers from neighboring jurisdictions, even though long- term employment may be taken by the government's own residents.

Economic development is not a priority for all local governments. Local governments that are composed of mainly residential suburbs may not have a desire or interest in increasing number of jobs. For instance, businesses that may increase sales tax revenue are welcomed by all local governments in a region, while an increase in property taxes is welcomed by local governments individually, but may contain major spillover to neighboring jurisdictions, in the form of taxes. Increase in the number of businesses may also increase the demand for services and goods. Greater benefits that local governments gain from their neighboring jurisdictions increase chances of collaboration for job creation.

The next chapter contains the first study, which examines collaborative mechanisms adopted by local governments to create green jobs. The objective of the study is to investigate how cohesion and positioning of local governments in regional networks help to create green jobs. To explain the relationship, the study adopts the ICA framework. The ICA framework highlights that local governments will position themselves closer to local governments that are central in collaborative networks to gain access to information and resources. In addition, the argument is that closeness and unity among local governments will help share resources required to create green jobs.

In Chapter 4, which contains the second study, the relationship between natural disasters and economic resilience is examined. Chapter 4 provides detailed findings on the effect of disasters and green jobs. By adopting the bouncing forward approach to economic resilience, the study highlights that following disasters, local governments initiate changes in strategies in order to increase the number of green jobs. The argument is that the economic activity of green jobs helps to surpass the average economic output and provide disaster resilient employment.

CHAPTER 3

REGIONAL RESILIENCE AND COLLABORATION: ANALYSIS OF THE EFFECT OF

ADAPTATION AND GREEN JOBS

This chapter provides an explanation of collaborative mechanisms adopted by local

governments to create green jobs. Scholars in the field of economics, public administration, and

emergency management argue that collaboration occurs when organizations face limitations that

cannot be attained if a government acts individually (Agranoff 2006; Eagle et al. 2010; Kapucu

2008; Kapucu et al. 2010). The traditional argument is that local governments are interested in

collaborating with others if they lack resources and information (Feiock 2013). Following

natural disasters, one of the main reasons for local government collaboration is access to

resources from other local governments. The argument is that exchanging resources and

information produces better options and ways to respond to natural disasters (Kapucu 2008).

Additionally, following disasters, scholars argue communities with closely- knitted linkages

experience higher level of community resilience (Andrew et al. 2016).

Consistent with the bouncing forward approach of economic resilience, this study

examines economic resilience and joint efforts for green job creation at the local level. The

argument is that collaborating for economic resilience and development at the local level is

essential to local governments because the economic impact of disasters is far more detrimental

to local governments. Furthermore, previous studies have shown that federal and state

governments fail at responding to disasters, in some cases leaving local governments in even

worse conditions (Sobel 2006). This explains why local governments work together to overcome

limitations created by higher government. Today, many coastal cities in Florida are taking action

to prepare themselves for climate change. Considering that the Florida state government does

not recognize climate change as a threat, this encourages local governments to collaborate to create policies and strategies to adapt to future disasters. This is because there is a lack of unilateral policy on climate change. One form of climate change adaptation is government policy adoption that helps create disaster resilient jobs. Few studies have, however, investigated how adaptation policies contribute to green jobs (Pearce 2008). The purpose of this study is to examine how collaboration and joint efforts affect green job creation as a form of adaptation and resilience to climate change.

This essay is organized in the following way: The first section provides a definition, description, and structures for collaborative networks used for economic resilience examined as economic development, specifically job creation. The second section discusses data collection methods and empirical analysis. The third section provides study findings, limitations, and conclusion for the study.

3.1   Introduction

Classical economic development theories argue that growth occurs when a government invests in its own economy (Bingham and Mier 1993; Hess and Ross 1997). Modern economic development theories argue that growth occurs when a government shifts from attracting conventional manufacturing to attracting newer and cleaner industries, such as financial and technology oriented industries (Arestis and Demetriades 1997; Demetriades and Hussein 1996; Gurley and Shaw 1955; Peet and Hartwick 2015). In addition, studies argue that economic growth does not take place within political boundaries of a government, but instead, spills over into neighboring jurisdictions (Caniels 2000; North 1955; Pinder 2017). This is because

residents of a local government travel to neighboring jurisdictions for employment and shopping. Hence, economic activity spreads into neighboring local governments.

Understanding this concept is important for creation of collaborative mechanisms for local governments. The argument is that the most optimal economic improvement can be achieved when a government takes into account its neighboring jurisdictions (Lee et al. 2012; North 1955). This means a local government will witness profound economic growth if it collaborates with neighboring local governments.

The concept of local government collaboration for economic development has been attributed to the game, public economy, contracting, transaction cost, and collective action theories (Feiock 2008; Feiock et al. 2009; Lee et al. 2012). The Institutional Collective Action (ICA) framework combines all of these theories to explain the collective action of public organizations. Recent studies have adopted the ICA framework to investigate how local governments collaborate during and after emergencies (Andrew and Carr 2013; Andre et al. 2016; Jung and Song 2015). However, the relationship between environmental policies, green jobs, and sources of local government adaptation to climate change remains an area that is under-investigated.

Investigating this area is important because the effects of climate change on local planning, economy, and sustainability require collective action. In response to climate change, many local governments in the United States are investing in areas that attract environmentally friendly—green—businesses and industries (Gibbs 1994; Leigh and Blakely 2016). However, very little is known about the joint efforts and collaborative mechanisms in attracting these jobs. In addition to having zero negative effect on the environment, green jobs have also been argued to be morally good, voter favored, politically stimulating, and technologically advanced. Green

job creation, however, can be a difficult task to fulfill, and may require the attention of a whole region.

In the past, game theoretical modeling and collective action frameworks have been used to investigate collaboration and cooperation for economic development. Local collaboration has been profoundly investigated in the fields of emergency management and public administration (Andrew 2009; Andrew and Carr 2013; Kapucu 2008; Waugh and Sreib 2006). Findings suggest that local governments tend to collaborate and work together during and after disasters, mainly during response and recovery stages (Andrew and Carr 2013). The logic is that a local government that lacks appropriate resources will try to collaborate with more resourceful neighboring local governments. In addition, information sharing and policy adoption are also important because lack of information cripples the ability to adopt a proper strategy for economic improvement. In order to get access to information, local governments collaborate with each other to help share information and resources within the region to produce joint outcome (Andrew and Carr 2013). Traditionally, local governments have been known to collaborate in order to (1) provide services that affect residents beyond their own jurisdiction but add to the economy, (2) provide access to residents of other jurisdictions to increase economic activity, (3) discontinue fragmentation of its economy into neighboring jurisdictions, (4) overcome environmental issues that require attention of the region, and (5) access and share scarce resources needed during and after disasters (Feiock 2008; Warm 2011).

A collaborative mechanism is developed when two or more local governments enter an agreement. There are two collective action dilemmas associated with collaborative mechanisms. The dilemmas are also known as first and second orders of collective action (Heckathorn 1989, 1996; Ostrom 2014). The first order occurs when local governments refuse to collaborate with

others. The second order occurs when some collaborating members receive incentives while not contributing at all. An agreement that is only supported by informal arrangements will ultimately fail due to lack of proper rules controlling for free-riding behavior (Heckathorn 1989). The uncertainty becomes the primary reason for actors to remove themselves from collaborative networks. The ICA framework has extensively examined the uncertainty in collaboration, and findings indicate that trust, reciprocity, commitment, norms, punishment, and leadership play a major role in reducing uncertainty (Feiock and Scholz 2009). In short, the success of collaboration can be predicted by the role and positioning of local government within networks.

Communicating information is critical in the adoption of strategies and policies that affect regional economic development (Feiock et al. 2009). Scholars argue that dealing with uncertainty and costs of relationships in collaboration can be achieved through an understanding among members in collaborative networks (Andrew and Carr 2013). Two strategies have been adopted to help understand the relationship of collaborating local organizations (Andrew et al. 2016; Jung and Song 2015). These are bonding and bridging strategies. The first—*bonding*—strategy contends for the establishment of strong connections to partners that contain strong embracing connections to other associates within the region (Andrew and Car 2013). By bonding with partners, regional economic resilience is achieved when a local government works closely with others. The second—*bridging*—strategy contends for establishing a role through which information flows to the region (Andrew et al. 2016). By bridging, a local government is able to process information and access local governments that are disconnected from certain parts of a collaborative network. At most general level, economic resilience is achieved when a local government places itself to a central actor in a network to access to novel resources from other members.

Many studies have investigated local government collaboration in the creation of business clusters for economic development purposes (Raco 1999; Westley et al. 1991). Despite the findings on economic development strategies and policies that have been argued to increase economic development, scholars are still investigating the impact of the environment on economic resilience. Recent studies show that natural disasters have a positive, negative, and no effect on an economy (Hallegatte and Dumas 2009; Ismayilov and Andrew 2016; Webb et al. 2000). Studies have also highlighted that following natural disasters, economic development becomes achievable through collaboration with neighboring jurisdictions (Simo and Bies 2007; Waugh and Streib 2006). However, the mechanism and sources behind collaboration for green job creation remains uninvestigated. In order to fill this gap in knowledge, this study investigates the creation of regional green jobs driven by climate change adaptation of local governments. The link between green job creation and local government social position collaborative networks in the South Florida region is examined.

The area chosen to meet the objectives of this study was the South Florida region. The region was chosen because it is one of the largest metropolitan regions in the United States with prosperous economic growth and disaster vulnerability (SRA 2013). The region consists of 102 local governments. All of the cities, towns, and villages are located within the three largest counties in Florida. The region is known for its tourism, finance, research, and manufacturing industries. In addition, the latest report conducted by the Florida Agency for Workforce Innovation (2011) indicates that the South Florida region has an average green job growth rate in comparison to the national average.

The region is also considered one of the most disaster vulnerable regions in the United States (RealtyTrac 2015). Environmental scholars argue that the South Florida region has

already started experiencing the calamitous effects of climate change (Scavia et al. 2002; Stanton et al. 2007). Many local governments have already started taking steps to adapt to the effect of climate change by raising sea walls and attracting environmentally friendly industries (Wallman 2017). In 2011, a regional climate change collaborative mechanism, the Southeast Florida Regional Climate Change Compact, was established in the region to overcome challenges posed by climate change. All of the 102 local governments, regardless of their political views and leadership, have unanimously agreed that climate change adaptation requires a regional response. Regional adaptation initiative makes the South Florida region a leader in regional response for climate change. All of these attributes make South Florida an ideal region for this study because the region is already leading the nation in adaptation strategies. Consistent with climate change adaptation, the argument is that local governments that have adopted adaptation policies are more interested in creating green jobs as a form of adaptation.

This study argues that there are consequences to acquiring information, and local government engagement in green job creation in the region can be explained by the role of a local organization. To examine this proposition, this study adopts survey data collected from local governments and organizations in the South Florida region. Out of 122 survey recipients, 48 responded to the survey. The study adopts two competing hypotheses on the relation and position of local governments in collaborative network structures for green jobs creation. The analysis of this study confirms the hypotheses on bonding and bridging effects, confirming that closeness of local governments with each other and social position of a local government is explained by and associated with local governments' activity in the region.

3.2   Bonding Hypotheses

The bonding effect takes place when an organization undertakes attachment to other organizations (Granovetter 1973). The argument is that the bonding effect occurs in a closely knitted community where actors have a strong sense of belonging toward each other (Hawkins and Maurer 2009). In a closely knitted community, an organization is adjacent to other organizations because of shared experience, nature of affairs, exchange of information, and trust. Organizations with similar nature of affairs are attracted to each other. For instance, an economic development office of a local government may bond with state and federal economic development offices, which can be explained by shared nature of affairs.

The bonding hypotheses have been used by scholars to explain the logic of a closely knitted community in the provision of services and joint efforts for collective benefit (Andrew and Carr 2013; Jung and Song 2015). Bonding is explained by a strong sense of unity and belongingness of community members to one another. The basic reasoning is that a community with a strong sense of unity and closeness would be more economically resilient than a community with a lower sense of unity (Jung and Song 2015). A community that has a strong sense of unity has a higher degree of cooperation and collaboration, in comparison to a community with a lower level of closeness (Andrew and Carr 2013). After natural disasters, the ability of a local—regional—community to work together is paramount during the recovery stage because of the readiness of a local organization to share resources and experience needed to help disaster-affected areas (Andrew and Carr 2013; Jung and Song 2015).

According to the bonding hypothesis, a highly dense network emerges actively if complexity and uncertainty are present in intergovernmental activities (Andrew 2009). Regional bonding structure can be explained by the benefits and information transmitted between member

local governments. Bonding structure also helps members get access to resources and information from actors across the collaborative network. The social structure also provides trust, reciprocity, monitoring, connections, and rich information for the members within the network.

In Figure 3.1, a hypothetical network of nine members is presented. In this network structure, organization F, in three different ways, is connected to organizations D, A, and I. By relying on organizations B, E, and G, organization F gets information at lower costs, instead of searching for information throughout the network. This hypothetical network structure highlights that bonding structures have an effect on the participation of organizations.
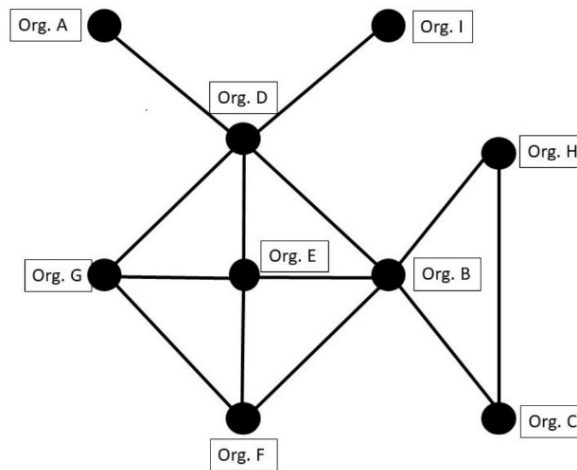
Figure 3.1: Hypothetical Network Structure

Participation of governments in the bonding structure can be explained by (1) gaining advantages of bonding relationships as a goal to reach a collective outcome, or (2) pull resources from other members of the network. During disasters, these close relationships help local governments improve economic growth and development, and encourage resilience. The logic is that local governments benefit from the bonding structure by sharing and gaining information and resources from each other.

However, the bonding structure has its negative parameters as well. That is, a member of the structure chooses not to share information with other members because it does not want to share its resources because of competition. This behavior takes place when a local government uses the bonding strategy to be less active in the region because it does not need to establish links with most members of the region in order to gain access to necessary information for economic growth.

> Hypothesis 1- the closer a local government works with others for climate change adaptation, the higher its level of collaboration for green jobs creation.

3.3   Bridging Hypotheses

The bridging effect occurs when a central organization passes information to other organizations (Granovetter 1983; Paxton 1999). Put simply, a central organization can coordinate information flow between otherwise disconnected organizations. Scholars argue that the bridging effect occurs when an organization places itself in a certain position in the collaborative network to gain access to information and other benefits (Granovetter 1973; Patulny and Svendsen 2007; Paxton 1999). Similar to the bonding effect, in the bridging effect, organizations are assumed to be opportunistic and rational (Uzzi 1997). An assumption of opportunism produces both positive and negative results. Positive results occur when an organization knowingly places itself in the network to coordinate valuable information to other organizations for greater good. Negative results, on the other hand, occur when an organization coordinates and shares false information and failures to other organizations with whom it is working.

Self-positioning of organizations occurs when an organization is interested in gaining information and resources from other organizations (Uzzi 1997). Most importantly, consequences occur when an organization that has the most resources to help other organizations places itself in the center of the network. For example, the federal department of economic development would place itself in the center of the network because it contains valuable resources needed by state and local economic development agencies. Hence, an organization positions itself to take on responsibilities of allocating and pooling resources to other members.

The negative effect of bridging structure occurs if an organization that contains false information, due to its position, coordinates false information to others within the network (Burt 2000; Patulny and Svendsen 2007). By doing this, an organization spreads the risk of organizational failures on to other members in a network. For instance, lack of guidelines on economic expansion and its effect on a region can become a normal business practice for all members of the network, whereby unchallenged and unregulated decisions of members affect others.

An organization that is placed in the center of the network is capable of sharing information with organizations that are otherwise disconnected. In addition, an organization has control over the nature of the information being passed to other members. Presence of the bridging structure helps some members to become dominant in negotiating and decision-making. An organization that plays the role of bridging is a "broker" that bargains on behalf other members and controls information. One of the explanations for the mediator members is their ability to pass on information to other members that are actively followed pursued by all network members.

During disasters, a local government that bridges information not only will pursue the best outcome for its own jurisdiction, but will also help other members. Similarly, if a bridging member is removed from the structure, then members that were associated with it will be also discarded. In Figure 3.1, if organization D is removed, then the link between organizations I and G will be also removed. This makes organization D very crucial for the network, because without organization D, there will not be any information sharing from organization A and I with other members.

> Hypothesis 2. - In climate change adaptation, the more central an organization is positioned in a network, the higher its level of collaboration for green jobs creation.

3.4   Data and Analysis

3.4.1   Research Site

This study uses the South Florida region to examine bonding and bridging structures of local governments and various other governmental and non-governmental organizations. The region is also known as the Greater Miami or Miami Metropolitan region. The Office of Management and Budget's (OMB) definition for the South Florida region is the Metropolitan Statistical Area surrounding Miami, Fort Lauderdale, and West Palm Beach. The South Florida region consists of three counties; Broward, Miami-Dade, and Palm Beach. Overall, there are 107 cities, towns, and other incorporated places (Census Designed Places) located in the region (US Census 2017). There are, however, 102 municipalities in the region. The municipalities are specified as cities, towns, and villages. However, there is no distinction between these terms because all municipalities have council/mayor or council/manager form of government. The region is dense, encompassing 102 local governments in 6,137 square miles, which has almost

the same population but 40 percent less land mass compared to the Greater Houston region (US Census 2017).

In addition, the South Florida region is ranked the eighth most populated region in the United States, inhabiting over 6 million people (US Census 2017). The region experienced an increase of 8 percent population growth from 2010 to 2015. The South Florida region is racially diverse, whereby the population is 35 % White, 35% Hispanic, 21% Black, and 6% Asian and other races (US Census 2017). The region's demographics indicate that 50% of the population are nonresidents. Education attainment of residents is above average, with over 80% of the population obtained high school degrees and 28% bachelor or higher degrees. According to the US Census (2017), the median income for the region is $43,000, with 80% of the households receiving work-related income. The political viewpoint of the region has been primarily Democratic in the last presidential and congressional elections. According to the Cook Partisan Voting Index (CPVI), the South Florida region consists of nine congressional districts; four Republican and five Democratic. Historically, the region elected federal and state lawmakers from Democratic and Republican parties. Voting behavior of residents shifts from one party to the other.

The unemployment rate of 5.2% for the region is slightly higher than the national average of 4.3 % (BLS 2017). Top industries are (1) tourism; (2) information technology; (3) trade; (4) media; and (5) financial services (Beacon Council 2017). According to the U.S. Bureau of Economic Analysis (2015), the region has been experiencing two to three percent annual growth in Gross Domestic Product (GDP). The largest county, Miami-Dade, has experienced an 8.4 % increase in population, which is two-times larger than the national average. Over 60% of adults are in the labor force, with an annual increase of 3.2% in total employment. The owner-occupied

housing unit rate is 54%, which is significantly lower than the national average, but slightly higher than other major metropolitan regions. Median home prices for the largest cities range between 200 and 250 thousand dollars.

3.4.2 Natural Disasters in South Florida

The region has experienced some of the worst disasters in the history of the United States. The most infamous disaster, Hurricane Andrew, made landfall in the South Florida region in 1992. Since 1990, the region has been affected by six hurricanes, category two and above. Moreover, the region has also experienced dozens of minor category one hurricanes and tropical storms. Over time, minor hurricanes and storms have also caused billions of dollars in damages to public and private properties. While immediate disasters cause billions of dollars in damages, the gradual disasters, such as rising sea level, will cause hundreds of billions of dollars in damages before the end of the century.

South Florida is considered one of the most vulnerable regions to the rise in sea level. According to recent studies (Wdowisnki et al. 2016), the South Florida region has one of the highest scores on the scale of hazards due to rising in the sea level. Main disasters occurring in the region are floods, flash floods, hurricanes, tropical storms, tornados, and severe storms (State Risk Assessment 2013). The effects of climate change are also noticed in the South Florida region. Many coastal cities, such as Miami, Miami Beach, Coral Gables, West Palm Beach, Fort Lauderdale, Key Biscayne, and Key West are adapting in order to overcome future losses caused by climate change (Cox and Cox 2015). The City of Miami Beach, for instance, has started investing hundreds of millions of dollars in mitigation and adaptation efforts already. The Federal Emergency Management Agency (FEMA) reports that Florida leads the nation in

property value (almost $500 billion) covered by the National Flood Insurance Program. Future climate change related losses will be experienced mainly by homeowners and businesses.

In order to respond to the impacts of climate change, local governments in the South Florida region have constructed the Southeast Florida Climate Change Compact. The compact covers 107 municipalities and incorporated areas, four counties, and inhabits 6 million residents. This collaborative agreement for adaptation purposes has been effective at developing (1) annual legislative programs to advocate for state and federal policies; (2) mitigation and adaptation strategies by dedicating staff and resources; and (3) identifying emerging issues and providing an example for other regions in the country (SEFCC 2012). The compact has been praised by academics, media, think tanks, and the previous president of the United States. Perhaps the most extraordinary aspect of the compact is the collective understanding and response of local governments on disastrous effects of climate change (Adger 2003). The compact also includes local government leaders from various political backgrounds, who put aside political differences in order to respond to climate change.

3.4.3   Why South Florida Region?

Economic and social factors, natural disaster occurrence and collaborative regional governance make the South Florida region an ideal area for this study. Most of the region is estimated to be underwater by the end of the century (Goodell 2013). However, the impact of climate change is already occurring today. Cities of Miami Beach, Key Biscayne, Bal Harbour, Surfside, and Golden Beach experience rise in the sea level annually (Cox and Cox 2015). This incidence is present in other coastal local governments as well. Many coastal cities in the region have developed their drains to flow from the city into the ocean (Cox and Cox 2015). However,

when sea level rises, water from the ocean moves through drains back to cities and causes overflow. As an adaptation mechanism, local governments installed underground water pumps to force water from drains back into the ocean (Kimmelman 2017). Local governments also build up pavements and roads to higher ground, and increase sea walls in order to avoid flooding. These adaptation solutions are known as climate change engineering solutions.

Once the engineering solutions are in place, local governments have to make changes to policies and strategies. Local governments must consider making changes to land use, transportation, fresh water, and ecosystem. For instance, in Broward County, the rise of sea level is already affecting aquafers by contaminating freshwater supplies (Wallman 2017). Interestingly, the federal and state governments have not accepted climate change as a threat. Due to lack of federal and state climate change policy response, local governments deal with climate change on a local level. When the federal and state governments do not take action, local governments are forced to take action on an individual or community level. Therefore, adapting to climate change is an informal responsibility of local governments.

Furthermore, the most troubling reality for the South Florida region is the inability to build sea walls. Unlike the Netherlands and New Orleans, the South Florida region's ground system is porous limestone (Kolbert 2015). Because of this geology, local governments cannot afford to build higher sea walls. Currently, local governments are not encouraged to use the resources to invest in the advanced form of sea walls, because water overflow is usually caused by sudden storms and immediate natural disasters, which can be alleviated. However, inability to mitigate future disasters creates an economic problem for the region. Businesses and industries may not want to invest in areas that will be underwater within the next few decades. But, considering that climate change is inevitable, businesses will not invest in disaster areas

unless their investments are guaranteed by local governments through the adoption of climate change adaptation strategies. For instance, a common form of adaptation strategy is making sure transportation and infrastructure is intact, to make sure future disasters do not stall day to day operations.

3.5   Data Collection Method

To examine the relationship between collaboration and green jobs creation, this study adopts a survey method of data collection. An economic development survey was prepared and mailed to local government and nonprofit organizations in the South Florida Region (Figure 3.2). In the survey, the participants were asked to name cities, counties, non-profits and state/federal organizations they participated with in order to create green jobs. The survey used the Bureau of Labor Statistics' definition for green jobs.

A list of local governments in the Southeast Florida Climate Change Compact was obtained from electronic records open to the public. A total of 102 cities, three counties, and 17 non-profit organizations were identified and contacted via email and paper survey. The total number of survey participants was 122. The unit of analysis in the study, however, is local governments (cities) in the South Florida region. Initially, the electronic survey, using Qualtrics method, was sent to all 122 participants in June 2017. The survey was sent to city managers and nonprofit economic development directors. Out of 122 participants, only seven participated in the initial electronic survey. Four city governments responded back requesting to be taken off the survey list because their local governments are mainly composed of residential areas and are not interested in green jobs. In addition, surveys gathered from seven recipients were not fully

answered, whereby responders reviewed the survey but did not engage in answering any of the questions.

In July 2017, a reminder email was sent to the remaining 108 participants. In the reminder email, survey recipients were contacted individually to their personal emails. Each email contained a personalized individual Qualtrics link that contained identification to help track participants' location. The reminder email delivered 12 responses. Responses contained answers to collaboration questions asked in the survey. At the end of July, the total number of survey responders was 17. Once again, a noticeable number of participants, over 20, revised the survey but did not respond to the questions, therefore their responses were not recorded in the final dataset. Because of the small number of responses from the first two attempts using electronic survey, the decision was made to contact participants directly through the United States Postal Service. After receiving the approval from the UNT IRB board in August, a paper survey was directly sent to the remaining participants.

The remaining participants were identified based on population size. Local governments with a population of 5,000 residents and above were identified and contacted through a mail survey. Out of the remaining 96 participants, 26 local governments had a population of fewer than 5,000 residents. A mail survey was sent to 70 participants. Out of 70 mailed surveys, only 12 responses were received. While waiting for the paper survey responses, the third and final electronic mail reminder was sent to participants. The third reminder helped gather 13 more responses. The total number was 40 survey responses by end of August. The decision was made to send out a paper survey for the second time in September 2017. The second paper survey included 58 local governments with a population of 5,000 or more. The second order of mail surveys delivered six responses. Due to events of Hurricane Irma, the survey was suspended,

because it would have been unlikely for city officials to respond to the survey while dealing with the worst catastrophic disaster the South Florida region had witnessed in twenty-five years. As of early October, 48 responses were gathered (Figure 3.3).
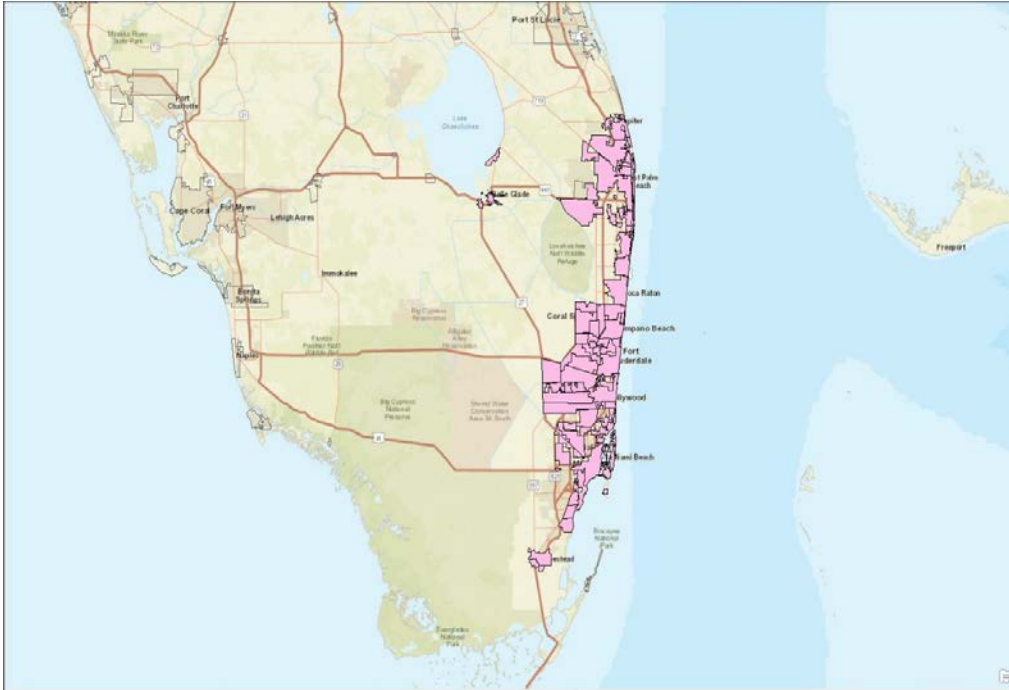
Figure 3.2: Surveyed Local Governments
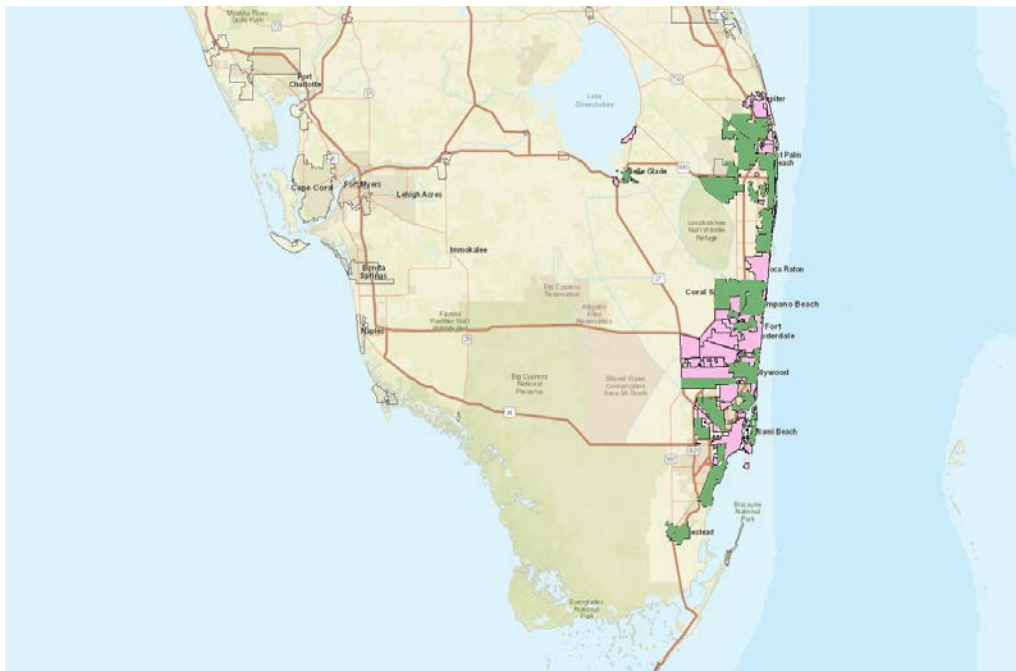
Figure 3.3: Responder Local Governments

3.6   Measuring Participation in Regional Adaptation for Green Job Creation

The focus of the study is examining the relationship between the social position of local governments in inter-governmental networks and climate change efforts for green jobs creation. Local communication network structure and participation in the regional committees comes from survey linkages answered by the responders. The study uses UCINET Social Network analysis statistical software to measure network centrality for each participant in the network, then averaged to create a single centrality score for the participating local governments (Andrew and Feiock 2008). Table 3.1 presents the distribution of the survey responders by organization type. Descriptive statistics are reported in Table 3.2 alongside with description of measures for the variables used in the analysis.

Table 3.1: Responders by Types of Organizations

Organizational Types	Frequency	Percentage
Municipal government	42	88
County government	2	4
Government organization	0	0
Non-profit organization	4	8
TOTAL	48	100

Table 3.2: Descriptive Statistics (N= 42)

	Mean	S.D.	Minimum	Maximum
Collaboration participation	39.5	22.66	0	78
Network closeness (bonding)	38.31	6.51	22.65	59.23
Network betweenness (bridging)	2.21	4.18	0	26.48
Natural disaster (last 3 years)	0.52	0.50	0	1
Median household income (logged)	11.18	0.41	10.25	12.44
Government worker/total labor (ratio)	0.63	0.07	0.37	0.73
Percentage white population	69.56	19.5	12.22	97.40
Population density (logged)	8.27	1.11	3.68	10.56
Green jobs/total employment (ratio)	0.55	2.99	0.08	2.21

	Mean	S.D.	Minimum	Maximum
Percentage unemployment	10.23	4.53	4.9	28.70
Number of Households (logged)	8.88	2.04	2.19	13.64

3.6.1 Dependent Variable

To test the hypothesis for this study, the dependent variable is operationalized in two ways. This study uses two dependent variables to examine collaborative mechanisms for green job creation. The dependent variables in the analysis are the green job creation and adoption of climate change policies for green jobs creation by local governments. The operationalization of the dependent variables is based on two questions. The two questions asked in the survey are (1) "To what extent has your jurisdiction experienced an increase in green jobs within the last 3 years," and (2) "To what extent have "Climate Change" policies adopted by your jurisdiction contribute to green job creation." A scale of 0 (not at all) to 4 (very much) was used to indicate the participants desire for green job creation. However, the study measured the survey responses as binary variable. The study adopts a binary dummy variable for measurement purposes for dependent variables. It is important to note that out of 48 responses to the survey, 42 are local government responses. Furthermore, 40 responded to the first question, and 38 responded to the second question.

The responses for the first question are on the Likert scale. The responses were identified based on distribution of answers and then measured as 0 for NO and 1 for YES. That is, 0 for "no, did not create green jobs," and 1 for "creation of green jobs." There were total of 40 responses for the first question. The distribution of responses was examined, and results indicated that 13 responders stated that they did not experience an increase in green jobs and 7

responders indicated that they experienced minimum growth in green jobs, providing a response score of 1. When combined, the total is 20 responses, with response scores of 0 and 1. The remaining 20 responses indicated green job growth rated 2 on the Likert scale. The total of 20 responses. Hence, the distribution of responses is 20 for responses 0 and 1, and 20 for responses indicating responses between 2 and 4. In order to operationalize the dependent variable as binary dummy variable measurement, the study uses 0 for responses indicating 0 and 1, and 1 for responses indicating between 2 and 4.

The responses for the second question are also based on the Likert scale. Similar to the first question, this study operationalizes the responses as binary. This means if a survey responder answered yes to "adoption of climate change policies contributing to green job creation," then it is coded as 1. There were total of 38 responses to the second question. Based on the distribution total of 38 responses, 18 responded 0, and 20 responded 2, 3, and 4 based on the Likert scale. Therefore, the new binary measurement for responses for the second question indicates 18 responses measured as 0, and 20 responses measured as 1.

3.6.2 Control Variables

The main control variable, a natural disaster, is introduced in the analysis. Earlier, it was discussed that previous reports showed that local governments that have not experienced natural disasters in recent years do not take action against climate change. Previous studies have also shown that disasters have a positive effect on growth (Ismayilov and Andrew 2016), which is why this study introduces the natural disaster variable in order to investigate whether there is a relation between disaster and collaboration for green job creation. The survey recipients were asked if their local government has experienced natural disasters in the last three years. In

addition to responses to the question, data gathered from the National Climatic Data Center (NCTC) were also used to find whether local governments have experienced natural disasters. Mean t-test was adopted to test the survey responses, and the results indicate that there is no significant difference in the number of natural disasters occurrence reported by survey participants and participants who did not answer the question on natural disaster occurrence ($p<$ 0.8722).

Socio-economic and demographic characteristics were also added to the dataset. Public and private employment ratio, median household income, white race ratio, and population per square mile were added. The logic is that a local government that has higher income residents, higher number of private sector employment, and a homogenous population is more likely to welcome green jobs. Mean t-test analysis was adopted to compare the cities that have responded to the survey with participants who received but did not respond to the survey. An independent sample t-test was used for selection bias between those who were invited to take the survey and those who answered the survey.

Table 3.3: Characteristics of Responded and Non-Responded

	Responded (N=42)	Non-Responded (N= 60)	t-test (2- tail)
Natural Disaster	0.54	0.45	-0.09
Population (density)	5,908	5,194	-713.76
(log population)	8.36	7.94	-0.42*
Government worker/total labor (ratio)	0.62	0.59	-0.03*
Median household income (thousand)	80,693	56,268	-24,425***
(log median income)	11.10	9.63	-1.62***
White population (percent)	68	56	-12**
Household (log)	9.28	8.70	-0.58
Unemployment (percent)	10.20	8.82	-1.37

Note: Asterisk (***), (**), (*) denote statistical significant at the 1%, 5%, and 10% level, respectively

3.6.2.1   Measuring Social Position

Main theoretic variables in this study are two measures of the social position calculated from analysis of collaboration network exposed by the survey. Closeness centrality and betweenness centrality were calculated using UCINET 6.36 software. In Table 3.4, betweenness and closeness centrality measures are reported for the seven most central local organizations.

3.6.2.2   Measuring Bonding Effect

Bonding effect is measured in using actor closeness index. The index indicates that an actor, by analyzing the distance from others, is able to connect to others very quickly. The index ranges from 0 to 100 and captures bonding relationship of actors within the network. If the index number is lower, then this shows that a local government has a greater closeness centrality. Higher index score means that a local government communicates with others more quickly than a local government with lower closeness centrality measure (Table 3.4; Figure 3.4).

3.6.2.3   Measuring Bridging Effect

The bridging effect is measured by using actor betweenness centrality index. The index captures strategic and important members an actor connects with, within the network. The shorter path between other two members means they are passed through a central actor. The betweenness centrality index ranges from 0 to 100. Greater centrality index means an actor has the most influence on the information movement within the network. Higher values indicate that a local government has greater influence over other actors within the network (Table 3.4; Figure 3.4)

By using the UCINET social network software, this study estimates that counties and nonprofit organizations have greater influence over other members within the network. Among counties, Broward, Palm Beach, and Miami-Dade are the most central actors within the network and also have the highest influence over others. Among organizations, the South Florida Economic Development Alliance, Greater Fort Lauderdale Alliance, Enterprise and Florida Department of Economic Opportunity have the greatest influence. Finally, among cities, Pompano Beach, South Palm Beach, West Palm Beach are the most central actors.

Table 3.4: Social Positions of Organizations (n= 78)

Organizations	Betweenness 'bridging'	Organizations	Closeness 'bonding'
Broward County	26.48	Broward County	59.23
SFEDA	15.69	South Palm Beach	50.33
Pompano Beach	11.91	Pompano Beach	50.00
Miami-Dade County	9.91	SFEDA	49.35
Palm Beach County	9.77	Miami-Dade County	49.04
DEO	8.40	Gr. Ft. Lauderdale Alliance	48.73
South Palm Beach	8.05	DEO	47.82
West Palm Beach	7.14	Palm Beach County	46.95
Enterprise Florida	5.95	Enterprise Florida	46.66

The analysis does not provide names of collaborating local governments and organizations due to confidentiality reasons. However, it is noticeable that counties and nonprofit organizations are central to other local governments within the network. If they are removed, many local governments would be unable to gain access to information. Figure 3.4 explains that without these central actors, sharing and accessing information would become unattainable for many local governments within the network.
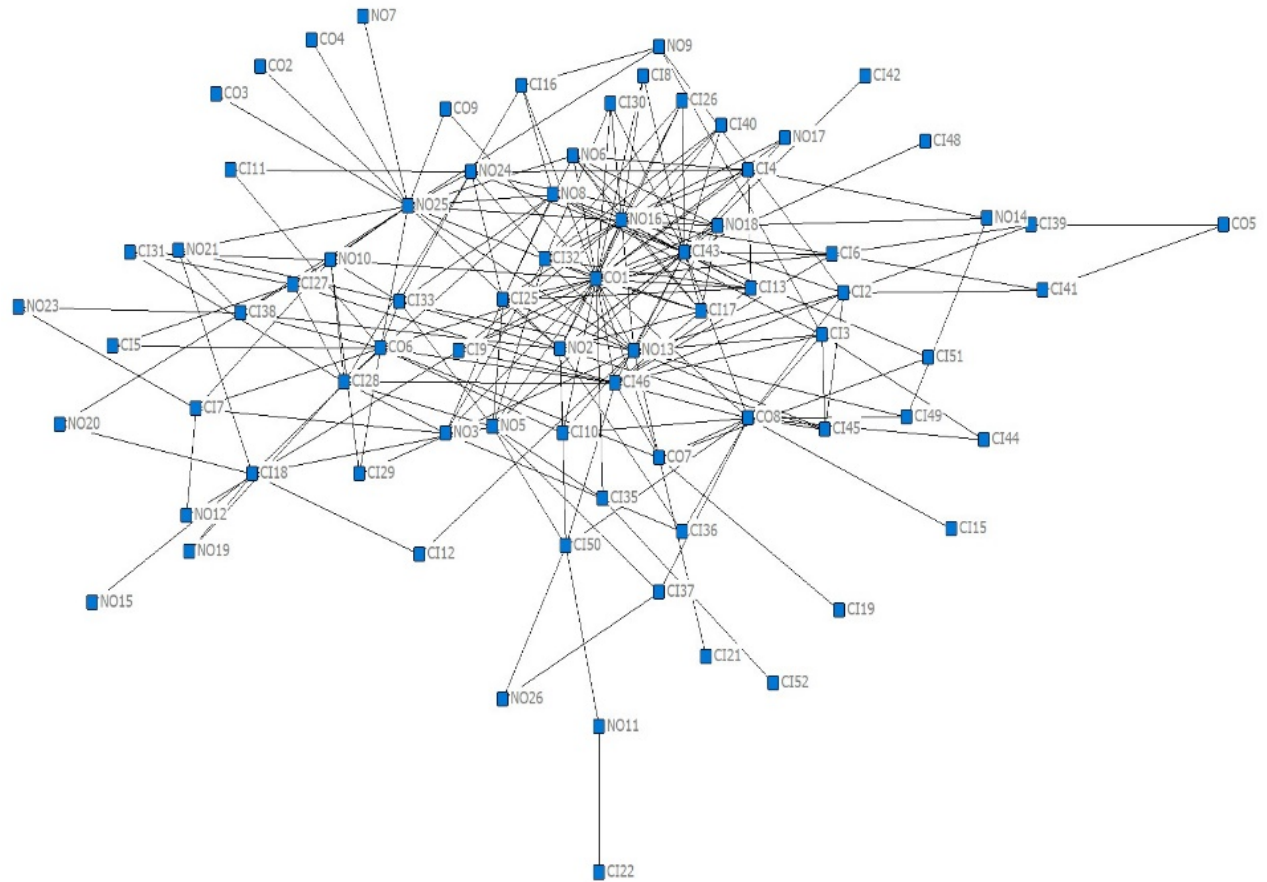
Figure 3.4: Collaborative Network Structure

3.7   Methods of Analysis

Out of 48 survey responders, nine declared that they did not collaborate with other organizations for green job creation. The study treated coded non- collaborating organizations as 0. Then, in the methodological analysis, the first stage examines organizations that did not collaborate as 0, while in the second stage these organizations are censored. Without controlling for the selection process, the maximum likelihood estimation in the outcomes would be biased (Heckman 1977).

The statistical model used in the analysis is the Heckman procedure. The study contained limited participation, hence adoption of the Heckman procedure is necessary to check for potential bias in selection (Heckman 1977). This model is recommended because the model has

two equations necessary to determine whether observations are censored (Heckman 1977, 1979). The first equation is the selection equation, which foresees whether an observation is censored (has a city considered collaboration or not). The second equation is the outcome equation, which predicts the likelihood of occurrence of collaboration for green job creation and/or adaptation policy adoption, considering that a local government has a preference for working with neighboring jurisdictions. The Inverse Mills ratio calculated value for each city from the first-selection- equation. The ratio indicates selection risk, which is used in the outcome equation to account for the risks presented by the selection process (Greene 2002).

Information on networks other than local governments are excluded. This leaves the analysis 48 local organizations that have responded to the survey. Out of the 42 local governments' responses, only 33 responded to collaboration questions. The dependent variable is a binary (dummy) variable, which is either 0 or 1. Two main independent variables are closeness and betweenness measures. Control variables used in the final model are a natural disaster, household income, public and private employment ratio, and white race ratio. In the final analysis, only local governments that responded to the survey were included. Analysis for potential bias in the dataset was checked. Results of the analysis are reported in Table 3.5.

The Heckman two- stage model is adopted to analyze for potential selection bias. The first stage, the selection model, includes variables that represent local government capacities, such as socioeconomic and demographic characteristics. The first stage tests for facilitating local governments to participate in green job creation. The second stage, outcome model, includes factors explaining the level of regional collaboration capacity perceived by local governments, but also the variables used in the first model (i.e., socioeconomic and demographic characteristics).

3.8   Results and Discussion

The result of Wald X^2 test, presented in Tables 3.5 and 3.6, indicate that both models are

statistically significant. The result of the likelihood ratio test for independence equations

indicate that in both models, selection bias is present between two equations. This justifies usage

of Heckman probit models for this study.

The findings of the Heckman two- stage model, are indicated in Tables 3.5 and 3.6. In

Table 3.5, the dependent variable is a binary, and measures green jobs creation in local

governments in the last three years. Similarly, in Table 3.6, the dependent variable is also

binary, and measures green jobs creation in local governments that adopted climate change

adaptation policies. The findings for both questions support hypothesis 1. The assumption is

that working together within a network generates a better outcome. This assumption is

positively and significantly associated with working together for green jobs creation (β= 0.09, $p<$

0.03; β= 0.11, $p<$ 0.00). The findings are consistent with the argument that working with others

helps create green jobs. The findings highlight that a highly dense and united network leads to

green job creation.

Table 3.5: Heckman Probit Analysis for Green Job Creation

	Coefficient	S.E.	Significance
Selection Equation (likelihood of participating)			
Natural Disaster (last 3 years)	-0.06	0.27	0.81
Household Income	0.42**	0.20	0.03
White Race Ratio	-0.31	0.86	0.72
Constant	-4.87**	1.86	0.00
Note: Coefficient and standard error of the bonding and bridging are not reported in the selection equation.			
Outcome Equation (green job creation)			
Network closeness (bonding)	0.09**	0.04	0.03
Network betweenness (bridging)	-0.16**	0.07	0.02
Household Income	-0.41	0.51	0.42

	Coefficient	S.E.	Significance
White Race Ratio	-0.35	1.36	0.79
Public/Private Job Ratio	1.05	1.79	0.55
Natural Disaster (last 3 years)	0.55	0.43	0.19
Constant	1.68	6.25	0.78
N (uncensored)	69 (33)		
Log Likelihood	-73.56		
Wald X^2	24.75***		
LR X^2 (rho=0)	0.52		

Notes: *p <0.10; **p <0.05; ***p <.001

In addition, there is also support for hypothesis 2 highlighted in Table 3.5. In bridging, the assumption is that closely knitted structure places stress on a local government and positioning self as a central actor in order to gain resources from other members is necessary for economic resiliency. The notion is that local governments that are in central position between two other members in collaborative network notice creation of green jobs. However, the findings indicate negative and significant association with collaboration for green job creation (β= -0.16; p<0.02). This means that a local government that played a role in connecting with other organizations, that otherwise would be disconnected, is negatively associated with green job creation. The findings are not consistent with the assumption that a local government positioning self to other local governments will gain access to additional resources. Considering this point, based on the findings, it can be argued that collaboration for green job creation may go beyond information seeking.

Other control variables; natural disasters and public/private employment have a positive but insignificant effect on green job creation. Similarly, household income and white race ratio have a negative and insignificant effect on green job creation.

Table 3.6: Heckman Probit Analysis for Green Job Creation

	Coefficient	S.E.	Significance
Selection Equation (likelihood of participating)			
Natural Disaster (last 3 years)	-0.06	0.28	0.81
Household Income	0.37**	0.18	0.04
White Race Ratio	-0.09	0.84	0.91
Constant	-4.46**	1.72	0.00
Note: Coefficient and standard error of the bonding and bridging are not reported in the selection equation.			
Outcome Equation (green job creation)			
Network closeness (bonding)	0.11**	0.03	0.00
Network betweenness (bridging)	0.01	0.07	0.90
Household Income	0.26	0.38	0.48
White Race Ratio	0.97	1.03	0.34
Public/Private Job Ratio	0.71	1.79	0.69
Natural Disaster (last 3 years)	-0.40	0.34	0.25
Constant	-8.09	3.41	0.00
N (uncensored)	69 (33)		
Log Likelihood	-73.37		
Wald X^2	21.74***		
LR X^2 (rho=0)	1.63*		

Notes: *p <0.10; **p <0.05; ***p <.001

3.9   Future Research and Conclusion

The objective of the study was to find how local governments working together affects green jobs creation. The study finds that working together with other local governments helps create green jobs. Yet, findings are consistent for the South Florida region only. It is recommended that future studies investigate other regions and increase the number of participants.

The main weakness of the study is its sample size and examination of one network. Earlier we mentioned that there were 48 survey responders out of 122 participants. Just 38.5%

percent of the participants responded to the survey. Additionally, only 39 of the responders pointed out other organizations they collaborated with to create green jobs, 33 of which are local governments. Therefore, the sample size for the analysis was 33. It is recommended that future studies use larger sample size. A follow-up survey will be conducted with survey participants using phone interviews in hopes of increasing the sample size to 50 responders. In addition, it is also recommended to ask participants about additional resources and strategies they have used to create green jobs. Unfortunately, this study was not able to capture this because of the limited knowledge on local collaboration for green jobs creation.

This study makes a key contribution to the theories of institutional collective action. This study makes a fresh contribution to measurement and conceptualization of local government relations for regional green job creation. While previous studies have provided a theoretical argument for regional resiliency, they have not conducted empirical analysis for the creation of green jobs. The theoretical argument of this study highlights that adaptation and economic resilience is dependent on local government collaboration. Based on the findings of this study, we can now argue with confidence that closeness, unity, and bonding of local government within a network positively affects creation of green jobs. The findings highlighted that it is important to study local government relations with cities, counties, and nonprofit organizations, as well as the development of networks to create green jobs as a form of climate change adaptation strategy, and economic resilience to disasters.

CHAPTER 4

NATURAL DISASTERS AND ECONOMIC RESILIENCE: AN EMPIRICAL ANALYSIS OF

GREEN JOB CREATION IN FLORIDA

Economic resilience to climate change provides opportunities for local communities to

bounce forward rather than merely bounce back. The ability of communities to adapt to

disruptive events depends on "how [localities] overcome negative lock-in" (Boschma 2014).

This means that sources of resilience depend on the motivation and incentives of local

governments to purposely develop practices and policies that depart from their existing growth

path.

While much has been written about community resilience as the ability of a community

to "bounce back" after major disasters (Hassink 2010; Simmie and Martin 2010; Welsh 2014),

few have examined resilient communities in terms of their ability to "bounce forward" (Johnson

and Blackburn 2014; Clark et al. 2010; Cowell 2013). While the former definition of resilience

suggests returning economic output to the level before an event occurred, the latter definition

aims to understand community resilience as a systemic ability of individuals and organizations to

adapt to new atmospheres generated by an event or crisis (Hill et al. 2008; Simmie and Martin

2010).

Consistent with the bounce forward approach to economic resilience, this study argues

that local governments, following disasters, will invest in the creation of green jobs in order to

return their economy to a status that is even healthier than their pre-disaster economy. In order

to investigate green jobs, this study examines green jobs in local governments in Florida. This

essay is structured in the following way: The first section defines and describes economic

resilience. The second section provides a theoretical argument for green job creation. In the third

section, data collection and analysis are presented. Lastly, findings and implications of the study are discussed.

4.1   Introduction

From a local government perspective, resilience can be viewed as the ability of public agencies to perform governmental functions and return to normalcy- where the community returns to the same level of productivity before the disaster occurred (Pike 2010). However, scholars have warned that such an approach to resilience implies areas frequently affected by disasters are often left in a stage of permanent reconstruction. Assets and resources are largely used to rebuild damaged infrastructure, instead of being invested in new and innovative technology, employment and infrastructure (Stromberg 2007; Toya and Skidmore 2002). Johnson and Blackburn (2014) argue that resilience involves four stages: (1) resistance, (2) coping capacity, (3) recovery, and (4) adaptive capacity. To be resilient, a local community must show signs of resistance toward an extreme event, given their available resources as coping strategies. The community must be able to recover from the event and adopt new strategies that would make their economy more resilient to future shocks.

An alternative approach is to think of resiliency as an opportunity to "bounce forward" – the resistance and adaption to external shocks and events (Manyena et al. 2011). The "bouncing forward" approach to resilience allows researchers to understand the reasoning, at the local level, for the adoption and implementation of innovative strategies and practices such as climate change mitigation and adaptation policies. The notion of "bouncing forward" also provides a policy guide on the importance of new capital investment and employment opportunities that sustain and build a better community (Mitchell and Harris 2012; Scott 2013; Shaw 2012).

Examining local action through the "bouncing forward" approach, therefore, provides a new perspective on the explanation for community-level resilience after natural disasters. Community-level resilience requires the engagement of institutions, usage of resources to reduce risks, identifying potential risks, and finally, upgrading infrastructure (Johnson and Blackburn 2014).

The main objective of this study is to examine factors explaining economic resilience in terms of local governments' policy response to natural disasters. The research aims to establish a relationship between natural disasters, resilience, and local government decisions to adopt green economic development. The focus is on the green industry. The study is guided by the following research question: What effects have climate-related weather events and disasters had on green jobs?

This research question is important for several reasons. Consistent with the bouncing forward approach, the basic premise is that natural disasters create an opportunity for local governments to invest resources in sectors that can jump-start economic growth, especially in new industries (Keys et al. 2004). In order to sustain and respond positively to short-term shocks, local communities are better off by moving away from one primary industry, while diversifying and providing opportunities for human capital to cross over to other industries within a region. However, investing in the green sector can lead to political conflicts between the private and public sector, because locked-in industries are resistant to change (Young and McPherson 2013). Yet, policy change occurs over time, and natural disasters will often put pressure on elected and local managers to change their practices, adopting new as well as innovative policies to minimize the consequences of natural disasters (Wilson 2000).

4.2   Explaining the Relationship between Natural Disasters and Green Jobs

Few researchers have investigated the relationship between natural disasters and the creation of green jobs. Some scholars mentioned the challenge of revenue base diversification and problems faced by local governments after natural disasters (Dilley 2005; Schoenfarber 1995). This means a government that has been affected by a disaster attempts to diversify its base in order to overcome economic losses caused by disasters (Cioccio and Michael 2007). This line of research has been done mainly to understand the attraction of businesses to disaster-affected areas.

While there has been research conducted to understand disaster-affected regions in attracting new businesses (Skidmore and Toya 2007), few scholars have investigated the relationship between natural disasters and the creation of green jobs (Runyan 2006). Table 4.1 summarizes the theoretical arguments, including the effects of natural disasters on a local economy, and the factors explaining local governments' motivation to create green industries and employment.

Table 4.1: Effects of Natural Disasters on an Economy

Positive effects	Negative Effects	No Effects
• Increasing new employment and training.	• Out-migration and emigration of local residents and skilled labor.	• Governments adjust their economies according to losses.
• Updating existing infrastructure, business-friendly policies.	• Increase in loans and public spending.	• Policies are adopted to retain businesses.
• Adopting new technologies.	• Loss of vital infrastructure.	• Readjustment of economic strategies.
• Diversifying revenues and increasing sales.	• Creation of poverty traps and resource competition.	
• Employing unused/saved resources.	• Spread of poverty traps to nearby regions.	
	• Loss of investments.	

There are at least two forms of economic resilience that can be adopted by local governments after major disasters (Rose 2004; 2009). The *first* form takes place when a government sets a priority to overcome economic shortfalls and return to the same level of productivity and output before the crisis occurred (Pike et al. 2010). The objective is to adopt strategies and approaches that would increase economic output immediately after the incident occurs. The *second* form of economic resilience occurs when a government adopts an economic approach that withstands shock, and implements adaptive policies that would improve the local economy through the restructuring of the economic base. The goal is to change the economy by not only returning to the economic output that took place before the incident occurred, but also passing the threshold line that withstands future losses (Arrow 1996; Martin 2012; 2014; Pendall 2009). In order to return to the previous level of economic growth, local governments adopt strategies and policies that help attract new businesses (Ismayilov and Andrew 2016).

Theoretically, extreme climate events can have a long-term effect on an economy through new capital and human investment. For instance, after the 1999 earthquake in Turkey and 1992 Hurricane Andrew in Florida, both governments were investing human resources and stimulating economic growth through capital investment and large-scale reconstruction projects (Hallegatte and Przyluski 2010). Skidmore and Toya (2002) suggested that economic growth can be generated by an increase in human capital, leading to an improvement in the total factor productivity. During the rebuilding and reconstruction stage, residents from regions immigrate to the affected areas seeking employment. Moreover, Guston (2008) shows that knowledge-based jobs are more sustainable and resilient both before and after a crisis. This is because green industries — particularly professional, scientific, and technical — are less likely to be affected by a crisis (Augustine 2011).

Extreme climate events can create an environment for governments and interest groups to change policies, adopt new technology, update capital stock, and restructure tax base and rates. In order to recover from natural disasters, local governments become competitive to attract new capital and residents in order to sustain and increase growth. The competition creates a window of opportunity for local governments to rethink established policies, attracting new residents, industries and businesses to increase revenue (Skidmore and Toya 2007). Skidmore and Toya (2002) argue that investments in disaster-affected areas encourage future investments that spill to neighboring unaffected regions. The basic economic argument is that local governments become resilient to disasters through diverse sources of revenue streams, and they adopt policies and strategies to endure external shocks. The restructuring of the economy after a crisis also pressures individuals to attend college (Callan 2002) and workforce training, which contributes to local labor supplies conducive in attracting green industries.

Adopting climate change adaptation policies that encourage growth in green industries not only ensures economic resiliency and sustainable businesses, they also provide local governments with inter-governmental aid and assistance. Although there is a debate regarding the level of employment growth that can be generated in the green industry (Yi 2013), green jobs are generally welcomed by the federal and state governments. Thus, they are more likely assisting local governments in acquiring funds and resources for growth. Scholars have also argued that extreme climate events not only create an opportunity for local governments to receive financial aid from higher level government (Birkland and Waterman 2008; Burby 2006; Kunreuther 2006), but they also create an opportunity to reinvest in areas that have been on the decline for a long period, and change policies that would attract businesses (Baade et al. 2007).

By analyzing socioeconomic and political impacts of disasters, Lindell and Prater (2003) noted that financial aid, loans, and investments can stimulate local growth through the multiplier effect (i.e., higher public spending creates employment and income, which in turn generates a higher level of labor and capital productivity). Chang (1984) finds that, although Hurricane Frederic in 1979 caused devastating damages to the southern region of Alabama with overall damages of $2.3 billion, the federal government allocated aid to counties and helped increase short-term growth in the region. According to Chang (1984), sales tax revenue increased in the coastal region of Alabama. This is explained by an increase in trade and construction as well as temporary employment. Local governments also adopted business-friendly policies to attract private businesses.

> Hypothesis 1: Local governments that are affected by natural disasters will have a *higher* number of green jobs compared to local governments that have not had natural disasters.

However, natural disasters may not contribute to local government incentive to invest in new industries. Stallings and Schepart (1987) argue that after major disasters, local governments face a choice of either increasing spending or relying on state and federal governments for assistance. Local governments receiving relief from a higher-level government are less likely to invest in emergency funds or to increase spending (Shiue 2004). Local governments may choose to "free ride" on financial assistance provided by state and federal governments. Internal competition for resources are often barriers for local governments to adopt long-term policies. Each department/authority within local government is interested in receiving the largest share of resources rather than focusing on long-term policies related to green industries and employment.

Another barrier explaining local governments' reluctance to focus on employment policies and industrial strategies is related to policy priority after major disasters. Albala-Bertrand (1993) highlights that disasters do not necessarily have a significant effect on an

economy because governments readjust their economic strategies and policies after disasters to avoid an economic fallout. Some scholars argue that natural disasters have negative consequences on the economy. For example, natural disasters not only result in loss of property and revenues but also social disruption and health problems (Hallegatte and Dumas 2009). The indirect effect of disasters, such as loss of revenue from businesses, loss of population, and a decrease of economic growth in affected areas, has a long-term implication on local government finance. A study conducted by Guimaraes et al. (1993), for example, suggests income neither decreases nor increases after major disasters.

Employment opportunities and the creation of green jobs also depend on public investment and infrastructure. Costly disasters will force local governments to cut back on spending for certain programs, but increase spending in service areas that are affected by the disaster. The negative consequences of disasters on local expenditure are loss of revenue, decrease in investments, unanticipated spending, apportionment of resources, increase in taxation and debts, as well as a change in budgetary policies (Carter et al. 2007; Hallegatte and Przylusk 2010; Hochrainer 2009). In order to sustain long-term growth, local governments increase the tax rate, increase fees for sales, increase property taxes, and accumulate debt (Chang 1984). Accumulating debt forces local governments to make long-term payments with a higher possibility of defaulting on payments. Governments allocating resources in disaster-affected areas might also create a slowdown in an overall economy (Stomberg 2007). This is because the non-disaster affected areas would experience a decrease in expenditure to compensate for growth in disaster-affected areas.

Another factor is related to the allocation of resources. Areas that are frequently affected by disasters are left in a stage of permanent reconstruction because assets and resources are used

to rebuild, instead of investing in new infrastructure in areas that need the resources the most. Natural disasters can also produce poverty traps, which spill over to other parts of the region, creating uneven development. The micro-level effect of poverty traps potentially leads to macro-level economic recession, particularly through unemployment and the spread of poverty from affected areas to other regions (Carter et al. 2007; Hallegatte and Przylusk 2010). Put simply, natural disasters affect local economies via the socio-economic structure, changing the relative production costs, as well as decreasing demand for products and technologies produced by green industries.

> Hypothesis 2: Local governments that are affected by natural disasters will have a lower number of green jobs compared to local governments that have not had natural disasters.

The literature on economic growth and natural disasters also highlights several factors influencing the creation of new industries and employment opportunities. Residents living within the affected region and other states move to the affected areas to find employment opportunities (Cuearesma et al. 2008; Rascky 2008). Several factors lead to this phenomenon. First, disasters force local governments to increase economic activities in disaster-affected areas, which increases human capital as well. Guimaraes et al. (1992) analyzes the effect of disasters and argues that, after disasters, the affected areas are rebuilt by creating employment opportunities for local residents. Employment in the private sector also increases.

Second, capital mobility and human capital increase because of new investments and new businesses (Ismayilov and Andrew 2016). Previous literature highlights that, after natural disasters, governments adopt business-friendly policies and tax incentives to attract new industries and businesses (Ismayilov and Andrew 2016). Subsequently, employment opportunity in the private sector increases due to business-friendly policy adoptions. Hallegatte and

Przyluski (2010) found that natural disasters force governments to employ unused resources during the recovery stage, which creates jobs for residents in affected areas.

Third, Cavallo and Noy (2009) found that the number of non-agricultural laborers tend to increase after disasters, while the agricultural labor force experienced a decline. Certain types of disasters tend to have a disastrous effect on agriculture oriented industries. In addition, bouncing back after disasters for agriculture oriented industries is costlier and harder.

Local political institutions also have an impact in ensuring that localities understand green industries and the importance of increases of localized green jobs, and some forms of government are more receptive than others. Mayors, for example, are more likely to adopt innovative policies and encourage green job creation, as opposed to a city-manager who likely takes orders from the council and does not initiate change or policy adoption. This is because of credit claiming and the threat of losing votes from the local constituents.

Two other factors are included in the theoretical framework: local governments with higher median income population, and the characteristics of the local population. Some research has found private income of local residents played a major role in policy innovation (Guimaraes et al. 1992; Hochrainer 2009). The argument is that the higher the level of income within a locality, the more likely local residents are to support innovative policies related to green jobs creation. An increase in median household income reflects a strong desire of the population for clean energy and environmentally clean industries. The racial composition of local residents also influences the number of green jobs within a local political boundary.

4.3   Research Design and Data Collection

4.3.1   Research Site

This study examines climate change adaptation policies, green jobs, and natural disasters among municipal governments in the state of Florida. In the analysis, there are 437 incorporated and unincorporated municipalities. More specifically, there are 410 cities, towns, villages, and incorporated areas. In addition, the sample contains 27 unincorporated places such as CDP, also known as Census-Designed Place CDP). While these places are not incorporated, they are included in the sample because of their population size, business activity, and urbanization. Therefore, this study shall refer to all of these places as municipalities. Some of the cities have created hundreds of thousands of green jobs over the course of 20 years, while smaller, local governments have created only a few (Table 4.2). Future analysis will control for outlier cities that have created profoundly large and small numbers of green jobs.

Between 2000 and 2011, Florida experienced several major disasters. Between 2004 and 2005, Florida was hit by Hurricanes Charley, Frances, Ivan, Jeanne, Dennis, Katrina, and Wilma. The disasters are argued to be one of costliest disasters since Hurricane Andrew in 1992 (Fronstin and Holtmann 1994; West and Lenze 1992). According to Morgan (2007), the occurrence of back to back of Hurricanes Ivan, Jeanne and Dennis not only accounted for billions in damages, but also pressured local governments to adopt policies preventing property losses and reducing future risks.

Florida is recognized as one of the fastest growing states in the country. The economy is growing rapidly in areas of heavy industry, tourism, and transportation, and it has also seen an increase in its retirement population (Beacon Council 2017). However, the green job industry employs a relatively low percentage of the total population in the state (Florida Agency for

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Workforce Innovation 2011).   Based on the state of Florida's definition of green jobs, the

percentage of green jobs was estimated to be around 0.6 percent (Florida Agency for Workforce

Innovation 2011). Based on the NETS dataset ― described further below—the main categories

of green industry in the state are Utilities, Construction, Research, and Entertainment (Table 4.2).

Table 4.2: Florida Green Industry Employment Statistics

Industry Sector Statewide	Green Jobs (2010)	Total Industry Employment	Percent of Total Employment
Utilities	857	29,634	2.90%
Construction	10,438	398,729	2.60%
Mining, quarrying, & oil & gas extraction	75	3,720	2.00%
Professional, scientific and technical services	4,878	435,007	1.10%
Arts, entertainment, and recreation	2,100	191,129	1.10%
Manufacturing	3,202	323,810	1.00%
Administrative/support and waste management/ remediation services	5,243	530,763	1.00%
Wholesale trade	3,029	318,160	1.00%
Management of companies and enterprises	526	80,004	0.70%
Transportation and warehousing	1,456	246,018	0.60%
Real estate and rental and leasing	873	156,690	0.60%
Public administration	2,338	465,449	0.50%
Information	529	144,045	0.40%
Agriculture, forestry, fishing and hunting	241	90,003	0.30%
Retail trade	2,463	927,388	0.30%
Other services (except public administration)	587	232,951	0.30%
Accommodation and food services	1,187	733,880	0.20%
Health care and social assistance	1,432	988,203	0.10%
Educational services	620	556,225	0.10%
Finance and insurance	346	324,846	0.10%
TOTAL	42,422	7,176,801	0.60%

Source*: Bureau of Labor Statistics (2011); Florida Agency for Workforce Innovation (2011)

In comparison to the United States average, Florida still lacks in the transportation,

utilities, research, waste treatment, and construction categories (Florida Agency for Workforce

Innovation 2011). Moreover, Florida has not consistently elected governors from the Republican or Democratic parties. In the last thirty years, the state residents have elected Republican, Democratic, and Independent politicians (Florida Department of State 2017) — each proposing different policies for green economies. Local governments in Florida adopt home rule and have discretion over climate change and green economy policy adoption. This makes Florida a good site to investigate, because it is one of the fastest-growing states in the country, yet it is behind in the creation of green jobs.

4.3.2   Dependent Variable

The dependent variable "green jobs" is operationalized as a ratio of green job employments within municipality political boundaries for years 2000 to 2011. The ratio of green jobs is calculated in comparison to the overall number of jobs created within municipalities.

Data on green jobs in Florida is based on the National Establishment Time-Series (NETS) dataset. The dataset contains information on all private sector businesses in the state of Florida from 2000 to 2011. There are over 4 million businesses (cases) establishments opened in Florida between 2000 and 2011. The NETS dataset also provides a list of employees per business, business rating per year, service scores achieved per year, Dun and Bradstreet rating per year, a number of sales in currency per year, and quarterly sales growth for all establishments. Local governments are identified accordingly by FIPS code and NETS allocated city codes. In addition, the data also contains the number of establishments opened per year by the individual business.

The types of businesses in the dataset were differentiated based on the North American Industry Identification Classification System (NAICS) description provided by the United States

Department of Labor. Green job industry classifications were separated by construction, trade,

utilities, labor, and etc. Green industries were separated into 20 main classifications. Each of the

20 classifications was broken down into dozens of sub-classifications. For example, the

construction category was classified as one of the industry sectors, while containing many sub-

classified areas, such as the construction of buildings, civil engineering, heavy construction,

trade contractors, and etc. Overall, the Department of Labor classified 1,187 industries in the

United States. The dataset contains over 1,000 classified cases.

Based on the NETS dataset, there were over 3 million non-duplicate businesses for

Florida between years 2000 and 2011. According to the "Green Job Report on Florida in 2010,"

the state contains 42,422 green jobs (Table 4.2). The total employment in Florida in 2010 was

7,176,801, where the green jobs made up almost 1 percent of the overall employment in Florida.

The Report also indicates that green jobs have been growing at a fast rate (i.e. range from 8

percent in the agriculture sector at minimum, to 15 percent for the construction sector at most).

Compared to the overall national average, the number of green jobs in Florida is lower, at just

0.60 percent versus 3.4 percent.

4.3.3   Independent Variables

The main independent variable is natural disasters. The natural disaster variable is

measured as a dummy variable. Two separate coding procedures were performed to capture the

effect of natural disasters on green jobs. The first coding procedure took into account if a local

government had experienced natural disasters; it was coded 0 before the disaster occurred and 1

after the disaster occurred. The second coding procedure takes into account time lagged; local

governments were coded as 0 before the disaster occurred, and 1 for three years after the disaster

(Ismayilov and Andrew 2016). The dummy variable is applied in the analysis because there is

no classification for types of disasters, which makes a dummy variable measurement the most

appropriate form for analysis. However, for the analysis, types of disasters are also adopted.

The five most common types of disasters (hurricanes, tornadoes, floods, drought, and

thunderstorms) are measured numerically from 0 and 1.

Data on natural disasters in Florida were based on the National Climatic Data Center

(NCDC) for years 2000 to 2011. The dataset provided county-level data with information

related to (1) types of disasters, (2) begin and end date of disasters, and (3) municipalities where

disasters occurred. A unique aspect of the NCDC dataset was the availability of data at the

municipality level. For example, the NCDC dataset contained a list of local governments that

were affected by disasters. Previously, the NCDC dataset has been used to study the impact of

climate change on the risk of natural disasters, the effect of climate on health, monitoring types

of disasters, and so on (Epstein 1999; Hayes et al. 1999; Van Aalst 2006). The NCDC dataset

has been used by emergency management scholars to identify the exact location of disasters. In

comparison to the Federal Emergency Management (FEMA) dataset on disasters, the NCDC

data provided a list of municipalities that have experienced disasters in the past. The dataset also

contained types of disasters, the strength of disasters, and the amount of property damage caused

by disasters.

4.3.4   Control Variables

Data at the municipal level for (1) population size, (2) form of government, (3) socio-

economic characteristics of local residents (racial composition and median household income)

are derived from the US Census Bureau between 2000 and 2011. The Census Bureau updates

numbers for population yearly, while economic and demographic variables are updated every

five years. An interactive variables, disaster and form of government are also added to the

analysis.

4.4   Methods of Analysis

The methods of analysis aim to examine whether natural disasters have an effect on the

number of green jobs among municipal governments in Florida. The analysis utilized a panel

data analysis. For the analysis, a panel data was analyzed, consisting of 437 municipalities over

the period of 10 years. The descriptive statistics are presented in Table 4.3.

Table 4.3: Descriptive Statistics

Variables	N	Mean	Std. Dev.	Min	Max
Green Employment	4, 370	3,167	91,23	0	112,142
Green Employment Ratio	4, 370	0.21	0.17	0	0.97
Natural Disaster	4, 370	0.367	0.482	0	1
Population	4, 370	26,541	55,909	69	841,646
Population Density	4, 370	1,524	2,275	1.8	20,150
Median Age	4, 370	46	7.6	25.5	74
Total Households	4, 370	10,589	21,889	30	322,406
Median Household Income	4, 370	40,493	14,226	14,453	145,273
Housing Units	4, 370	12,449	24,852	33	387,192
Per Capita Medium Income	4, 370	21,772	11,221	2,364	114,115
Race (White)	4, 370	20,850	39,551	67	531,642

Source: National Establishment Time Series (2000-2011); US Census (2000-2011)

Analyzing 437 municipalities over the course of 10 years violates several empirical

assumptions. The panel data analysis has been adopted by economists to study the effect of

disasters on GDP of affected countries (Kellenberg and Mobarak 2008), in particular, a well-

known analysis a fixed effects model is often adopted. A fixed effects model assumes that the

independent variables explains that the levels of revenue are not random. To check for potential

error, the results of analysis from both fixed and random effects models were compared.

Multiple models for fixed and random effects were generated to compare and contrast the effects of natural disasters and green job employment. By running the Hausman's test, the random effects model was preferred to the alternative fixed effects model. Other tests for basic assumptions were also run to ensure the models have not violated any assumptions.

In order to find the proper model, Random Effect and Fixed Effect models were performed to determine which model was applicable for the panel dataset. The random effects model essentially argues that a "group" effect is random, whereby the rational is that the levels of sample we observe in that group are from a larger population. For example, if collecting data from different local governments, a local government may be a random effect. Therefore, the observations are no longer independent in the random effects model. According to Woolridge (2009), it is unusual for the random effects model to be applied to large datasets. In this case, the unit of analysis (437) is larger than the time variable (10 years), which is why the fixed effects model is more applicable. However, it has to be tested regardless of the size of the dataset.

On the other hand, the fixed effects model suggests that factors/variables can be thought of as fixed. For example, an employment position opened per a local government during different years are levels, whereby there is no intent to discuss other quantities. For the fixed effects model, it is assumed that the independent variables may impact each other, which requires control for this. It is assumed that the error terms and constant should not be correlated with independent variables. By removing the effect of characteristics that influence other variables, the net effects of the independent variables on green job employment are found. Hence, by controlling for the fixed characteristics, the analysis finds real effect, whereby variables do not change over time. It is also important to note that fixed effects will not work if variables change slowly over time or if the numbers stay constant. Another important factor is

that the fixed effects model is most appropriate when time variable (10 years) is lower than the sample size (437 municipalities).

Woolridge (2009) argues that the fixed effects model is more appropriate than the random effects regression for panel datasets, yet empirical analysis must capture the corrected standard errors. In fact, in the presence of autocorrelation, the R-squared results are usually low. It is common to have serial correlation and heteroscedasticity problems in panel data. By adopting the Wald's robust error test, it is noticeable that the fixed effects models have the presence of heteroscedasticity. By adopting the Woolridge's test, it will be noticeable that the fixed models, in fact, have serial correlation problems. Hence, in order to correct for standard errors, it is important to adopt Panel-Corrected Standard Error (PCSE), estimated for fixed effect models where parameters are estimated by Prais-Winsten regression. The benefit of using PCSE is that when computing the standard errors, the PCSE estimation assumes that disturbances are heteroskedastic and correlated across panels, and the estimate is applied for all time points (Beck and Katz 1995). Therefore, to fully analyze and interpret the results, it is recommended to run PCSE estimator for dependent and independent variables.

4.5   Results

In order to determine which model is more appropriate for the dataset, Hausman's test is used to find whether errors are correlated among independent variables. The results indicate that chi-square is 13.17 and the probability is 0 i.e., chi^2= 0.0003, p<0.000. Therefore, the null hypothesis is rejected, and it can be concluded that the fixed effects model is most appropriate for panel data analysis. Moreover, the result of the Wald test indicates the presence of heteroscedasticity chi^2 = 760, p<0.000. The result of the Wooldridge test indicates the presence

of serial correlation (first order autocorrelation) i.e., $F(1, 43) = 806$, $p<0.000$. And the result of Pesaran test shows the presence of sectional independence i.e., Test = 302.992, $p<0.000$). All of the assumptions are controlled for in the final analysis.

Table 4.4: Hausman Fixed v. Random Effects

	Fixed	Random	Difference
Natural Disaster	.1032***	.1039***	.0136
Constant	-1.85 ***	-1.85 ***	
N -sample size	4,370	4,370	
R -squared	.0153	.0153	
F -statistic	130.97***	0	
Wald-statistical probability	0	132.87***	
Hausman Chi-squared			13.17
Hausman Probability			.0003

For the final analysis, Prais-Winsten regression with Panel Corrected Standard Errors (PCSE) is adopted. The Panel Corrected Standard Error estimation is recommended because it assumes for heteroscedasticity and serial correlation (Beck and Katz 1995). Two analyses are adopted though PCSE. The first analysis measures the independent variable as a dummy variable, as 0 before the major disaster occurred and 1 after. For example, if the disaster occurred in 2004, then years before 2004 are coded as 0, and years after 2004 are coded as 1. In addition, second analysis measures natural disasters as 0 before the disasters occurred, and 1 for two years after the disasters because studies show that effects of disasters last for a maximum of two or three years (Ismayilov and Andrew 2016). Therefore, this study adopts two analyses to find support for the theory adopted in the paper. The study uses $P = 100*(\exp\{b\_hat - 0.5*Var(b\_hat)\} - 1)$ to calculate percent increase in green job employment.

Results of the first analysis (6 years after a major disaster occurred) shown in model 1 indicate that green job employment ratio increases by 4 percent after natural disasters (Model 4;

Table 4.5). Several variables were also added to the first model. Results indicate that on average, green job employment increases by 4 percent for 6 years following natural disasters. The goodness of fit in the models (R-square) for the models ranges from 79 to 81 percent, indicating a strong relationship. Population density, individual median age, and individual income have a negative relationship on green job employment. Other variables, such as a number of households, household income, and predominant white race have a positive effect on green employment.

The main difference between the first and second models is the operationalization of the natural disaster variable. The variable is operationalized as 0 before a disaster and 1 for two years following the disaster. Based on the Prais-Winsten regressions with PCSE, this study finds that, after natural disasters, local governments are experiencing an increase of about 3.7 percent in green job employment (Model 4; Table 4.6). With 83 percent model fit, this study finds that the natural disasters play a major role for green job employment.

Furthermore, this study also investigates the effect of natural disasters by type on green jobs. Based on the results of the analysis, hydrological (water movement) disasters have a significant and positive effect on green job growth. For instance, hydrological disasters are noted to cause on average a 3.6 percent increase in green jobs (Model 5; Table 74.). Additionally, hurricanes, on average, cause 3.4 percent increase in green job employment, according to analysis. These findings support arguments provided by other studies, which argued that rapid and costly disasters created a window of opportunity to change policies and establish new regulations in order to increase business activity.

Lastly, this study investigates the effect of natural disasters on the type of green jobs. Previously, this study analyzed green jobs altogether. This meant any job that did not cause

damage to the environment could be argued to be a green job. For example, a professor at a university or a customer service representative at a local electronics store can be argued to be a green job. However, green jobs are also classified by type. The four most common types of green jobs in Florida are (1) construction, (2) professional and technical, (3) natural resource and mining, and (4) manufacturing and trade. Construction jobs are those that build infrastructure. Professional and technical jobs are research, business, and administrative jobs. Natural resource and mining jobs are those that utilize minerals and substances generated by the planet. Manufacturing and trade are jobs that build environmentally friendly products and sales. In addition, recreation is also included in this variable.

The results of the analysis show that construction and professional jobs increase after natural disasters. To be precise, after disaster occurs, there is an increase in construction, trade, and professional jobs for two years. Unfortunately, research has not looked at the specific types of green jobs, hence, this research makes an addition to the scholarship on resilience and recovery after natural disasters (Table 4.8).

Table 4.5: Green Job Growth 6 Years after Major Disasters

Prais-Winsten Regressions assuming for panel-level heteroskedastic errors with Panel Corrected Standard Errors (PCSE)

Model	1	2	3	4	5	6
Natural Disaster	.0457***	.0418***	.0429***	.0458***	.0436***	.0543***
Population			.00002***		-.00003***	-.00007***
Population Density				.00001***		-.00002***
Median Age						-.0043**
Total Households						.00003***
Household Income					.00003***	-.00002
Housing Units					.00001***	.00009
Individual Medium Income						-.00008***
Race (White)						.00001**
Manufacturing				0.0006***		
Private Businesses				0.0002***		
Form of Government (Mayor 1; Manager 0)		.0981**				
Interactive Variable (Disaster*Form of Government)		-.0047				
Constant	-1.9328***	-1.9551***	-1.9876***	-1.9243 ***	-2.1880***	-1.9915***
R-squared	.7912	.8106	.8090	.7938	.7900	.8066
Wald Chi-squared	22.26***	25.72***	52.72***	22.93***	107.14***	784.65***
(N= 4,370)						

Note: Asterisk (***), (**), (*) denote statistical significant at the 1%, 5%, and 10% level, respectively

Table 4.6: Green Job Growth 2 Years after Disasters

Prais-Winsten Regressions assuming for panel-level heteroskedastic errors with Panel Corrected Standard Errors (PCSE)

Model	1	2	3	4	5	6
Natural Disaster	.0377***	.0395***	.0367***	.0372***	.0365***	.0399***
Population			.00006***		-.00004***	-.00001***
Population Density				.00006***		-.00002***
Median Age						-.0033
Total Households						.00004***
Household Income					.00005***	-.00009
Housing Units					.00001***	.00004
Individual Medium Income						-.00004**
Race (White)						.00001*
Manufacturing				0.0007***		
Private Businesses				0.0004***		
Form of Government (Mayor 1; Manager 0)		.0687**				
Interactive Variable (Disaster*Form of Government)		-.0119				
Constant	-1.9116 ***	-1.9289***	-1.9778***	-1.9167***	-2.2893***	-2.0569***
R-squared	.8424	.8485	.8427	.8373	.8178	.8271
Wald Chi-squared	34.21**	37.98***	157.87***	34.49***	233.91***	970.01***
(N= 4,370)						

Note: Asterisk (***), (**), (*) denote statistical significant at the 1%, 5%, and 10% level, respectively

Table 4.7: Green Job Growth by Disaster Type

Prais-Winsten Regressions assuming for panel-level heteroskedastic errors with Panel Corrected Standard Errors (PCSE)

Model	1	2	3	4	5
Natural Disaster					
Hurricanes	.0348***				
Geophysical		.0327*			
Meteorological			.0229		
Climatological				-.0126***	
Hydrological					.0363***
Constant	-1. 9527***	-1.9296***	-1.9392***	-1.9414***	-1.9168***
R-squared	.8463	.8240	.8443	.8273	.8384
Wald Chi-squared	32.16***	2.70*	8.98***	0.33***	17.64***
(N= 4,370)					

Note: Asterisk (***), (**), (*) denote statistical significant at the 1%, 5%, and 10% level, respectively

Table 4.8: Green Job Growth by Type

Prais-Winsten Regressions assuming for panel-level heteroskedastic errors with Panel Corrected Standard Errors (PCSE)

Model	Construction	Professional/Technical	Natural Resource/Mining	Manufacturing/Trade
Green Job Type				
Natural Disasters	.0573**	.1499***	-.0251	.1191***
Constant	-5.7139***	-4.1995***	-7.8107***	-4.0975***
R-squared	.9153	.8695	.9763	.9239
Wald Chi-squared	6.53**	51.18***	2.05***	43.05***
(N= 4,370)				

Note: Asterisk (***), (**), (*) denote statistical significant at the 1%, 5%, and 10% level, respectively

4.6   Conclusion

The purpose of this study is to examine factors and influences that explain the economic resilience of local governments to natural disasters. More specifically, this study investigates policy response of local governments to natural disasters. The goal of the study is to establish a framework for future studies by focusing on green industry. This is done by establishing a relationship between natural disasters, economic resilience, and local government decisions to adopt green economic development. The research question asked in the study is, "What effects have climate-related weather events and disasters had on green jobs?" This research is important because of following reasons: (1) natural disasters create a window of opportunity for local governments to invest resources in new industries to jumpstart the economy, and (2) local governments diversify their economies to overcome future losses.

Based on the results of panel data analysis, this study shows that after natural disasters, growth in the green job sector is, on average, 3 percent in Florida local governments. It can be argued that local governments rethink their established policies and strategies in order to attract new jobs, specifically green jobs. Considering that green jobs are associated with technology, research, and finance, they are more likely to be natural disaster-resilient. This explains the drive of local governments to attract green jobs, because they are disaster resilient. Furthermore, results of the analysis also suggest that the mayor form of government, population density, and income have a positive impact on green job economic development. However, population, household, and income have a positive effect on economic growth.

Additionally, this study investigates the effect of types of disasters on green job sectors. Analysis results suggest that hydrological disasters have a positive effect on green job sector in Florida. Hydrological disasters, such as floods, have a positive effect on green job growth.

Furthermore, this study also analyzes the effect of natural disasters based on green job type. Results indicate that after a disaster occurs, there is a positive and significant growth in construction, professional and technical, and manufacturing jobs.

There are limitations to this study. This study only investigates green jobs in local governments in the State of Florida. The study does not include other local governments in other states. The logical reason for choosing Florida is because it is considered the most hazardous state, and one of the fastest growing states in the United States. Another limitation is that this study relies on the Bureau of Labor Statistics for the definition of green jobs. Because the definition is broad, the study choses four major types of green jobs and investigates the effect individually. However, future research will highlight other definitions of green jobs, specifically state and local government definitions. Future studies will also investigate economic strategy types, climate change adaptation policies, and institution and political factors that affect local government resilience and growth in the green job sector. Lastly, future research also aims to investigate local government collaboration designed for growth in the green job sector. The main contribution of this study to theory is the adoption of empirical analysis to study the moving forward approach of community resilience. This study also has practical contributions by highlighting the importance of community resilience for green job creation.

CHAPTER 5

DISCUSSION AND CONCLUSION

This dissertation investigated the bounce forward approach of economic resilience to disasters in local governments. Specifically, this dissertation examined the effect climate change-related natural disasters have on green employment in the State of Florida. The dissertation was guided by two research questions: (1) is green job creation influenced by climate change adaptation policies and regional collaboration; and (2) what effects have climate-related weather events and disasters had on green jobs.

This chapter summarizes empirical findings discussed in previous chapters, highlights theoretical and practical implications, examines limitations, and outlines future research.

5.1   Summary of Empirical Findings

This dissertation discussed theoretical arguments for local collaboration for green job creation. To explain the relationship between green job creation and natural disaster, the dissertation adopted two studies. The first study investigated the relationship of local governments and their collaborative efforts to create green jobs. The second study investigated the effect climate change-related natural disasters have on the creation of green jobs in local governments.

Consistent with the collective action theories (Andrew and Carr 2013; Feiock 2007, 2010; Jung and Song 2015), the first study highlighted that closeness of local governments to one another are used as sources for creating green jobs and providing climate change adaptation mechanisms for the South Florida region. Previous studies have shown that natural disasters have generated increases as well as decreases in business behavior and economic growth

(Ismayilov and Andrew 2016; Webb et al. 2000). This study further examined job creation as a means of resilience, consistent with the bounce forward approach. In addition, scholars highlighted that local governments increase economic activity through the adoption of strategies and policies in order to encourage resilience to natural disasters (Ismayilov and Andrew 2016). Consistent with resiliency theories, this dissertation provided empirical results to the long-standing theoretical argument of the bounce forward approach to economic resilience.

In the first study, the Heckman procedure was adopted to examine the interaction of local governments in the South Florida region that encouraged green job creation. A survey was adopted to examine the relationship of local governments with each other in regard to green job creation. Specifically, the empirical analysis of social networking was adopted to measure the relationship of local governments in the South Florida region. The findings highlighted that a local government working closely with others helps create green jobs. Consistent with the collective action theories, a local government working with a neighboring jurisdiction helps gain access to resources and information that otherwise would not be attainable.

The second study adopted Panel Data analysis to investigate the impact of climate change-related natural disasters on green jobs in all local governments in Florida. The study examined the number of green jobs created in all local governments between the years 2000 and 2011. The study also examined the relationship between types of disasters with different types of green jobs. The empirical findings indicated that hurricanes generate a positive and significant effect on green jobs creation. The findings also highlighted that hydrological disasters have a positive and most significant effect on green jobs. Furthermore, construction, retail, and professional/technical green jobs experience an increase for two years following natural disasters.

5.2   Theoretical and Practical Implications

Theoretically, following natural disasters, local governments can become resilient by reinvesting in disaster-affected areas (Ismayilov and Andrew 2016). The argument is that reinvesting in disaster-affected areas jump starts economic activity and brings economic output to normalcy. However, natural disasters also create a window of opportunity for local governments to invest in other areas to surpass the normalcy that was attained before a disaster. Furthermore, the relationship between local governments is crucial to understand the bouncing forward approach of economic resilience on a regional level. This research filled four gaps in the literature on economic resilience: (1) providing an alternative approach to studying economic resilience of local governments; (2) the extent to which intergovernmental collaboration can increase the ability of local governments to adapt to climate change; (3) analysis of regional effort for green job creation; and (4) the extent to which natural disasters can increase the number of green jobs in local governments.

First and foremost, the contribution of this dissertation to theory was utilizing collective action theories. This dissertation advanced knowledge by integrating the institutional collective action theory with theories on economic resilience, meaning the social positioning of local governments in intergovernmental climate change response networks may affect a local government's ability to bounce forward. Also, close relationships of governments with each other matter when responding to climate change and natural disasters.

In addition, this study provided empirical findings for the bouncing forward approach of economic resilience in local governments. The dissertation argued that climate change and natural disasters require collective action because negative externalities generated by disasters have a regional effect. Consistent with previous studies that highlighted local government

collaboration as a response to emergencies (Andrew and Carr 2013), this dissertation argued that local government collaboration has a positive effect on green job creation. Specifically, interaction among local governments results in an opportunity for local governments to place themselves closer to others that contain resources and information required to create green jobs. Therefore, by interacting with each other, local governments are able to invest in economic areas that allow them to bounce forward.

This dissertation also argued that natural disasters create a window of opportunity for local governments to form a new strategy for their economy and invest in new areas. Theoretically, investing in non-traditional areas of the economy creates an opportunity for disaster-affected areas to become resilient, meaning, in order to bounce forward, it is necessary to step away from traditional industry jobs. Conforming to this argument, this dissertation provided empirical findings highlighting an increase in the number of green jobs following disasters. The findings indicated that natural disasters create a window of opportunity for local governments to adopt policies and strategies to form resilient economies.

Practically, this dissertation also contributed to public and nonprofit administrators' understandings of economic resilience and the significance of the collaborative process in climate change adaptation and green job creation. This is a timely and important topic in the field of public administration, especially useful for local governments facing the negative effects of climate change and natural disasters. This dissertation provided a practical implication: the role of local governments and nonprofit organizations is significant in economic development and resilience following disasters. Climate change and related natural disasters are becoming costlier every year. Recently, Hurricanes Harvey and Irma caused billions of dollars in damages to property and massive temporary emigration (Rodriquez 2017). Effects of climate change are

also noticed in the rise of sea level in coastal cities in the United States (Hauer et al. 2016). Given these sudden changes in the climate and nature, it is critical for local governments to enhance collaborative efforts in adapting to future changes in the climate.

5.3   Limitations and Future Research

Despite significant findings, this research has a few limitations. These limitations are due to lack of data and resources available to help conduct this research on a broader spectrum. First, the research relied on the Bureau of Labor Statistics for the definition of green jobs. The definition is quite broad and does not provide a specific description for jobs. This means that any job that has limited or no negative outcome on the environment is considered a green job. For this reason, this research classified several major industry jobs as green jobs, such as construction, retail, research, and finance. These industry jobs, however, can be argued to be non-green jobs because equipment and goods used in construction are generated by industries that may harm the environment.

Second, the study investigated local governments in Florida. If applied to other states, this research might have produced different results. For instance, examining the San Francisco Bay region in California and Greater Boston region in Massachusetts areas might have produced results indicating high collaboration for green jobs creation. This is because these areas are known for their attraction of green jobs. Similarly, applying this research to the Grand Rapids region in Michigan and Louisville region in Kentucky areas might have indicated lower local government interaction for green job creation, because these areas are known for their devotion and interest in manufacturing industries. Hence, it is recommended that future studies examine local governments in other states.

Third, this research did not take into account other variables and data in the analysis. The second analysis did not include variables measuring specific policies and strategies adopted by local government that might have had an influence on green jobs. Similarly, the interaction between political changes and green jobs was not taken into account. It is recommended that future research takes regional and local government climate change and sustainability policies into consideration. Moreover, this research included years 2000-2011. Considering that green jobs have become trendy and essential for local government in recent years, future research should measure the relationship of green jobs with natural disasters for recent years.

Lastly, future research should also adopt other statistical models for analysis. Time series analysis is recommended to analyze the annual interaction of green jobs with natural disasters. Time series analysis would also help examine green jobs for a particular period of time or interval. Time series can also predict future growth in green jobs based on past values. By noticing predicted growth rate, public managers may change strategies to increase the number of green jobs in the future. Finally, this research examined how collaboration of local government results in adaptation and green jobs creation. Future studies should link intergovernmental collaboration to outcomes resulted from the creation of green jobs.

APPENDIX A

IRB APPROVAL

April 13, 2017

Dr. Simon Andrew
Student Investigator: Orkhan Ismayilov
Department of Public Administration
University of North Texas

RE: Human Subjects Application No. 17-193

Dear Dr. Andrew:

In accordance with 45 CFR Part 46 Section 46.101, your study titled "Collaborative Management and Networks in Green Jobs Creation in Florida" has been determined to qualify for an exemption from further review by the UNT Institutional Review Board (IRB).

Enclosed are the consent documents with stamped IRB approval. Since you are conducting an online study, **please copy the approved language and paste onto the first page of your online survey. You may also use the enclosed stamped document as the first page of your online survey.**

No changes may be made to your study's procedures or forms without prior written approval from the UNT IRB. Please contact The Office of Research Integrity and Compliance at 940-565-4643 if you wish to make any such changes. Any changes to your procedures or forms after 3 years will require completion of a new IRB application.

We wish you success with your study.

Sincerely,

Chad Trulson, Ph.D.
Professor
Chair, Institutional Review Board

CT:jm

APPENDIX B

INFORMED CONSENT

<p style="text-align: center;">**Informed Consent Notice**</p>

Before agreeing to participate in this survey, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

Title of Study: Collaborative Management and Networks in Green Jobs Creation in Florida.

Investigators: Dr. Simon A. Andrew and Orkhan Ismayilov, University of North Texas (UNT), Dr. Richard Feiock, Florida State University (FSU).

Purpose of the Study: The purpose of this research is to understand best practices related to economic development in Miami metropolitan region in Florida. We aim to understand whether economic resilience for natural disasters is influenced by interorganizational collaboration established local governments at the regional level. We specifically aim to understand adoption of strategies and policies on local governments, because the policy is one of the major economic growth strategies adopted by local governments.

Study Procedures: You will be asked to answer questions pertaining to joint activities your organization undertook with other organizations in order to implement an local government growth policy. This survey will take 10- 15 minutes.

Foreseeable Risks: There are no foreseeable risks involved in this study.

Benefits to the Subjects or Others: This study is not expected to be of any direct benefit to the subject, but we hope to learn more about factors that influence the way public agencies response to disasters in the Miami Metropolitan Area and thus generating knowledge that may help local governments and public agencies to change or retain policies and procedures for more effective emergency preparedness and land-use planning.

Compensation for Participants: None.

Procedures for Maintaining Confidentiality of Research Records: All precautions will be taken to maintain the confidentiality and anonymity of both you and your organization. The confidentiality of your individual information will be maintained in any publications or presentations regarding this study. We will not publish the names of participants or the organizations that they work for. All identifiable information will be maintained in a password protected file and only the investigators will have access to this information. This information will not be distributed to any other parties. Confidentiality will be maintained to the degree possible given the technology and practices used by the online survey company. Your participation in this online survey involves risks to confidentiality similar to a person's everyday use of the internet. The findings will be reported at an aggregate level.

Questions about the Study: If you have any questions about the study, you may contact Dr. Simon A. Andrew at Sandrew@unt.edu.

Review for the Protection of Participants: This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

Research Participants' Rights:
Your participation in the survey confirms that you have read all of the above and that you agree to all of the following:
• *Dr. Simon A. Andrew* has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
• You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
• You understand why the study is being conducted and how it will be performed.
• You understand your rights as a research participant and you voluntarily consent to participate in this study.
• You have been told you will receive a copy of this form.

APPENDIX C

SURVEY

Q1. How important is the attraction of "green business" in your jurisdiction's economic development strategy? (Pick one)

[   ] 1. Not important   [   ] 4. Highly important
[   ] 2. Somewhat important   [   ] 5. Most important
[   ] 3. Important

Q2. To what extent has your jurisdiction experienced an increase in green job within the last 3 years? (Pick one)

[   ] 0. Not at all   [   ] 3.
[   ] 1.   [   ] 4. To great extent
[   ] 2. Some extent

Q3. Does your jurisdiction's economic development strategy include efforts to attract new green business or industry through the following? (Select all that apply)

[   ] Financial incentives encouraging energy efficient technologies
[   ] Financial incentives specifically targeted for renewable energy sector
[   ] Regulatory relief of streamlined processes for developments that incorporate energy efficient technologies
[   ] Regulatory relief or streamlined processes for development in the renewable energy sector

Q4. To what extent has your local government collaborated with neighboring jurisdictions to create green jobs? (Pick one) 0=Not At All …. 4=Very Prepared

[   ] 0   [   ] 3
[   ] 1   [   ] 4
[   ] 2

Q5. How long have you or your organization been collaborating with neighboring jurisdictions in order to create green jobs? (Pick one)

[   ] 1-3 years   [   ] 10- 12 years
[   ] 4-6 years   [   ] 12- 15 years
[   ] 7- 9 years   [   ] 16 or more years

Q6. To what extent have "Climate Change" policies adopted by your jurisdiction contribute to green job creation? Climate change policies are arrangements on measures to reduce greenhouse gases produced by human activity and to mitigate possible effects on climate. The goal of policies is to reduce greenhouse gas emissions and promoting a clean energy economy. **(Pick one)**

[   ] 0. Not at all   [   ] 3.
[   ] 1.   [   ] 4. To great extent
[   ] 2. Some extent

Q7a. In relation to creating green job/employment in your jurisdiction, please indicate municipal governments you have worked closely with in the region. (Select all that apply)

[   ] Boca Raton (1)   [   ] Hollywood (9)
[   ] Boynton Beach (2)   [   ] Lauderhill (10)
[   ] Coral Springs (3)   [   ] Miami (11)

[ ] Davie (4)	[ ] Miami Beach (12)
[ ] Deerfield Beach (5)	[ ] Miami Gardens (13)
[ ] Fort Lauderdale (6)	[ ] Miramar (14)
[ ] Hialeah (7)	[ ] Pembroke Pines (15)
[ ] Homestead (8)	[ ] Other (16) _____

Q7b. In relation to creating green job/employment in your jurisdiction, please indicate county governments you have worked closely with in the region. (Select all that apply)

[ ] Broward County (1)	[ ] Miami- Dade County (6)
[ ] Collier County (2)	[ ] Monroe County (7)
[ ] Glades County (3)	[ ] Palm Beach County (8)
[ ] Hendry County (4)	[ ] St. Lucie County (9)
[ ] Martin County (5)	[ ] Other (10) _____

Q7c. In relation to creating green job/employment in your jurisdiction, please indicate federal and state agencies you have worked closely with in the region. (Select all that apply)

[   ] Council for Community and Economic Research (1)
[   ] Enterprise Florida (2)
[   ] International City/County Management Association (3)
[   ] National Association of Regional Councils (4)
[   ] National League of Cities (5)
[   ] Small Business Association (6)
[   ] Southern Economic Development Council (7)
[   ] U.S. Economic Development Agency (8)
[   ] Other (9)

_____

Q7d. In relation to creating green job/employment in your jurisdiction, please indicate regional agencies you have worked closely with in the region. (Select all that apply)

[   ] Beacon Council (1)
[   ] Department of Economic Opportunity (2)
[   ] Division of Community Development (3)
[   ] Florida City Community Redevelopment Agency (4)
[   ] Greater Fort Lauderdale Alliance (5)
[   ] Greater Pompano Beach Chamber of Commerce (6)
[   ] Hollywood Community Redevelopment Agency (7)
[   ] Miami Community Development Agency (8)
[   ] Miami-Dade County Industrial Development Authority (9)
[   ] Miami – International Trade & Development (10)
[   ] Perrine-Cutler Ridge Council (11)
[   ] South Dade Chamber of Commerce (12)
[   ] South Florida Regional Planning Council (13)
[   ] Southwest Florida Economic Development Alliance (14)
[   ] Vision Council (Economic Development for Deep South Dade County) (15)
[   ] Other (16) _____

Q8. Has your jurisdiction been affected by natural disasters in the last 3 years? (Pick one)
    [　] Yes   [　] No

Q9. To what extent has your jurisdiction changed revenue strategies in order to adapt to negative consequences of extreme climate events? (Pick one) 0=Not at All …. 4=Very Prepared
    [　] 0   [　] 3
    [　] 1   [　] 4
    [　] 2

Q10. To what extent is your jurisdiction's tax base prepared to overcome natural disaster related economic loss? (Pick one) 0=Not at All …. 4= Very Prepared
    [　] 0   [　] 3
    [　] 1   [　] 4
    [　] 2

Q11. To what extent has your jurisdiction accumulated sufficient rainy day/ emergency funds to help jump-start local economy following severe natural disasters? (Pick one)
    [　] 0. Not at all   [　] 3.
    [　] 1.   [　] 4. To great extent
    [　] 2. Some extent

Q12. What is your gender? (Pick one)
    [　] Male   [　] Female

Q13. What is your ethnicity? (Pick one)
    [　] White   [　] Asian
    [　] Black   [　] Other_____
    [　] Hispanic

Q14. What is your age? _____

Q15. What is the highest level of education you have obtained? (Pick one)
    [　] Associate's degree   [　] Master's degree and above
    [　] Bachelor's degree

Q16. What is your current income? (Pick one)
    [　] less than $40,000   [　] $80,000- 100,000
    [　] $41,000- 60,000   [　] more than $100,000
    [　] $61,000- 80,000

Q17. How many years of experience do you have in your current position? (Pick one)

[   ] 0- 3 years   [   ] 12- 15 years

[   ] 4-7 years   [   ] 16 or more years

[   ] 8-11 years

Q18. Numbers of state/ federal disaster declarations have you worked through. (Pick one)

[   ] 0- 2   [   ] 6- 9

[   ] 3- 5   [   ] 10 or more

Q19. How many years have you lived in the metropolitan region? (Pick one)

[   ] 0- 3 years   [   ] 12- 15 years

[   ] 4- 7 years   [   ] 16 or more years

[   ] 8- 11 years

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