The Governance Capacity of Southeast Florida to Adapt to Sea Level Rise

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I. Abstract

Southeast Florida faces extreme risks from rising sea levels and forecasts predict extensive economic, environmental and societal damage during the 21st century. This research will examine how organizations and political institutions respond to sea level rise and whether the current regional governance has the capacity to adapt to it. Through an in-depth study of the governance of climate change adaptation, a framework of analysis was developed to assess the governance capacity, and its four sub-capacities: managerial, political, resource and learning capacity. The overall conclusion from the analysis of policy and academic documents and nine in-depth semi-structured interviews is that the political capacity seems to appear to be the most important component for adapting Southeast Florida to sea level rise. The Florida state government has strongly influenced the barriers found in the other three capacities as well. In contrast, the greatest opportunities for adapting to sea level rise in Southeast Florida are from the bottom-up leadership efforts from local and regional government employees, as well as engaged non-profits and public-private-partnerships in the region. Based on findings from respondents and several links drawn from theory discussed in this thesis, Southeast Florida, in its current state, is not able to adapt to sea level rise given the barriers stemming from the current top-down political leadership.

II. Acknowledgements

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CCA	Climate change adaptation
SLR	Sea level rise
SFRCC	Southeast Florida Climate Compact
South Florida Water Management District	SFWMD
Climate Leadership Engagement Opportunities	CLEO
Florida Earth Foundation	FEF
National Research Council	NRC
United Nation Economic and Social Commission for Asia and The Pacific	UNESCAP
International Council for Local Environmental Initiatives	ICLEI
Intergovernmental Panel on Climate Change	IPCC
World Meteorological Organization	WMO
Miami Dade County Climate Change Advisory Task Force	MDCCCATF
Broward County Climate Change Task Force	BCCCTF
Monroe County Climate Change Advisory Committee	MCCCAC
Palm Beach County Go Green Climate Change Initiative	PBCCI

1 Introduction

1.1 General background

In spite of mitigation efforts to limit greenhouse gas emissions, climate change is occurring rapidly around the world (IPCC, 2013). Between the years of 2000-2010 it was the warmest decade on average ever recorded across the globe, while 2010 was the warmest year on record (WMO, 2013). Climate change is predicted to have large-scale impacts on economic, ecological and health around the world due to sea level rise, coastal erosion, water shortage among scores of others effects (IPCC, 2013).

Sea level rise (SLR) impacts due to climate change are having and will continue to have an ever-greater bearing around the world. SLR has caused saltwater intrusion, inundation, erosion and increased storm surge flooding along the world's coastal zones (Zhang, 2011). During the years of 1992 to 2010, the global SLR rates recorded by satellite altimetry, in concurrence with tide gauges, range from 3.2-3.3mm/yr. (1.26-1.30in/yr.) (NRC, 2012). SLR experts agree that projections for the next century range from 0.4m-1.2m (1.3- 4ft), depending on feedbacks and emissions scenarios (Horton et al., 2014). Across coastal regions throughout the United States, SLR due to climate change is an increasing threat. According to the 2013 report by the Proceedings of the National Academy of Sciences (PNAS), if global warming continues at the current rate through 2100 a total of 1,400 cities and towns in the United States will mostly be under water at high tide, including Miami, Florida, Virginia Beach, Virginia and Jacksonville, Florida (Strauss, 2013).

The risk of regions to the extremities of climate change has been shown recently, such as extreme flooding events in New Orleans and New York Regions after Hurricane Katrina (2005) and Hurricane Sandy (2012), and we will see further intensified hurricanes in the coming of years from increased SLR (Hill, 2012). Regions around the world will be forced to adapt to the effects of climate change to lessen the imminent risk of SLR and other problems (Termeer et al., 2011). Consistent with adaptation literature, adaptation measures nevertheless can be ineffective because it can remain unclear and disjointed in forming agreements due to political strains from stalemated decision-making (Booher and Innes, 2010; Bisebroek et al., 2010, Termeer et al., 2012, 2013). Urwin and Jordan (2008) express that climate change adaptation (CCA) is plagued consistently by vague responsibilities and unclear allocation of responsibilities for addressing CCA. Lorenzoni et al, (2007) suggests that CCA faces uncertainty with regard to the rate of SLR

and will require challenging solutions, in addition to environmental and social change, engaging many actors in society. It is widely accepted in both academic and political realms that adaptation to climate change is a 'wicked' problem which necessitates a governance approach, where each component in society (organizations, government and citizens) is involved (Lorenzoni et al., 2007; Meadowcroft, 2007; Biermann et al., 2008; Termeer et al., 2011; van Herk, 2014).

Southeast Florida is incredibly prone to intense tropical storms and hurricanes, and the permeable limestone makes the land vulnerable to flooding through groundwater. The region has now recognized SLR impacts including "king tide" flooding, deteriorating drainage, failing canals, and erosion along beaches (Nelson, 2014 in: Bolter, 2014). These impacts will be further intensified when storm surges occur likewise as SLR is occurring parallel. Straus et al. (2013) estimates that 10% or 3.7 million residents in the United States live within one- meter of high tide water. Of the 3.7 million residents a total of 1.6 million of these residents live in the state of Florida. Southeast Florida is uniquely vulnerable to SLR due to its geological composition, rapid population growth and low elevation (Zhang, 2011). The Southeast Florida region stretches 400 kilometers from Palm Beach in the north to Key West in the South (SFRCCC, 2012) and includes 112 municipalities in four counties (figure 1.1) which have economic connections through transportation, though there are noticeable cultural differences within the Southeast Florida identity county-by-county (Eisenhauer, 2014).

Figure 1.1: Map of the four counties of Southeast Florida (SFRCC-IMVA, 2012)

Southeast Florida has a population of 5.6 million residents within the geographic boundaries of the four counties as of the 2010 Census. The population of the Southeast Florida region exceeds

the total population of 30 US states and represents a total of 30 percent of Florida's population and Gross Domestic Product (GDP), making the four counties a center of Florida's economy (RCAP, 2012).

1.2 Research problem

Southeast Florida has a high probability of physical impacts from SLR, which is coupled with substantial risks due to highly valued coastal properties, dynamic ecosystems, and heavily concentrated populations. In response, robust SLR adaptation options will require significant economic costs and coordinate governance (Eisenhauer, 2014; Bolter, 2014) and an essential component for sea-level rise preparedness will be increased public awareness of the issue (Moser, 2014). In Florida, a survey by the Yale University Poll completed by Leiserowitz and Broad (2008) found that 57% of the population worries only a little or not at all about SLR, and based on this survey, Berry et al, (2011) explain that it is not likely that many Floridians will take SLR adaptation strategies seriously.

The aim of this research is to gain knowledge about the current governance of CCA in Southeast Florida, through analyzing specific sub-capacities of its governance capacity. Considering the broadness of CCA, the focus of this research will be on the governance capacity related specifically to SLR adaptation in Southeast Florida. The region of Southeast Florida is currently in the initial development stages of adaptation policy (Eisenhauer, 2014), so this research is concentrated on the recent governance capacity developments related to SLR in Southeast Florida.

Therefore, the regional level has been chosen for this research, rather than the national or global scale. Regional governance of CCA refers to efforts to minimize the potential damages at this level and the term "regional" refers to the subnational level, which can range from city, county, and up to the provincial level. Examples of regional actors are cities, water management districts, non-profit organizations, universities, counties and regional organizations (Termeer et al., 2011). As this research will focus on the regional level, and for the purposes of this research, the regional level is denoted the policies, programs and purposeful interventions which try to reduce the impacts of SLR in Southeast Florida and improve governance capacity across the USA. While, this research will focus on the regional level, it is important to note that local, state and federal actors will not be excluded from the context. Clearly, the state and federal actors provide important financial support for regional governance.

1.3 Research question

The central research question poised here is: In Southeast Florida, how do organizations and political institutions respond to sea level rise, and is the current regional governance capacity suitable to adapt to it?

The sub-questions from the main research question are:

- What are the potential economic, environmental and societal impacts of SLR inundation in Southeast Florida?
- What governance arrangements presently exist in regard to CCA of SLR and what is the overall governance capacity in Southeast Florida on these issues?
- What are the main barriers and opportunities related to the critical aspects of governance capacity of Southeast Florida that could weaken or strengthen the efforts to adapt the region to SLR?
- What governance recommendations could be constructed from existing barriers and opportunities to improve governance capacity in Southeast Florida?

1.4 Research strategy

The governance capacity of CCA in Southeast Florida is the theme of this research and through compiling data, this research aims to provide insights into the barriers and opportunities related to the current governance capacity to SLR adaptation in Southeast Florida, and provide suggestions to how adaptation strategies can be done given the current governance barriers. Barriers are defined here as hindrances that can be overcome with concentrated effort, change of thinking, prioritizing, and related shifts in resources, land uses, institutions (Moser and Ekstrom, 2010). Opportunities on the other hand, are defined as ways to improve the overall governance capacity of Southeast Florida.

In order to develop an understanding of the future impact of SLR in Southeast Florida, an analysis of the risk of the region to SLR will first address the potential economic, environmental and social effects. Subsequently, the sub-capacities of political, managerial, resource and learning capacities of governance to adapt to CCA will be examined through document analysis and in-depth interviews. Concerning governance, this research will examine the main barriers and opportunities related to the governance capacity to adapt. Furthermore, based on the findings on barriers and opportunities to governance, this research will then discuss governance

recommendations that should be fulfilled in order to improve the overall governance capacity of Southeast Florida.

Through an improved understanding of the current governance capacity it becomes relevant for international companies, and this research is also being performed through an internship for Arcadis. As a global design, engineering and management consulting company and for my master thesis internship, I consulted with Arcadis on my research of governance capacity in Southeast Florida. This research could also provide insights for political institutions, organizations and citizens to help them identify the main limitations of their governance system.

1.5 Structure of thesis

The structure of the remaining parts of the thesis is as follows: Chapter 2 will provide a contextual background into the specific risks that Southeast Florida faces with from SLR. Chapter 3 includes a literature review, concepts and theories connected to the research questions. Chapter 4 describes the methodology employed in this research and the methods used to answer each sub-question. Chapter 5 provides the findings of the research. Chapter 6 presents a discussion of the results from the previous chapter. Lastly, Chapter 7 explains the conclusions of the research, offers policy recommendations and areas for potential future research.

2 Contextual Background

As discussed in the first chapter, Southeast Florida faces risk from the impact of SLR and the objective of this contextual chapter is to provide a background to the potential dangers that the region may face in the coming years to SLR. This chapter will provide a contextual background of the risks by responding to the question: "*What are the potential economic environmental and societal impacts of SLR inundation in Southeast Florida?"* The findings based on this question will provide a contextual understanding of the issue at hand, and provide justification for the subsequent research into ability of the present governance structure to respond to these imminent risks.

2.1 Risks of SLR in Southeast Florida

In an investigative study of worldwide coastal regions, the Southeast Florida region was ranked fourth on the list of risk to SLR based on population size and first in terms of its financial assets (Hanson et al., 2011). However, the rate at which SLR will increase is uncertain, and the IPCC report (2007) forecasts that at a minimum of at least two degrees (Celsius) of warming are probable by the end of the 21st century. However, even if greenhouse gas emissions were to reach a peak in 2015, and then begin to decrease, temperatures would still increase and SLR could reach 1.4 meters by 2100 globally (IPCC, 2007). This is a very troubling trend for Southeast Florida since extensive areas are situated less than a meter above sea level (Eisenhauer, 2014).

2.1.1 Assessing SLR impacts from a regional level

Though there is questionable reliability with taking past sea level records and attempting to make projections for the future (Bolter, 2014), the four counties of Southeast Florida acknowledged the critical need to unite the existing local SLR projections to develop a single regional approach (RCAP, 2012). Table 2.1 shows an example of the wide range of existing SLR projections from 2007-2009, all located within the region of Southeast Florida prior to the development of one specific regional SLR projection.

Table 2.1: Various projections (inches) of SLR in Southeast Florida 2007-2009 (SFRCC, 2011)

Projection	Year Developed	Reference Year	2030 SLR range (inches)	2050 SLR range	2060 SLR range	2100 SLR Range
Historic Key West (1920-2000)		2000	2.5	4.5	5	9
Miami-Dade Climate Change Advisory Task Force	2007	2000	-	>18	-	36-60
Broward County Climate Change Task Force	2009	2000	3-9	-	10-20	24-48
South Florida Water Management District	2009	1990	-	-	5-20	-
U.S. Army Corps of Engineers	2009	2010	3-7	7-17.5	9-24	19.5-57
Florida Atlantic University	2009	2000	4.5-7	9-15	11.5-20	24-48

In response, the Southeast Florida Regional Climate Change Compact (SFRCC), comprised of Monroe, Miami-Dade, Broward and Palm Beach, developed a regionally consistent methodology for inundation mapping and vulnerability analysis shown in table 2.2 (SFRCC-IMVA, 2012). The SFRCC was developed in Southeast Florida to establish a program for adaptation planning in the region and it has been successful in changing Florida planning legislation to incorporate efforts which address climate change and sea-level rise, and prioritize funding for this purpose (Bolter, 2014). The outcome was the development of the SFRCC's vulnerability assessment of the Southeast Florida region was to use a 1, 2 and 3 foot SLR scenarios (table 2.2) rather than the various projections in inches (table 2.1) to assess the economic and environmental impact of SLR in the region.

Table 2.2: SLR Projections for Southeast Florida *(*SFRCC-IMVA, 2012)

Years	SLR height
2040-2070	1 foot
2060-2115	2 foot
2075-2150	3 foot

The SFRCC-IMVA (2012) explains that the maps and tables of information on vulnerability to SLR in the region are intended to be used for planning purposes among the four counties of Southeast Florida to identify at risk infrastructure and habitat land and to develop adaptation strategies and policies to address these risks. In the next section (2.1.2) the findings from the SFRCC Inundation Mapping and Vulnerability Assessment (SFRCC-IMVA, 2012) will be used to identify the potential economic impacts of SLR.

2.1.2 Economic risks of SLR

The SFRCC-IMVA report (2012) is not the first report analyzing the costs of SLR in Florida, and *Florida and Climate Change: the Costs of Inaction*, published in November 2007 by Tufts University, was the first wide-ranging investigation on potential consequences of projected climate change for Florida's economy. The report projected the annual costs of inaction to be $92 billion by 2050 and $345 billion by 2100, making up 2.8% and 5% of the state's projected Gross State Product respectively (Stanton and Ackerman, 2007). Bolter (2014) explains that these projections were only based on the effects on tourism, hurricane damage, residential real estate, and increased electricity costs, while it did not include industries such as agriculture, fisheries, insurance, and transportation. Murley et al, (2008:3) explains in *Florida's Resilient Coasts: a State Policy Framework for Adaptation to Climate Change,* the most recent draft adaptation framework in Florida, and states that "there has been no attempt to rank, order, or prioritize these policy options in terms of expected costs or effectiveness."

Building on these expressed limitations in addressing adaptation to climate change in Florida, the SFRCC-IMVA (2012) presents a valuable analysis of the potential economic impacts of SLR in Southeast Florida. For each county in Southeast Florida, geographic information system (GIS) staff members received digital elevation maps for 1, 2, and 3 foot sea level rise scenarios created by the South Florida Water Management District (SFWD) using recent Florida Division of Emergency Management (FDEM) lidar elevation data and the NOAA VDatum surface. Each of the four counties in Southeast Florida completed the vulnerability assessment for particular

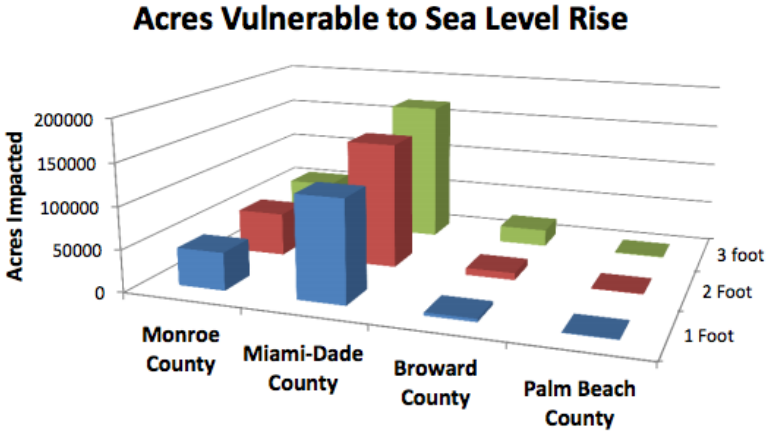
infrastructure using regionally consistent methods and created a report outlining impacts that may occur under each of the three scenarios. These findings in table 2.3 expose the potential risk faced by the infrastructure (ports, airports, hospitals, schools, wastewater treatment facilities, power plants, and landfills) based on SFRCC (2012) projections

Table 2.3: Major infrastructure at risk to SLR in Southeast Florida (SFRCC-IMVA, 2012).

Facility Type Below sea level(SL)	SLR Scenario	Monroe County	Miami-Dade County	Broward County	Palm Beach County	Southeast Florida Region
Ports		2	2	1	1	6
# ports > 10% property below SL	1 foot, 2 foot, 3 foot,	no data (ND) ND	0 0 1	0 0 1	0 0 0	- - 2
Airports		6	6	4	12	28
# Airports with > 20%property below SL	1 foot, 2 foot, 3 foot,	2 3 6	0 2 2	0 0 1	0 0 0	2 5 9
Power Plants		13	1	2	4	20
#Power Plants with > 20% property below SL	1 foot, 2 foot, 3 foot,	1 4 6	1 1 1	1 1 1	0 0 0	3 6 8
Hospitals		4	34	26	14	78
#Hospitals with >20 % property below SL	1 foot, 2 foot, 3 foot,	3 3 4	0 0 3	0 2 2	0 0 1	3 5 10
Schools		17	897	239	187	1340
# Schools with property below SL	1 foot, 2 foot, 3 foot,	11 14 14	0 0 3	0 0 1	0 0 1	11 14 19
Landfills		4	3	7	3	17
Landfills with > 20% property below SL	1 foot, 2 foot, 3 foot,	1 1 2	ND ND ND	1 2 2	0 0 0	2 3 4
Waste Water Treatment Plants (WWTP) WWTP with > 20% property below SL	1 foot, 2 foot, 3 foot,	14 2 3 7	6 0 0 0	40 0 0 1	38 0 0 0	102 2 3 8

Based on these findings from the SFRCC-IMVA (2012), the most at-risk infrastructure appears to be the airports, hospitals, schools, power plants and wastewater treatment plants. Among the four counties of Southeast Florida, there tended to be more at-risk infrastructure in Monroe and Miami-Dade County, which is described below in figure 2.1.

Figure 2.1: Acres vulnerable to SLR by each county in Southeast Florida (SFRCC-IMVA, 2012)



Each of the four SFRCC counties face substantial risk to SLR, though as figure 2.1 shows, Monroe and Miami-Dade face greater risk, and 68% of unincorporated Monroe County's land mass is vulnerable at the one foot scenario, whereas it is much lower in Miami-Dade, Broward and Palm Beach Counties. However, Monroe County has a substantially smaller land mass, thus a higher percentage at risk, but fewer acres impacted (SFRCC-IMVA, 2012). Centered on economic risks to SLR, table 2.3 provided information on the potential impacts to infrastructure that should be expected in Southeast Florida, however the SFRCC-IMVA makes no indication of the estimated costs of subsequent damages. Therefore, it would be important to assess the total expected costs of damage to infrastructure based on projections of 1, 2 and 3 foot of SLR.

2.1.3 Environmental risk of SLR

The environmental impact of SLR based on the SFRCC-IMVA (2012) are imminent and 75% of the lands impacted across the region in a one-foot scenario are comprised of conservation lands, which are shown in table 2.4. Palm Beach County was the only county of the four that would not see substantial impacts to its conservation lands in a 1, 2 or 3 foot scenario. The natural systems that will be potentially impacted consist of mangrove, scrub mangrove, buttonwood, and herbaceous coastal saline and freshwater wetlands, which considerably impacted in each of the circumstances (SFRCC-IMVA, 2012).

Table 2.4: Top three land use categories impacted by SLR (acres) of habitat loss in Southeast Florida (SFRCC-IMVA, 2012)

Sea Level Rise Scenario	Monroe County	Miami-Dade County	Broward County	Palm Beach County
1 foot	Conservation (24,616) Residential Conservation (14,342) Military (2,153)	Conservation (107,988) Electrical Generation (5,332) Agricultural (2,994)	Conservation (1,044) Recreation Space (364) Low residential (283)	Low Residential-1 units (283) Low Residential-2 units (191) Low Residential – 3 units (81)
2 foot	Conservation (26,894) Residential Conservation (15,421) Military (2,994)	Conservation (126, 809) Electrical Generation (5,999) Agricultural (7,746)	Conservation (1,149) Agricultural (854) Recreation Space (823)	Low Residential - 1 units (292) Low Residential-2 units (229) Low Residential-3 units (115)
3 foot	Conservation (27,948) Residential Conservation (15,717) Residential (3,293)	Conservation (133,088) Electrical Generation (7,000) Agricultural (10,890)	Conservation (1,325) Agricultural (2,788) Residential Medium (1,936)	Low Residential-1 units (301) Low Residential-2 units (284) Low Residential-3 units (161)

These results show the extensive amount of acres of conservation areas that face risk to SLR across Southeast Florida. Interestingly, at a 1, 2 and 3 foot SLR scenario, conservation areas are the most heavily impacted areas of three out of the four counties among land categories. Based on this data it is evident that the natural environment will be severely impacted from SLR. Table 2.4 has demonstrated how adaptation strategies should be emphasized to incorporate the natural landscape as they provide protection to residential areas and also an important part of the ecosystem (SFRCC-IMVA, 2012).

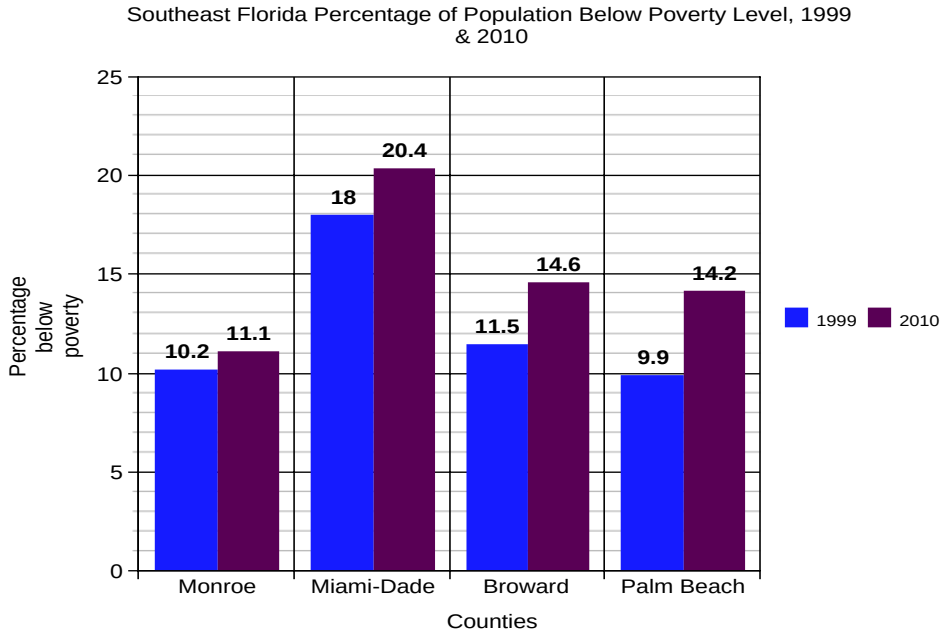
2.1.4 Social implications of SLR

Adaptation plans for New York, San Diego, and Southeast Florida Region (Nordensen et al., 2011; ICLEI, 2011; SFRCC-IMVA, 2012) focus on transportation, infrastructure, and ecosystems, however they do not incorporate social risk factors. The previous two sub-sections on economic and environmental impacts used secondary data analysis from the SFRCC-IMVA, though social aspects were not included in that report. Social factors have been found to influence

different social groups in varying ways. Research on Hurricane Andrew, which hit Miami in 1992, recognized that groups which are more marginalized and consequently have fewer political power and economic resources face greater risk to "natural" hazards (Morrow, 1999). Population demographics comprising gender, class, race, age, and income have been shown to impact the capacity to withstand environmental hazards (Peacock, Morrow and Gladwin, 1997). Furthermore, Maantay and Maroko (2009) have shown that racial and ethnic minority groups face higher vulnerability when subjected to the same severe environmental event as non-minority groups in the United States. This could help clarify why specific disastrous events could present understated harm to a particular group. This sub-section will look specifically on demographic data of Southeast Florida based on trends from the South Florida Planning Council (SFPC) and US Census. The information from the SFPC on poverty, population growth, and age in Southeast Florida will be used to indicate the social risks faced by the region to impacts of SLR.

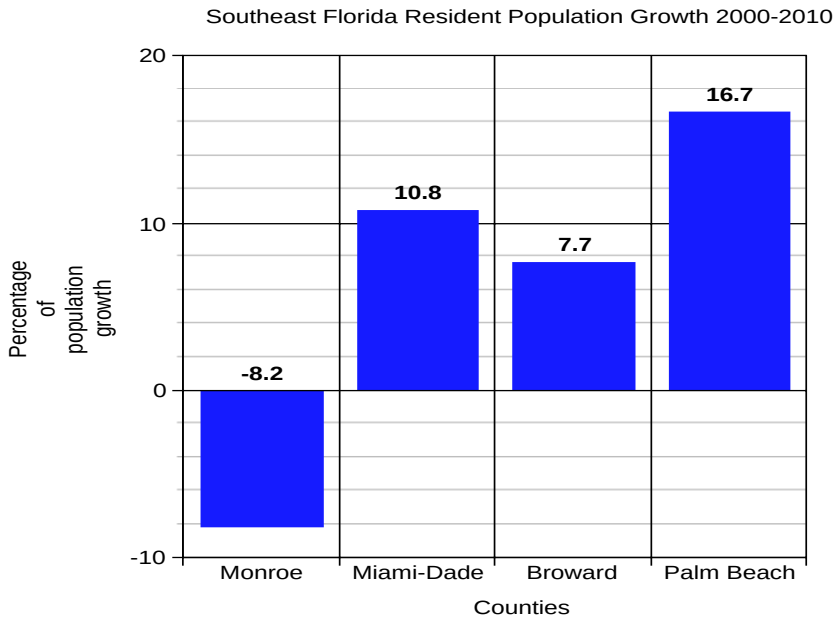
US Census data show that poverty, age and population growth are all continuing to surge in Southeast Florida. Among poverty levels, figure 2.2 displays that poverty rates have grown in each of the four counties (Monroe, Miami-Dade, Broward and Palm Beach) of Southeast Florida from 2010 compared to 1999. Compared to the economic and environmental projections described in sub-sections 2.1.2 and 2.1.3, this sub-section provides data, which is not based on projections, but on empirically found data from the US Census and SFRP. Figure 2.2 shows that there has been an increase in the percentage of the population living below poverty in each of the four counties of Southeast Florida from 1999 to 2010.

Figure 2.2: Percentage of population living in poverty by county in Southeast Florida in 1999 & 2010 (Based on US census (2010) and adapted from the South Florida Planning Council (2013)).



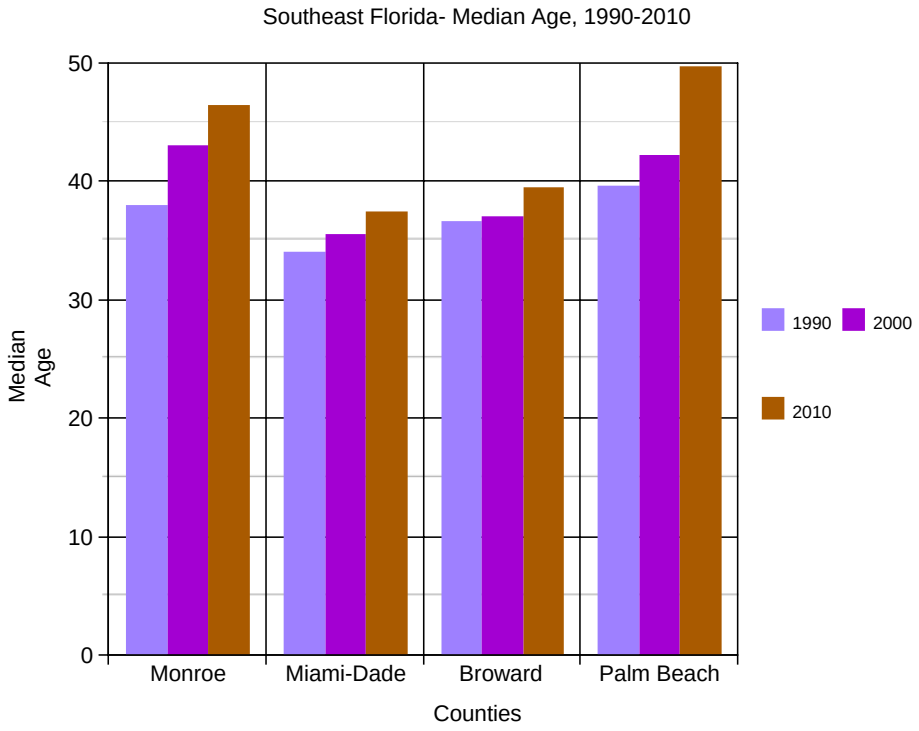
Additionally, based on the findings on poverty levels, figure 2.3 shows that there has been a substantial increase in population growth in each of the counties, except for in Monroe, where the population also decreased 8.2% between 2000-2010.

Figure 2.3: Population growth by county in Southeast Florida (based on US census (2010) produced by the South Florida Planning Council (2013))



Furthermore, a sizeable increase in age among the citizens of Southeast Florida stands out as another social risk to SLR. Figure 2.4 presents data on the median age of citizens in the four counties of Southeast Florida in 1990, 2000 and 2010. These data have shown a consistent increase in age throughout the four counties during these years, and it is presumed built that the median age will continue to rise in Southeast Florida. According to the Center for Disease Control (CDC), overall data on deaths related to flooding and hurricane events in the US, indicate that the aged population is at higher risks to these events (CDC, 2013). Compared to a younger population, an older population could face greater risks from SLR as they have less mobility than younger people.

Figure 2.4: Median age of citizens in each of the counties of Southeast Florida in 1990, 2000 & 2010 (based on US census 2010, produced by South Florida Planning Council)



2.2 Contextual findings

The previous sections have provided a contextual background about the risks faced to SLR in Southeast Florida. Regarding the economic impacts, the region has yet to face large-scale effects of SLR. However, the anticipated effects on infrastructure provide an indication of what can be expected in the coming years. Based on the findings, many of the infrastructure facilities types shown in table 2.3, such as schools and hospitals, will face widespread damages from SLR in the

future. Furthermore, the projected environmental impacts of SLR are also severe based on the amount of conservation acres that will be potentially destroyed. Moreover, the majority of the conservation areas are heavily forested with mangroves, which protect inland areas from flooding. Concerning the social impacts of SLR, the use of three types of demographic data has presented a rudimentary approach to predict future risks toward society. This information has also shown an increase in age, poverty and population growth, along with the impending economic and environmental impacts, SLR therefore presents a complex issue. Based on the expected impacts of SLR in Southeast Florida, this research will evaluate whether the current governance capacity is capable of adapting to the changing environment.

3 Theoretical Framework

This chapter will present a theoretical framework for the governance of CCA in Southeast Florida. The literature review will then provide a description of the analytical framework of governance capacity designed by Mees and Driessen (2010). Their framework is primarily composed of adaptive capacity and good governance theory (Nelissen et al., 2000; Gupta et al., 2008, 2010; Pahl-Wostl, 2009; UNESCAP, 2010) and will be adapted for this research. Subsequently, the application of the model (Mees and Driessen, 2010) will be described and its variations to fit the governance capacity of Southeast Florida. A detailed theoretical outline of each of the four sub-capacities will be discussed and their critical aspects and indicators will be examined.

3.1 Defining governance

In researching the governance of CCA, it is important to develop a definition of the concept of governance. The term "governance" has been defined in numerous different ways, and Rhodes (1997: 47-53) distinguishes six uses of the term of governance:

- *Governance as the minimal state: the use of markets and quasi- markets to deliver 'public' services';*
- *Governance as corporate governance: this is mainly about transparency, integrity and accountability, by means of control;*
- *Governance as the new public management: the introduction of private sector management methods and incentive structures such as market competition to the public sector;*
- *Governance as 'good governance': a 'marriage of the new public management with liberal democracy';*
- *Governance as a socio-cybernetic system: interdependence among social-political-administrative actors; governance is the result of interactive social-political forms of governing; and*
- *Governance as self-organizing networks: networks develop their own policies and shape their environments.*

Common among these definitions shown above is that governance is more than simply the execution of power (Meuleman, 2006). Meuleman (2006) states that the list of six approaches to governance defined by Rhodes (1997) includes other types of relations than network relations, namely hierarchical relations and market-style relations, and provides governance as having a

wide-ranging perspective. Therefore, for this research, one broad definition for governance is used, which is that: "the entirety of interactions, in which government, other public bodies, private sector and civil society participate, targeting at solving societal problems or creating societal opportunities" (Kooiman, 2003:182).

3.2 Climate change adaptation

Numerous studies have shown that the cost of taking action against climate change now to address the effects is significantly lower than the cost in the long-term (European Commission, 2009). Mitigation measures are focused on dealing with the causes of climate change, while adaptation focuses on preventing or decreasing the impacts for present and future periods. While climate mitigation places focus on the global and national level, climate adaptation places more emphasis on the local and regional levels (Termeer et al., 2012). Due to the variations among regional conditions and climate impacts, there needs to be more emphasis on regional actors in CCA (Termeer et al., 2011). As for methods of governance of CCA at the national level, there are several national level adaptation initiatives that are emerging in Germany, Denmark, Spain Netherlands and the United Kingdom (UK), which are shown in table 3.1.

Table 3.1: European national adaptation initiatives by country and year of creation (Swart et al., 2009)

Country	National level adaptation initiative
Germany	National adaptation strategy (2005)
United Kingdom	Adapting to Climate Change in England (2008)
Netherlands	Make Space for Climate" (2007)
Spain	National Plan of Climate Change Adaptation (2005)
Denmark	Danish Strategy for Adaptation to a Changing Climate (2008)

Termeer et al, (2012) conducted a comparative analysis of CCA policies at the national level in each of the four countries and found that each one has developed a combination of proactive CCA policies. The research concluded that a growing number of proactive national level CCA policies have certainly been influenced by the increasing number of extreme weather events.

Since the late 1990's, adaptation as a policy objective to the effects of climate change has slowly gained traction on international, national, regional and local levels. Prior to this time adaptation was considered to actually hamper mitigation efforts (Rayner and Jordan, 2009). There has been a shift away from a single focus on mitigation of climate change toward adaptation objectives (Rayner and Jordan, 2009; Biesbroek et al., 2010). Swart et al. (2009) explain that after concentrating largely on mitigation for nearly two decades, Europe was relatively slow in developing adaptation approaches. Nevertheless, since 2005, climate adaptation strategies accelerated swiftly. There is growing recognition of the necessity for societies to adapt to the impacts of climate change, and the definition of CCA by Burton (1992) (in: Feenstra et al., 1998:119) points, "adaptation to climate change is the process through which people actively, passively or anticipatorily reduce the (consequences of the) impacts of climate change on their health and well-being, and take advantage of the opportunities that their climatic environment provides." The IPCC has developed a definition of CCA, which states, "the adjustment in human or natural system in response to actual or expected climatic effects, which moderates harm or exploits beneficial opportunities," (IPCC, 2007 in: Bauer et al., 2011:5). CCA has gained significance in the IPCC dating back to 2001, and is mentioned in the IPCC Third Assessment, which included a report "Impacts, Adaptation and Vulnerability" and then in the IPCC Fourth Assessment (2007) followed by the IPCC Fifth Assessment (2014). The inclusion of adaptation in the IPCC reports has led to increased interest from different levels of government in the need for adaptation planning, most specifically in Europe, where the policy is still developing (Rayner and Jordan, 2009). However, it has been described that in practical terms, adaptation to climate change seems to be heavily controlled by government (Termeer et al., 2011). This research will identify whether CCA planning in Southeast Florida is profoundly influenced by the government, which will be examined through an analysis of the political and learning capacities of governance in the region.

3.3 Governance of climate change adaptation

As explained by Swart et al. (2009) CCA has only relatively recently been gaining attention in places such as Europe. Furthermore, Gupta et al. (2008) explain that social scientists now have an increased interest in CCA and its governance arrangements, however there has been inadequate research regarding the institutional scope of governance of adaptation. The Hague ESPACE for Environmental Global Governance Project has declared that the shortage of institutional frameworks to promote adaptation is a major barrier to the governance of CCA (Espace, 2007, in: Mees and Driessen, 2010).

CCA has also been indicated as a "wicked problem" (Davoudi et al., 2009; Jordan et al., 2010; Termeer et al., 2012). Wicked problems are very complex and all aspects are interwoven, which can further complicate governance that arises in connection with climate change (Termeer et al., 2012). Addressing CCA is not dependent only on the aptitude to design solutions based on scientific visions, but also on the capacity to modify adaptation based on complex institutional contexts in which these strategies have to be developed, implemented, and performed (Adger et al., 2003 in: Termeer et al., 2012).

CCA is not only a technical issue, but also a difficult matter of governance extending from the international to local level and traces through all levels of governance (Adger, et al., 2003 in: Termeer, et al., 2012). Meadowcroft (2007) explains that governance is in fact generally designated as a horizontal way of routing society, which makes public issues the concern of the state, market and civil society. There are several approaches toward the management of adaptation and some researchers state that adaptation should be managed on the local and regional level since the influences of climate change vary region by region. Others mention that the state and regional levels should in fact deliver assistance to the local levels (Biesbroek et al., 2010). Biermann et al. (2008) present an opposing view to the emphasis on local and regional governance of CCA, and the authors proclaim that a global governance system should be established that could manage matters such as climate-induced migration and environmental injustices.

The governance of CCA is gaining increased political traction on the local, regional, national and global level since 2000 (Rayner and Jordan, 2009; Biermann et al., 2008). The United Nations Development Program (UNDP) has developed an 'Adaptation Policy Framework' which helps countries formulate and implement adaptation strategies, policies, and measures (UNDP, 2015). In the European context, in 2009, the European Commission (EC) developed its policy guidelines: "Adapting to Climate Change: Toward a European Framework for Action." On the national level many European countries have developed a diverse array of adaptation strategies, called the National Adaptation Strategies (NAS), which are referred to in table 3.1. The varying NAS objectives differ between each country. For example, water availability is stressed in southern European countries, while flood risk is a persistent subject in central and northern Europe (Swart, 2009). For the purposes of this research, it will focus mainly on the local and regional level of governance of CCA in Southeast Florida.

3.4 Components of governance capacity framework

Governance capacity has been given several definitions and has been described as the capacity of an organization, institution, community or other entity for good governance (Graham et al., 2003). The World Bank has defined governance capacity as "the ability to coordinate the aggregation of diverging interests and thus promote policy that can credibly be taken to represent the public interest" (Frischtak, 1994:vii). Based on the framework of Innes and Booher (2003), collaboration is regarded as a key aspect for improving the system of governance. In their research, they outlined and evaluated the emerging collaborative governance efforts in terms of how they are changing our capacity to manage our systems. Building on this work, Bulkelely et al. (2009) researched good governance practices, and financial and human resources for cities to adapt to CCA and found that good governance is a decisive factor of CCA. Building on these prior works, Mees and Driessen (2010) explain that governance capacity is the essential precondition to positive governance of adaptation to climate change, and the greater the capacity, the more effective the governance of CCA will be. Mees and Driessen (2010:251) define governance capacity "as the degree to which a public-private network of actors is able to resolve societal issues by applying principles of good governance." Governance capacity and its theoretical context will be discussed in greater detail in the description of the conceptual framework.

Based on prior literature of governance capacity, Mees and Driessen (2010) developed a framework to measure the governance of CCA, which is composed primarily of the principles of good governance and adaptive capacity. Their model provides a key framework of governance capacity and is chiefly inspired by aspects of good governance based on Bulkeley et al. (2009), Nelissen et al. (2000), UNESCAP (2010), and concepts of adaptive capacity as developed by Gupta et al. (2008, 2010) among other sources.

In the framework of analysis, the governance capacity model of Mees and Driessen (2010) will be adapted to be appropriate for the assessment of the governance capacity of SLR adaptation in Southeast Florida and shown in Figure 3.1. This framework has been chosen for this research because it offers a sound frame of analysis on good governance and adaptive capacity, which are included within the governance capacity framework. In the framework it is divided into five sub-capacities, three of which are related to good governance (resource, legal, managerial) and two are centered on the literature of adaptive capacity (resource, learning).

Figure 3.1: Governance capacity model (Mees and Driessen, 2010:258)

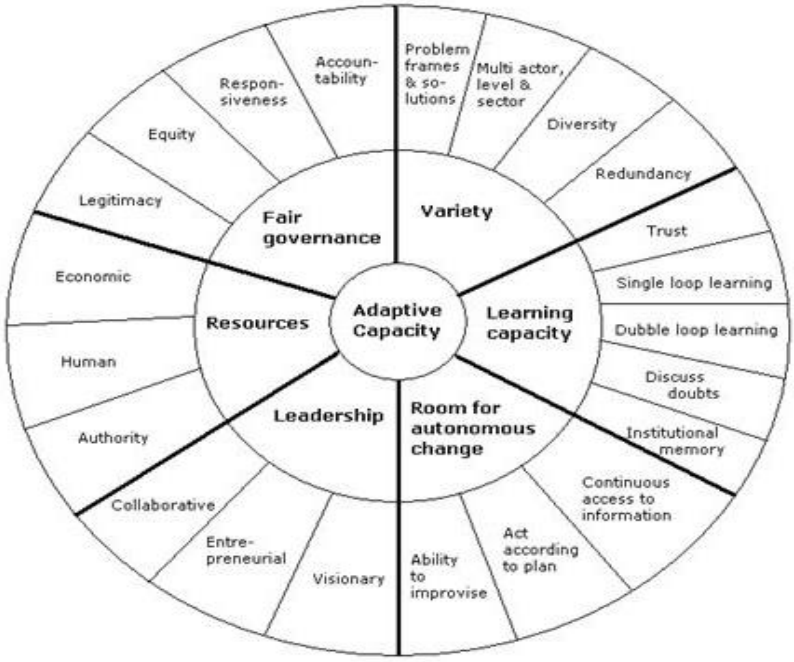
The framework of Mees and Driessen (2010) was designed for a comparative study of London, Rotterdam and Toronto which assesses the barriers and opportunities of governance capacity for green space development to absorb rainfall in each of the cities. This research will contribute to the framework by building on it, and aiming the theory and evaluation to the governance capacity of Southeast Florida.

3.5 Governance capacity framework for Southeast Florida

3.5.1 Adaptive capacity and good governance

To understand the framework of Mees and Driessen (2010) and the adapted framework for this research it is important to appreciate the concept of adaptive capacity, which is the key principle of the resource and learning capacities. Adaptive capacity is linked to the adaptation to climate change, and is generally understood as the assets and entitlements that build the ability for different systems to cope and respond with a range of stressors (Kates et al., 2012). More specifically, it centers on the capacity of organizations, institutions, and communities to adapt to a transforming environment (Pahl-Wostl, 2009). The IPCC (2001 in: Gupta et al., 2010) clarifies adaptive capacity more explicitly as a means to adapt to climate change and curb damage by acting proactively. Gupta et al. (2010) defined a framework of adaptive capacity, which is denoted as the Adaptive Capacity Wheel (ACW), and used several criteria to assess society's response to climate change. Examples of this include the ACW (figure: 3.2), which has six dimensions: variety, learning capacity, room for autonomous change, leadership, availability of resources and fair governance (Gupta et al., 2010). These dimensions and their 22 criteria form the ACW, which is used to identify strengths and weaknesses in institutional systems to adapt to climate change. By indicating strengths and weaknesses it helps better understand the system of governance and enhances the discussion of how it can be improved (Gupta et al., 2010).

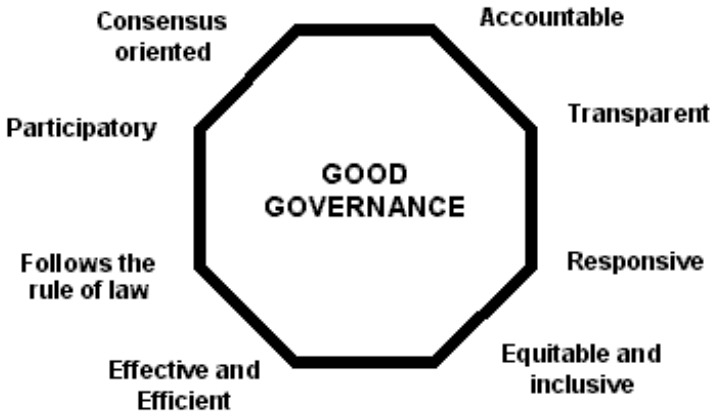
Figure 3.2: Adaptive Capacity Wheel (source: Gupta et al., 2010)



For analyzing the governance capacity to adapt to climate change, adaptive capacity offers valuable insights for this framework on how a system can manage processes, such as social learning process (Pahl-Wostl et al., 2009). Though, for the nature of this research on governance of CCA, there will also be a strong focus on the framework of good governance (UNESCAP, 2010) similar to that on adaptive capacity (Gupta et al., 2010; Pahl-Wostl et al., 2009; Kates et al., 2012). Their analytical framework places strong emphasis on principles of good governance as it focuses on the actual governance process, while the adaptive capacity aims more at the system's ability to cope.

Governance capacity and adaptation in this research will focus on the general process of governance and will be grounded in the values of good governance. The United Nations Development Program (UNDP) describes good governance as "governing systems which are capable, responsive, inclusive, and transparent" (Clark, 2011, in: Gisselquist, 2012:6) and the UNESCAP model is shown in figure 3.3. Good governance has been shown to be vital factor in shaping climate change adaptation based on the research of Bulkekey (2009) and there are numerous models of good governance. This research framework will be constructed mainly on the basis of good governance and adaptive capacity.

Figure 3.3: UNESCAP model of good governance (UNESCAP, 2010)



Mees and Driessen's (2010) governance capacity framework is strongly focused on three values of the governance triangle, which are explained by Nelissen et al. (2000), as legal, political and managerial. Each of these three values describes aspects of good governance and the framework incorporates aspects of good governance, such as accountability, as well as diminesions from the adaptive capacity wheel.

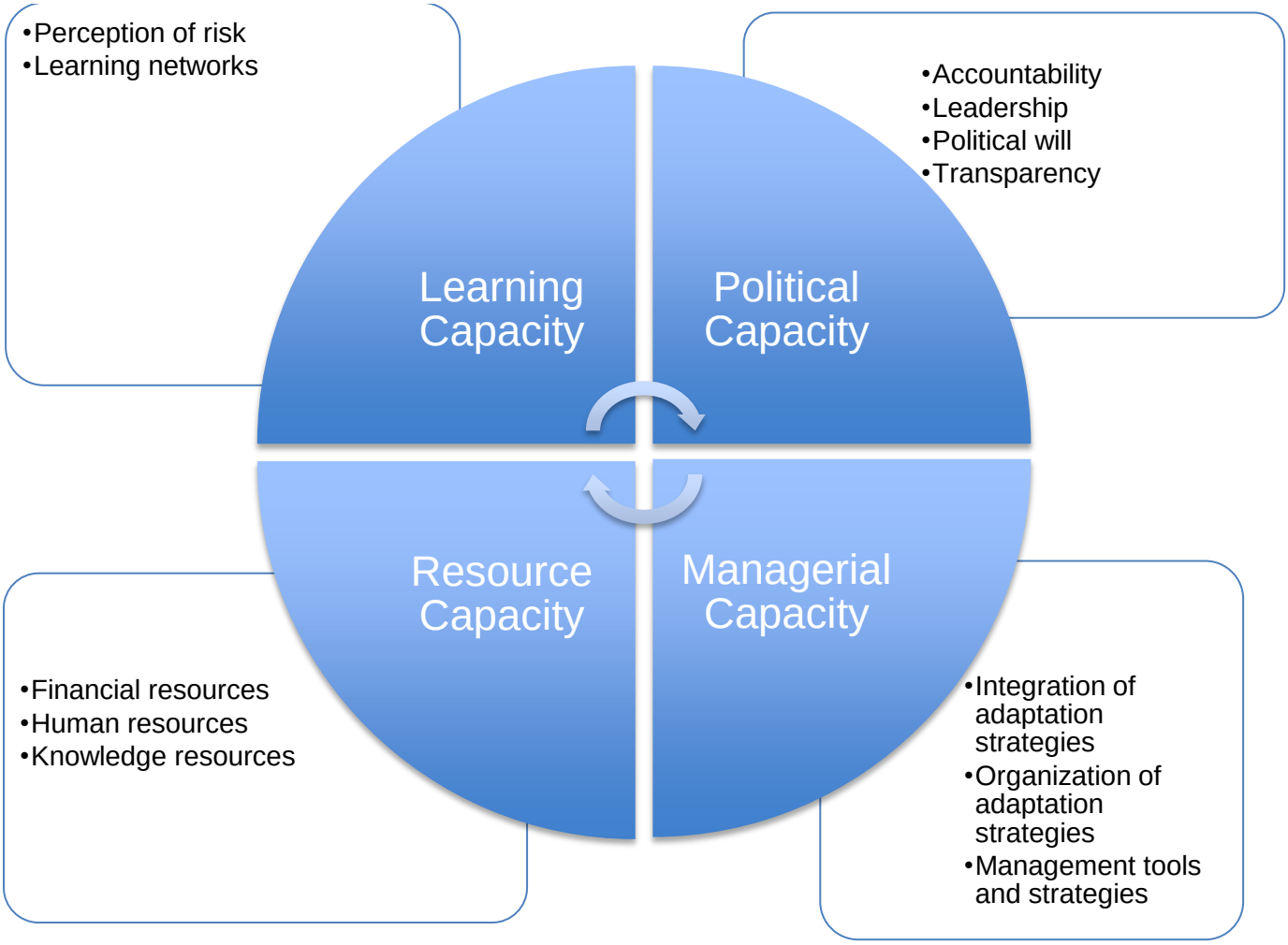
In developing an analytical framework of governance capacity, it will include concepts based on good governance (UNESCAP, 2010), the governance triangle (Nelissen et al., 2000) and adaptive capacity (Kates et al., 2012; Gupta et al., 2008; 2010; Pahl-Wostl et al., 2009). Additionally, the model will build on this and include additional theory connected to each of the sub-capacities of governance and explained in section 3.7.

3.6 Operationalizing governance capacity as a framework

In order to develop a framework for the governance capacity in Southeast Florida, this concept should be further explored. Graham et al (2003) describes governance capacity as the capacity of organizations, community and institutions object for good governance. The framework includes aspects of good governance, such as the leadership and accountability, which are required within the topic of political capacity as well as concepts of adaptive capacity, specifically resources capacity and learning capacity (Gupta et al., 2008; Gupta et al., 2010; Pahl-Wostl, 2009). Furthermore, the five capacities (managerial, legal, political, learning and resources) are critical to the governance of adaptation to climate change and the governance of urban green space (Mees and Driessen, 2010). Compared to the research context of Mees and Driessen (2010), which focused on green space adaptation is a "no-regret adaptation strategy" in comparison, CCA strategies have also been referred to as "win-win" or "no-regret" solutions (Rogers et al., 2012:1). Moreover, Rogers et al. (2012) explain that CCA has the potential to improve community resiliency to short-term hazards of SLR, while improving a community's capability to adapt to long-term climate change impacts.

The governance capacity framework is shown in figure 3.4, including a total of four sub-capacities (political, learning, resources, and managerial) and will be used to identify the current governance capacity to SLR adaptation in Southeast Florida.

Figure 3.4: Framework of analysis for governance capacity with critical aspects per sub-capacity



Mees and Driessen (2010) legal capacity has been left out of this model and by excluding this sub-capacity, this research will be limited in that it will not identify the legality of CCA in Southeast Florida. This could provide limitations to the research, such as critical aspects of legal capacity used by Mees and Driessen (2010), since environmental equity and the legality of adaptation strategies will be excluded from this research and could be addressed in future research. The framework of analysis will incorporate the four other sub-capacities as the central group of theoretical concepts for the governance capacity of adaptation. The outer part of the framework will involve more detailed understanding of each sub-capacity. The application of the governance capacity model aims tries to explain the governance of adaptation to SLR in Southeast Florida to therefore gain an understanding of the region's capacity to address SLR. Furthermore, table 3.2 explains the governance sub-capacities, principle theory and critical aspects in order of the below sections.

Table 3.2: the components of each sub-capacity of governance capacity (author)

Governance sub capacity	Principle theory	Critical Aspects
Managerial capacity	Good governance	• Integration of adaptation strategies • Organization of adaptation strategies • Management tools and strategies
Political capacity	Good governance	• Accountability • Transparency • Leadership • Political will
Resource capacity	Adaptive capacity	• Human resources • Financial resources • Knowledge resources
Learning capacity	Adaptive capacity	• Perception of risk • Learning networks

3.6.1 Managerial capacity

According to Mees and Driessen (2010) there are three critical managerial aspects of governance that are essential for adaptation to climate change. Among these critical aspects, the theoretical context and indicators will be tailored to adaptation to climate change. These critical aspects are as follows.

Table 3.3: Managerial capacity critical aspects and indicators (author)

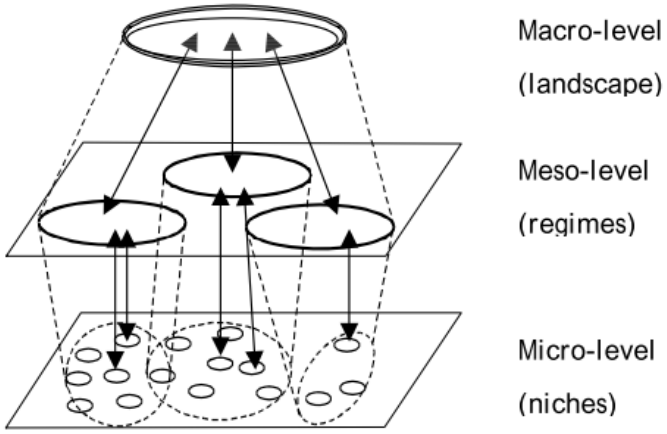
Capacity type	Critical Aspects	Indicators
Managerial capacity	Integration of adaptation to SLR into governance	Integration of SLR adaptation strategies across each of institutional agenda (local, regional, state)
Managerial capacity	Organization of adaptation into governance	Multi-level governance of SLR adaptation
Managerial Capacity	Management tools and strategies	Use of SLR adaptation tools and strategies to encourage adaptation

With respect to the first critical aspect, there are substantial academic literature (Adger et al., 2009; Gupta et al., 2010; Bauer et al., 2011) and policy reports (Berry et al., 2011; IPCC, 2013), that claim that adaptation should be integrated in different sectors. Integration can happen in several different ways, which are varying depending on the governance structure. Hierarchical integration is regarded as being vertical, in which institutions with the greatest control use order and control strategies to change the policies of institutions at a lower level. Characteristically, this is a linear procedure, in which low-level institutions get few opportunities to contribute to the policies of those institutions at the upper level (Bauer et al., 2011). This type of integration is usually found in top-down structures of governance that comprise hierarchical structures. Horizontal policy integration, on the other hand, is much more of a collaborative approach, in which political institutions, organizations and citizens standing at various ranks of governance are brought together to examine, cooperate and conciliate while establishing new policies and plans

(Bauer et al., 2011). The procedure of adaptation can be found in a diversity of social and technical problems, ranging from social confrontations, narrow governance and unproductive institutional arrangement (Agrawal, 2008). Horizontal integration is a method that can avoid these difficulties since the information and capabilities of these diverse actors can become part of the policy development. This horizontal approach is far less hierarchical and explained by Gupta et al., 2010) as improving the adaptive capacity of systems since the concerns of various institutions and stakeholders can be addressed. This approach can also lead to policies and plans that are capable of being employed over a diverse number of institutional levels and geographical dimensions. Based on the indicator adapted from Mees and Driessen (2010) this sub-section will focus on the extent of integration of CCA planning in each political level (local, regional, state), explicitly concerning SLR adaptation issues, goals and impacts.

The second critical aspect considers the connectivity of organizations in the governance to CCA. According to the literature cited above, integration plays a crucial role in adaptation, as it crosses several sectors and policy levels. Interaction among different governance levels is also critical and is discussed in literature (Geels and Kemp, 2000; Van der Brugge et al., 2005; Loorbach et al., 2007, 2010; Geel and Schot, 2007; Biesbroek et al., 2010) as having significant importance for effective adaptation. In the context of climate adaptation, the notion of multi-level governance is especially important, as it includes exchanges among various administrative levels (Hooghe and Marks, 2003). Much of the literature on coordination of governance adaptation refers to Rip and Kemp's (1998) multi-level model, which describes that a macro socio-technical landscape, meso-level regime and micro level niche. The main point of the model is that there is co-evolution between each level, which can help to change the profile of the regime and reshape it. The coordination of multi-level governance in the context of institutional fragmentation is described by Geels and Kemp (2000 in: Loorbach, 2010) and explains the organization of governance systems (Figure 3.5)

Figure 3.5: This multi-level concept is founded on (Geels and Kemp, 2000 via van der Brugge et al., 2005).



Advances at the macro-level correspond to slow and extensive societal/cultural trends. Forces at the meso-level are controlled by the regime. The regime is the leading design of institutions and organizations in the social system. At the micro-level, individual persons, organizations, or innovations are distinguished (van der Brugge et al., 2005).

Building on the multi-level concept (Rip and Kemp, 1998; Geels and Kemp, 2000), the framework of Loorbach (2010) will be valuable in demonstrating the organization between different governance levels and is shown below and described in figure 3.6. Interestingly, the model shows the varying levels of governance that can coordinate with one another and perform efficient tasks depending on the level.

Figure 3.6: Multi-level governance framework (Loorbach , 2010)

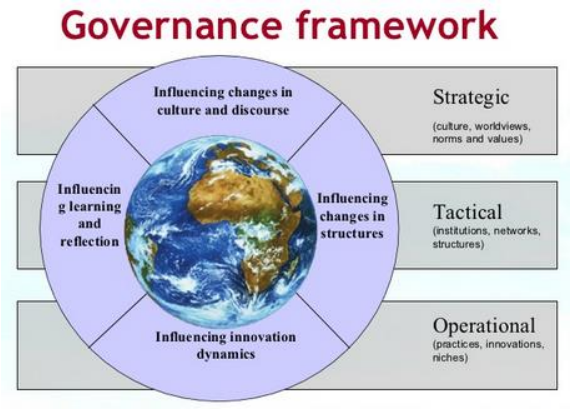


Figure 3.6 provides a governance framework, which depicts the various levels of governance and the influences that each has on the overall system. This framework is vital when evaluating the extent of the activities and influences occurring at every level (local, regional, state) of

governance in Southeast Florida. Furthermore, table 3.4 provides a further description of each of the levels (strategic, tactical and operational) in further depth below.

Table 3.4: Description of governance levels (Loorbach, 2010)

Strategic activities	Progressions of vision expansion, strategic discussions, long-term, goal preparation, cooperative goal and norm setting and long-term anticipation
Tactical	Steering activities that are interest driven and relate to the dominant structures (regime) of a societal (sub) system. Comprises all patterns and structures, all actors that are dealing on a daily basis with developing programs, financial and institutional regulations and frameworks
Operational	Experiments and actions are acknowledged that have a short-term horizon and are often carried out in the context of innovation projects and programs, in business and industry, in politics or in civil society and commonly denoted as innovations. Action is frequently driven by individual goals, entrepreneurial abilities, or promising inventions;

It is postulated, based on the literature, that in the instance of improved organization among governance levels and geographic areas that adaptation to climate change could be enhanced. Based on the literature, the indicators will assess the extent of multi-level organization of governance of CCA to develop a clearer understanding of managerial capacity in Southeast Florida.

The third critical aspect regards the use of management strategies and tools. According to Termeer et al. (2011) at the EU level there has been growing consideration of adaptation strategies and task forces have been developed to address adaptation through the coordination of stakeholders from different policy fields to improve governance networks. In the Netherlands, interest groups, businesses, governments, and research institutes have designed adaptation strategies, and is assumed to be a public interest. The Dutch "Room for the River" project is a prime example of a multi-level governance adaptation effort. For example, among river widening

measures, the program involved the coordination of local, regional, NGO's, and citizens and produces a unique adaptation strategy (Termeer et al., 2011). Public-private partnerships (PPP) offer another possible strategy and (Agrawal, 2008) suggests that there are good reason to think that PPP collaborations could be very important in addressing CCA. Agrawal (2008) also notes that as climate change is one of the growing issues around the world, it will be essential to have a diverse number of stakeholders from diverse institutions.

Agrawal (2008) further argues that management strategies, such as committees, task forces and PPP's, could improve coordination among stakeholders and therefore improve the managerial capacity. The indicator that will be used for this managerial capacity is the use of management tools and strategies to encourage adaptation to SLR in Southeast Florida.

3.6.2 Political capacity

The sub-capacity of political capacity is adapted from Mees and Driessen (2010) governance capacity model, as well as its critical aspects with the addition of transparency shown in table 3.5.

Table 3.5: Political capacity critical aspects and indicators (author)

Capacity type	Critical aspects	Indicators
Political capacity	Accountability	The extent of the accountability of politicians for the adaptation to SLR.
Political capacity	Transparency	Public access of relevant and timely information relating to SLR adaptation; Access to local and regional CCA conferences for citizens to attend
Political capacity	Political will	Extent of political support for CCA; Influence of term limits on CCA progress
Political capacity	Leadership	Existence of bottom-up leadership (political staff members); Existence of top-down leadership (political leaders)

Accountability and transparency are both deemed characteristics of the good governance model (UNESCAP, 2010). Mees and Driessen (2010) include transparency within accountability, however as they are both designated as characteristics of good governance (UNESCAP, 2010) they will be distinguished separately in this research. The accountability of institutions differs strongly depending on whether the decisions are dealt with internally or externally. In the realm of government, citizens and stakeholders that are included within its political boundaries are affected by its decisions or actions. Therefore, accountability of policy makers cannot be expected if there is no transparency in decision-making (UNESCAP, 2010). It is clear that it is essential to have both accountability and transparency within the political capacity, and that one cannot exist without the other.

According to the Transparency and Accountability Initiatives report (TAIR), transparency and accountability are important aspects for improved governance of CCA due to the potential for helping to reduce the power imbalance within countries (McGee et al., 2010). Furthermore the authors explain in the TAIR that by improving the transparency of the decision-making of policy makers could empower citizens to tackle climate change collectively through enhanced participation of civil society. Participation could lead to constructive outcomes through heightened policy decisions and strong coordination, thus increasing accountability between citizens and the state (McGee et al., 2010). Furthermore, accountability is important in that it can be helpful in shifting the talks from government-to-government dialogues and broaden the circle to increase participation from the citizens and stakeholders (McGee et al., 2010). Tanner et al. (2009) recognize accountability as a specific characteristic of good governance that can improve the process of climate adaptation and emphasizes that there should be more accountability and transparency of politicians. Subsequently, it could increase citizens' ability to acquire information and keeping a relationship of accountability between the government and their citizens. Then, accountability and transparency can result in improved citizen involvement and access to information and knowledge (Tanner et al., 2009). Interestingly, a measurement of the governance of climate accountability has recently been born out of the 2009 United Nations Climate Conference in Copenhagen. The Climate Competitive Index (CCI) has the ability to measure a diverse set of criteria to gain a picture of climate action, one of which is accountability of stakeholders in developing climate strategies (CCI, 2010).

Therefore, in order to increase the political capacity of governance, there should be increased accountability and transparency (Tanner et al., 2009; UNESCAP, 2010; McGee et al., 2010). The

main indicators for the critical aspect of accountability are adapted from Mees and Driessen (2010) and will assess the accountability of politicians for the adaptation to SLR. In terms of the critical aspect of transparency (McGee et al., 2010; UNESCAP, 2010) there will be two indicators that will be examined which are: 1) citizen access of relevant and timely information relating to SLR adaptation; and 2) access to local and regional CCA conferences for citizens.

Leadership is routinely used as a variable for adaptive capacity (Gupta et al., 2010) and can pose a challenge for government officials in executing climate adaptation due to the challenge of leadership across levels, actors and sectors (Termeer et al., 2011). Government officials who actively endorse the climate adaptation agenda and are arranging connections among others involved have stronger levels of leadership (Termeer et al., 2011). There are two distinctive types of leadership according to Mees and Driessen (2010) within the political capacity: 1) extent of bottom-up leadership (political staff members); and 2) top-down leadership (political leaders). These leadership concepts aim to incorporate joint problem solving through connectivity of organization of multi-level governance networks (Rip and Kemp, 1998; Geels and Kemp, 2000; Loorbach, 2010) as explained in the managerial capacity sub-section. Leadership has received significant attention from the literature on adaptation to climate change as has been explained by (Crosby and Bryson, 2010). This is due to the fact that leadership has the potential to raise awareness to CCA issues for building coordination across governance levels, while fragmentation still exists. Influenced by the indicators of leadership by Mees and Driessen (2010) on top-down and bottom-up leadership, these indicators will be adapted in the context of SLR adaptation in Southeast Florida.

Political will is another critical aspect of political capacity and without the commitment of politicians, integration of CCA could fail (Mickwitz et al., 2009). Developing long-term CCA strategies can be hindered by the short-term nature of the political process. The regular cycle of politicians entering and leaving office, combined with vastly different agendas of politicians routinely entering office, can hinder adaptation to climate change (Paulson Jr., 2015). The indicators of political will that will be used are: 1) Extent of political support for CCA strategies; and 2) the influence of short-term constraints on developing CCA strategies.

3.6.3 Resource capacity

Adding to the sub-capacities of learning, managerial and political, the resource capacity is included within adaptation capacity (Gupta et al., 2010) and governance adaptation (Holgate, 2007; Fussel, 2007; Bukeley et al., 2009). A significant element of the capacity of institutions is to what extent to which they can produce or obtain sufficient resources to achieve their goals (Tanner et al., 2009; Gupta et al, 2010). Resource capacity is critical in enacting adaptation plans, as the financing must be available for operation, as well as the available human and knowledge resources. Financial resources regard whether the institutions can acquire or produce enough money to execute policy measures (Gupta et al., 2010). Concerning governance capacity, human resources are the degree in which institutions have people with the required skills, expertise and knowledge to progress and employ adaptation policies. The third aspect concerns whether there are knowledge resources to engage citizens about CCA, which is often cited as a challenging issue in climate adaptation (Adger et al., 2009). The critical aspects described are comprised of this sub-capacity which are based on the adaptive capacity wheel of Gupta, et al, (2010) and shown in table 3.6.

Table 3.6: Resource capacity critical aspects and indicators (author).

Capacity type	Critical aspects	Indicators
Resource capacity	Financial resources	Availability of funding or money resources available for adaptation.
Resource capacity	Human resources	Quantity of people involved in adaptation. Skills and know-how of staff involved in adaptation planning
Resource capacity	Knowledge resources	Support of external experts to increase CCA knowledge of the region (climate scientists, NGO's, universities, etc.)

The first critical aspect regards financial resources, which is a requirement for the development of adaptation projects. If finances for CCA are found to be deficient then strategies to adapt to climate change cannot be executed (Adger, 2009). The need for funding for CCA is becoming

increasingly significant as the impacts of climate change in coastal areas of the world are expected to signify a large confrontation this century. In terms of the global scale at risk to SLR, there are millions of unprotected people and thousands of billions of USD of exposed assets (Hanson et al., 2011). Satterthwaite et al. (2008) focus attention on the problem of inadequate financing for developing adaptation plans in both developing and developed countries at the local government level. The authors further explain that a lack of financing at local governments levels will result in unrepresentative and unaccountable government. Bulkeley et al. (2009) explain that the regional level has shown to be important for assembling the resources and building capacities of local governments to address climate change, as there are more opportunities for partnerships between state and non-state actors at this level. The financing aspect of CCA will be a critical factor in developing adaptation measures at the regional level of Southeast Florida. Therefore, the indicator of financial resources is the availability of funding for adaptation measures in Southeast Florida.

The second critical aspect has to do with the human resources, in terms of the quantity and quality of people involved in the governance of CCA. The quantity has to do with the abundance of people involved in CCA. These people can come from committees, task forces, non-profits, governmental organizations, private sector companies, universities and other forms of collaborative organizations. In research on human resources of CCA, Holgate's (2007) study of climate change policy and action in Johannesburg and Cape Town, South Africa exhibited how inadequate human resources can make a significant difference to the extent and efficacy of measures to address climate change. In the example of Cape Town and Johannesburg, the research found that when there were additional human resources brought in from outside of the local city government, noteworthy improvements were made to the development of plans to confront the issues of climate change (Holgate, 2007).

While, the quantity of those involved in CCA strategies is an important component of human resources, Fussel (2007) explains that the quantity of staff does not imply that there is a high level of knowledge among the people. Therefore, it is also important to gauge the quality of those involved in CCA adaptation and related fields (Fussel, 2007). Adger et al. (2009) explain that adaptation can limit itself by having people involved who lack proper expertise of the discipline being tackled. As explained by Eisenhauer (2014), a means of improving the quality of human resources is to widen the circle of those involved in CCA. Widening the circle implies that to

make improvements on adaptation, others need to be brought into the conversation apart from the core group (Eisenhauer, 2014).

The third aspect is the knowledge resource available. A robust knowledge base is a prerequisite for developing and implementing effective adaptation measures, whether it is focused on long-term proactive measures or urgent post-disaster responses and rebuilding (Satterthwaite et al., 2008). Therefore, the authors suggest that in adapting to climate changes it is vital for citizens to acquire knowledge on current climate conditions. Numerous academics have claimed that in order to move CCA plans forward there needs to be an ability to expand beyond the science community. This would include "mutual learning among scientists and society", with a main constituent of solving issues collaboratively (Sholz, 2010: 73 in: Eisenhauer, 2014).

Certain countries are proactively developing programs and events to support growth in the knowledge base of their citizens on issues of climate change. In Sweden, there are attempts to advise and teach citizens about climate change. Specifically, schools are considered to be vibrant places for increasing knowledge and understanding about CCA. The implication of this approach is that knowledge about climate change will spread from children to their parents (Granberg and Elander, 2007 in: Bulkeley et al., 2009).

Programs to improve knowledge about CCA have also emerged in the US, including the Climate Adaptation Knowledge Exchange (CAKE), which was founded, by Eco Adapt and Island Press in July 2010. It aspires to create a communal knowledge base for handling the natural and built systems in the face of rapid climate change by including climate researchers and universities in the process (CAKE, 2015). A community of shared values and knowledge, such as CAKE, are valuable ways in which to improve the knowledge capacity of governance and could help to increase the community around CCA.

Though, as the rates with which these approaches of snowballing knowledge is arranged in multiple contexts, recent studies have preserved the case that public engagement regarding climate change is still only shaped by an assortment of individual and social factors. The studies found that the delivery of information only, is unlikely to have a great deal of effect on behavior towards improving knowledge capacity on the subject of climate change (Lorenzoni et al., 2007; Pidgeon et al., 2008). Though it is thought provoking to see the downplay of knowledge engagement, this research will nevertheless examine whether knowledge resources are an

essential aspect of resource capacity. Regarding SLR, it will be valuable to see if resources, such as educational programs for students and others knowledge exchange programs like CAKE are present and running in Southeast Florida, and if so, performing well.

3.6.4 Learning capacity

Learning capacity is used as an integral basis for adaptive capacity (Gupta et al., 2010) and will be used as a sub-capacity for this model. The indicators of learning capacity as used by Mees and Driessen (2010) are dealing with uncertainty of climate change risks and were identified to see whether uncertainty was regarded as a risk or opportunity. Schmidt (2004) explains that uncertainty plays a major role in actual risk perception, and for the nature of this research it will look to more broadly at whether perception of risk toward SLR is seen as an opportunity for CCA or as a limitation in Southeast Florida. The second aspect will identify the learning process of risks of climate change (Pahl-Wostl, 2009; Gupta et al., 2008). The criteria aspects will explore the greater understanding of how risk is be perceived among citizens and stakeholders and learning processes to reduce negative perceptions.

Table 3.7: Learning capacity critical aspects and indicators (author)

Capacity type	Critical aspects	Indicators
Learning Capacity	Perception of risk of SLR by citizens/stakeholders/government officials	Acknowledging risk of SLR as an opportunity or threat. Understanding of risk (Slovic, 1986; Kraus and Slovic, 1988; Beck, 1992)
Learning Capacity	Organized learning networks	Existence of learning organizations, digital formatted learning, workshop learning and research projects for increasing learning of CCA.

Risk perception is described as the perceptive opinion of individuals and groups of risks in the setting of incomplete and uncertain information (Slovic, 1986). Several researchers have conducted studies on how risks are perceived differently depending on the context (Slovic, 1986, Kraus and Slovic, 1987, Beck, 1992) and this sub-section will first begin with addressing the understanding of risk. In table 3.8, Slovic (1986) provides several explanations of how some specific risk are perceived differently among individuals than other risks.

Table 3.8: Research findings on the limitations of public understanding of risks (Slovic, 1986)

Limitations on public understanding of risk
(1) Risks from dramatic events, such as large-scale natural disasters, homicides, and plan crashes tend to be overestimated, compared to non-fatal risks which tend to be underestimated.
(2) Hazards described on news media coverage have also been found to be prejudiced in much the same way, therefore contributing to the difficulties of receiving an appropriate perspective on risks (Combs and Slovic, 1979 in: Slovic, 1986).
(3) Risk information might scare and aggravate the public, leading them to separate from the issue.
(4) Individuals try to limit their uneasiness in the face of uncertainty by rejecting that uncertainty, therefore triggering the risk to seem either so insignificant that it can be ignored or so great that it certainly must be evaded.
(5) Strong opinions among people connected to risks can be hard to alter and once an initial view is made on a topic
(6) Naïve views of a risk can easily be manipulated by presentation format. When individuals do not have a solid previous opinion on an issue, they will cultivate a version based on how evidence is rendered.

These six main points are of importance to the debate of the perception of risk of SLR in Southeast Florida and should be engaged when examining risk perception among stakeholders and citizens. Building on the main points of Slovic (1986), it is also stimulating to compare certain types of risk within one another to distinguish several risk characteristics versus one another on the risk perception spectrum. In table 3.9, Kraus and Slovic (1988) provide the main qualitative characteristics that result in decisions whether a certain activity is risky or not

Table 3.9: The main qualitative risk characteristics (Kraus and Slovic, 1988)

Characteristics of risk
(1) immediate and delayed;
(2) old and new;
(3) known to be exposed and not known to be exposed;
(4) voluntary versus involuntary risks;
(5) certainly not fatal versus certainly fatal;
(6) chronic versus catastrophic risks;
(7) known to science and not known to science;
(8) not controllable and controllable.

There is a connection between each of these risk characteristics and for example, a risk that is recognized to be manageable is less threatening than a risk that cannot be managed. According to Kraus and Slovic (1988) the entire range of these eight risk characteristics, can be limited to two or three high order characteristics. The two factors that can be used as indicators of the risk are "unknown risk" and "dread". Therefore, the higher the hazard-score for these two risks the higher the perceived risk, and the more people want to see the risk reduced. Slovic (1986) and Kraus and Slovic (1988) provide extensive information in clarifying the differences in how risks are perceived depending on the context. For example, while people are comparatively confident of using cars, there is an enduring fear among people of nuclear energy, while automobiles have led to far more deaths than the nuclear catastrophes. The dispute is that countless car accidents allow the public to sense that it is proficient of evaluating the risk. Simply put, the risk appears knowable and familiar.

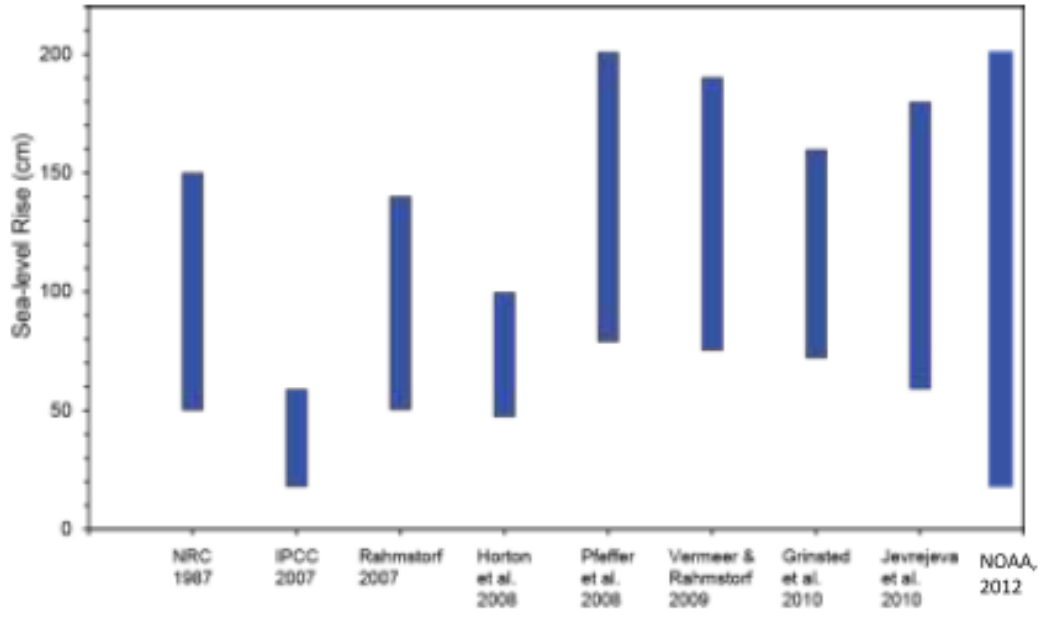
Slovic's (1986) main research outcomes on the perception of risk irrefutably lie in accepting that the public's perception of risk is inclined by cultural, social, political and economic factors. His writing on the perception of risk could contribute greatly to developing an improved understanding on the perception of risk of SLR in Southeast Florida and methods to address the problem. Slovic (1986) explains several limitations of people in understanding risk, and this research will look intensively into whether these play a role in the context of Southeast Florida. Furthermore Kraus and Slovic (1988) distinguish between several risk characteristics and explains risk phenomenon, which are significant in accepting which type of risk SLR is categorized (e.g. certain or uncertain risk).

Within risk perception literature it is valuable to remark on contemporary risks, as opposed to older dangers, and the means in which we perceive risks as contemporary or old (Beck, 1992). According to Beck (1992) old dangers came from what we call natural risks, such as floods or epidemics, which could be appropriately managed. Beck argues, contemporary risks on the other hand are largely hidden, for example SLR is not a visible risk. The contribution of Beck's *Risks Society* (1992) delivers a framework for thinking about the contemporary risks of modernization and explains that, "risk to human life are so great that they can't be delimited spatially, temporally or socially unlike older dangers" (Lupton, 1999:171). Beck's *Risk Society*, offered a timely view on the efficient way of handling "risks" of modernization and in the vision of Beck, SLR should be regarded as a contemporary risk amongst citizens, else it will be dealt with from an "old risk" approach.

Through the works of (Slovic, 1986, Krause and Slovic, 1988; Beck, 1992) it builds a basis in how risk perception can be better understood. There are several factors, which have major influences on risk perception to climate change such as political ideology, age and education and worldviews and Poortinga et al. (2011) further argues that one of the most determinant factors is perceived uncertainty. A poll from the Pew Research Centre (2009) found that there has been an increase in the perceived uncertainty about anthropogenic climate change since 2006. Societal and political decisions about how and whether to reply to climate change are tense with uncertainties (Lorenzoni et al., 2005). Shome and Marx (2009) express that the ordinary meaning of uncertainty is negative, as it is commonly equated with ignorance. Furthermore, they elucidate that uncertainties are also seen as a major limitation to public engagement with the subject of where 'public engagement' is defined as a personal connection with climate change comprising cognitive, emotional and behavioral aspects uncertainties of the risks related to climate change seem to limit public engagement and that the low position of climate change as a worry is reflective of a widespread perception amongst the public that the issue is a spatially and temporally remote risk. (Lorenzoni et al., 2007).

Figure 3.7 shows below the SLR projections by end of 21st century and therefore the uncertainty in SLR projections, which explains a possible factor that could influence limitations of risk perceptions (Bolter, 2014).

Figure 3.7: Range of sea level rise projections for the end of the 21st century (Bolter, 2014)



Termeer et al. (2011) allude that as the debate on the risk of climate change continues to occur, global debates deeply influenced the legitimacy of climate adaptation on the regional and local level. The uncertainties ascribed to climate change and its ambiguities affect the perceived legitimacy of climate scientists and climate adaptation policy. There are examples of research councils which have designed a means to approach the uncertainties of climate change and the National Research Council (NRC), a working arm of the US National Academies has defined its approach to handling uncertainty as "an ongoing process in which the potential but uncertain consequences of climate change and climate policy are identified, assessed, prioritized, managed, and reevaluated in response to experience, monitoring, and new information" (NRC 2010b: 92). It is interesting to see the NRC's stance on dealing with the uncertainty of climate change, and the framework will now look toward learning loops in governance and learning networks.

Building on concepts of risk perception and uncertainty in relation the three types of learning processes (Pahl-Wostl, 2009) as described in table 3.10 shows that incremental changes in learning, could help increase learning and reduce uncertainty of risks of climate change. In the three types of learning processes (single- loop, double-loop, triple-loop) there is a varying amount of action to reduce risks. In the single-loop learning process discourses rely on science to find a truth, while in the triple-loop there are new methods to manage uncertainty (e.g. participatory scenario development) and risk (e.g. risk dialogues, robust action) are applied with consistent attempts to change structural constraints (Pahl-Wostl, 2009). The triple-loop learning process offers a potential means in which to help improve the perception of risk toward climate change, though most attempts at governance of adaptation to climate change are limited to the single loop learning (Pahl-Wostl, 2009). The different sequences of governance loops are explained in the figure below.

Table 3.10: Sequence of learning cycles and changes in governance modes based on single, double and triple loop. (Pahl-Wostl, 2009)

	Single loop	*Double loop*	*Triple loop*
Governance Mode	No change in the relative dominance of governance types Improvement of performance within established governance modes	Other than dominant governance types start to become more visible and dominant governance type called into question (e.g. discussion of market based instruments if absent before, introduction of participatory approaches, emergence of bottom-up participatory processes, argument about dominance of one type-bureaucratic hierarchies or privatization)	New governance types implemented, established governance types substantially changed More diverse governance structures- less dominance of one type Learning networks challenging dominating structural assumptions become effectively connected to and influence established policy arenas

Based on the adaptive capacity wheel (Gupta et al., 2010), and the model of governance, Pahl-Wostl (2009) explains that governance of CCA is still stuck in a single-loop process and given that is the situation in Southeast Florida it is valuable for actors to learn through organized processes of learning networks. Learning networks such as workshops, media, and educational programs could help to advance the learning capacity and move from single to double-loop learning (Gupta et al., 2008). In connecting learning networks with loop learning, it is assumed by Pahl-Wostl (2009) that interactions in formal policy cycles are mainly limited to single-loop learning and informal learning networks are required to support double-loop or even triple-loop learning. Pahl-Wostl (2009) explains that learning networks could be tolerant based of membership, power of actors and the relations. These networks support learning by delivering entrance to new types of knowledge and by backing multiple ways of understanding. However, Pahl-Wostl (2009) further explains that networks may also be selective based on the population dynamics and that membership to a learning network could possibly not be representative and their sincerity of addressing an issue of public interest could face challenges (Pahl-Wostl, 2009). For this research, it will examine the learning network component of triple-loop learning since it identifies a component of improved learning. Future research could examine the learning loops more specifically, but this study will be limited to identifying whether triple-loop learning exists in Southeast Florida.

The perception of risks of climate change plays a key role in governance capacity and indicators of learning capacity will be used to understand: 1) the perception of risk of SLR in Southeast Florida among citizens based on surveyed citizens and responses from interviews (Bolter, 2014; Interviews, 2015), and 2) examine the extent of which learning networks focused on education of the risk of SLR in Southeast Florida.

4 Methodological Design

4.1 Methodology

Grounded on theory, it is important to develop a plan to collect the data for this research and this chapter is the creation of that. This chapter looks ways in how the research methods were selected for this research. A selection of strictly quantitative or qualitative data analysis for this research did not seem appropriate, but rather a combination of the two. Yin (2013) differentiates between the two traditions in that quantitative methods relies heavily on statistics and numbers, while qualitative research helps to understand a certain behavior or behaviors. Qualitative research allows the researcher to search into the perceptions of the participants to comprehend the topic in a more profound way (Yin, 2013).

For example, the various sub-questions types in this research required both the use of qualitative and quantitative data analysis and for example the sub-questions, "*What are the potential economic, environmental and societal, impacts of SLR inundation in Southeast Florida?"* could for the most part be answered with obtainable (secondary) quantitative and qualitative data collection relating to the inundation of SLR impacts. Whereas, another sub-question, "*What are the main barriers and opportunities to the governance capacity of Southeast Florida that could weaken or strengthen the efforts to adapt the region to SLR?"* will require primarily qualitative data analysis and probe into the perceptions of key informants along with additional document analysis.

This research will be comprised primarily through the use of qualitative data, though several aspects of the methods will be supported by secondary quantitative data from supplementary sources. Therefore, in obtaining the necessary data to develop conclusions for this research a mixed methodology, will integrate both qualitative and quantitative data. As explained by O'Leary (2010:128), "mixed approaches can help you capitalize on both quantitative and qualitative traditions and overcome many of their shortcomings." A mixed approach is helpful in constructing a wider portrayal of the issue at hand by complementing depth and insights from 'numbers' through an addition of dialogue, and accounts (O'Leary, 2010). Formed on the ideas of mixed approach, this research will be developed on the qualitative perspective with an acceptance of quantitative data and O'Leary (2010) describes that the basis for this perspective is constructed on in-depth analysis through a qualitative framework. However, O'Leary (2010) further mentions

that the inclusion of quantification in the forms of surveys, quantifying qualitative data or merely searching available data can help complement a research study.

A question driven perspective has been employed in this research and (O'Leary, 2010:129) states, "It simply asks what strategies are most likely to get credible data needed to answer the research question and sees you adopting whatever array of strategies can accomplish the task." In table 4.1 the data and methods that were considered essential to answer each research objective of the four sub-questions are described below. Section 4.2 will reflect in further detail on the methods that were used in order to collect appropriate data to answer the research questions.

Table 4.1: Objectives, data and required methods (author)

Research objective	Type of data required	Methods
Identify the potential economic, environmental and societal impacts of SLR inundation in Southeast Florida.	Qualitative data: to explain and check quantitative data	Document analysis
Identify governance arrangements that presently exist in regard to CCA of SLR and what is the overall governance capacity in Southeast Florida on these issues	Qualitative data: observations and accounts	Document analysis and interviewing process
Identify the main barriers and opportunities related to each sub-capacity of the governance capacity in Southeast Florida	Qualitative and quantitative data: secondary data analysis Qualitative data: observations and accounts	Refer to surveys, and organizational records Document analysis and interviewing process
Identify based on barriers of governance which type of governance conditions should be used to improve overall capacity	Qualitative data: observations and accounts	Document analysis and interviewing process

4.2 Methods

The methods that are described in the table above make it evident that different types of data collection techniques were used. The mixed approach of data collection can help overcome many of their limitations and work to compliment one another's deficiencies (O'Leary, 2010). "In research terms, the desire to use multiple sources of data is referred to as triangulation" (Mills, 2003:52). Yin (2013) explains that it is beneficial to use different data collection techniques to increase the quality of the overall results and in the table 4.2 Yin (2009) describes four different types of triangulation.

Table 4.2: four types of triangulation (Yin, 2009)

Types of triangulation
Data source (multiple data sources)
Investigator (multiple investigators)
Theories
Methodological (multiple data collection methods)

Based on Yin (2009), this research used methodological triangulation in the forms of document analysis, in-depth interviews and the use of multiple data sources. These methods will be described below. Going forward with the methodological triangulation, this research will need to be evaluated and the technique of coding was conducted to identify indicators from the document analysis and interviews of each sub-capacity of governance. The interviews were coded for language that revealed major concerns related to governance capacity, varying definitions of the problems, and views of how issues should be dealt with.

4.2.1 Document analysis

One of the main sources of qualitative information for this report comes from a widespread document analysis. As stated by O'Leary (2010:223), "a document analysis is a collection, review, interrogation, and analysis of various forms of written text as a primary source of research data." A document analysis provides contextual information for this research study, though O'Leary (2010) highlights that it is important to take into account the matter of subjectivity of the authors. The level of subjectivity of the documents can jeopardize the legitimacy of this research as well as the researcher depending on how I interpret the literature (O'Leary, 2010). In extracting the data from the documents it is valuable to refer to questions about the document type, tone, agenda, and political purpose (if policy report) while choosing

which documents to use in this research (O'Leary, 2010). Therefore, document analysis is a valuable tool, however on several topics in this research confirmations were elucidated further through interviews.

For this research, there are two different types of literature that were used, the first being academic journals and books. The second type of literature that was analyzed in this research was based on policy documents. The majority of the literature that was engaged in this research was from academic literature. Completed Ph.D. dissertations on the topic of SLR in Southeast Florida, such as "Perceived Risk versus Actual Risk to Sea-Level Rise" by Bolter (2014) and "Socio-ecological Vulnerability to Climate Change in South Florida" by Eisenhauer (2014) provided valuable assessment for document analysis. The other type of literature used in this research came from government and other types of policy documents. Several of these documents were very helpful in delivering theoretical concepts, though, the bulk of them were most suitable for offering insights from the practical realm. An example of a useful policy report is the "Florida Water Management and Adaptation in the Face of Climate Change" (2011) produced by a collaboration of researchers at the University of Florida and provides valuable outlooks on the issue of SLR from an objective observation. These reports, among others have presented my report with valuable demographic data, which is useful for explaining numerous types of information.

4.2.2 Secondary data analysis

There is an abundant amount of quantitative and qualitative data in censuses, large-scale surveys, and organizational records which can assist in responding to research questions and O'Leary (2010:226) defines secondary analysis as the, "collection, review, interrogation and analysis of existing data sets in order to answer questions not previously or adequately addressed." To address the first research objective, "identify the potential economic, social and environmental impacts of SLR inundation in Southeast Florida" mostly secondary quantitative and qualitative data was collected. This data was for the most part presented in tables, graphs and maps to validate the potential economic, environmental and social impacts from SLR in Southeast Florida.

The US Census, South Florida Regional Planning Agency (SFRPA) and Southeast Florida Regional Climate Compact (SFRCC) were discussed in this research as well as the large-scale survey results on risk perception (Bolter, 2014) in Broward County, Florida. The US Census provides this research with valuable demographic information, relating to poverty, age and

density indicators, while the SFRPA and SFRCC deliver data particularly for the Southeast Florida region.

Secondary data is valuable to this research process as it has allows oneself to pass by the data collection process and to use data and sample sizes that otherwise would not be attainable had researcher had to conduct it oneself (O'Leary, 2010).

4.2.3 Interviews

Interviewing is a technique of data collection that includes researchers pursuing open-ended responses associated to a number of queries and themes (O'Leary, 2010). Interviews are a suitable way to attain material that cannot be located in a document analysis and (Darke et al., 1998:283 in: Baškarada, 2014) explains, "interviews should only be used to obtain information that cannot be obtained in any other way." The interview format for this research was semi-structured interviews, which comprised of a adaptable format, in which interviews can initiate with a set-questioning plan but be adjusted to fit the natural path of discussion (O'Leary, 2010). The main benefit of semi-structured interviewing over structured ones is that one is able to acquire the projected data, though also gain unanticipated data that emerges (O'Leary, 2010).

For this research, a total of nine people were interviewed which is displayed in table 4.3. Interviews were conducted with people from diverse backgrounds and skills to increase the knowledge of the researcher on governance capacity in Southeast Florida (information on the respondents is provided in table 4.3). This procedure of field research is indicated as qualitative research, which is a type of observation research, which is difficult to condense into numbers (Babbie, 2010). A semi-structured interview process was conducted in the format of three, one-to-one interviews over Skype and a group of six people were interviewed in a round table format. In the appendix one general interview guide is provided. The choice of a semi-structured interview guide was chosen to have a basis of themes and questions to answer, though allowing room for the interviewee to alter the discussion if appropriate. I developed an interview guide, which has several questions that were divided into themes, which stayed the same across the interviews, but the exact questions were tailored to the particular interviewee. Thus, when comparing the results of the interviews there was a general theme across all of them. These interviews were voice recorded and transcribed. By transcribing the interviews, the transcripts (example transcript in appendices) were then coded for key terms in relevance to the governance capacity of Southeast Florida.

Table 4.3: List of interview respondents

Respondent	Specific/non-specific organization	Method/Date of interview
Governance leader 1	Public-private-partnership (Florida)	In-person (round table interview) May 15, 2105
Environmental Lawyer 1	Attorney (Florida)	In-person (round table interview) May 15, 2105
Landscape architect	Landscape Architect (Florida)	In-person (round table interview) May 15, 2105
Professor 1	Professor (Florida)	In-person (round table interview) May 15, 2105
Environmental Lawyer 2	Law Practice (Florida)	In-person (round table interview) May 15, 2105
Professor 2	Professor (University of Southern California)	In-person (round table interview) May 15, 2105
Robert Daoust	Arcadis US (Florida)	Skype June 1, 2015
Edgar Westerhof	Senior Planner at Arcadis US (New York City, NY)	Skype June 8, 2015
Henk Ovink	Special Envoy for International Water Affairs (NL)	Skype June 16, 2015

In the interview setting there were two formats used and the approach of interviewing one-on-one versus in a group format have several differences, and O'Leary (2010) explains that one-on-one interviews allows the researcher control over the process and interviewees freedom to express his or her own thoughts. O'Leary (2010:195) further explains that, "one-on-one interviews conducted over the telephone have a lack of non-verbal cues that can be a challenge." The (three), one-on-one interviews were all conducted over Skype, and O'Leary's (2010) statement about control of the interviewer over the interviewee could possibly be shifted as the people are not meeting in person, which could shift the power dynamics. O'Leary's (2010) statement about telephone calls

also has validity with Skype, since compared to discussing in person it lacks the same non-verbal cues.

The other type of semi-structured interviews came in the format of a 1.5-hour group interview with a group of six American professionals from the US-Netherlands Connection Professional Policy Program. The focus of their research was to gain insights into Dutch coastal resilience technology and the thought process behind it. These interviews was conducted at the UNESCO-IHE Institute for Water Education in Delft, NL and gave myself a unique opportunity to interview Americans, five of which were from South Florida and from various professional backgrounds ranging from environmental lawyers, professors, and Governance Leader. However, steering interviews with more than one individual at a time can be completed in a formal structured way that tries to obtain independent opinions of every individual or may include a more open procedure which lets respondents to discuss with one another (O'Leary, 2010). For this group interview, a semi-structured format was regarded as the most suitable and followed an arranged format of questions, though permitted for a natural flow in discussion, which sometimes diverged from the plan in order to pursue interesting tangents. It is important to note that the group format, like Skype interviews can have some disadvantages, as some members may feel unheard or marginalized in this format (O'Leary, 2010). Therefore, it must be mentioned that the way in which the interview was formatted in a group format could have had an influence on the responses that were given, compared to if each interviewee was interviewed in a one-on-one format.

4.2.4 Reflection on interviews

Based on the main research question, it was suitable to interview various people from Southeast Florida engaged in the topic of adaptation to SLR. The basis was that by interviewing people from various fields, including, private companies, universities, government, and non-profits would have diverse opinions on the governance capacity to adapt to SLR in Southeast Florida. As predicted, there were some opposing perspectives between respondents, which helped deliver a more comprehensive understanding of governance capacity in Southeast Florida. Based on the diverse number of respondents from varying fields, there is no reason to believe that the results are subjective. However, this research lacked the ability to gain the perspective of citizens living in Southeast Florida due to travel constraints and this issue was addressed to a degree by the use of document and secondary data analysis to provide further evidence for components of the governance capacity framework.

4.3 Positionality of research

Research positionality is important in all research types and according to (Herr and Anderson, 2015:37) "positionality means asking the question 'who am I in relation to my participants and setting'?" In this section I will address this question posed by Herr and Anderson (2015) as I conducted interviews in the Netherlands as an American citizen from the New York region with various people from Southeast Florida visiting the Netherlands as well as the interviewing of several Dutch citizens over Skype. As a US citizen, it could have helped ease the discussion with the group of Americans as we are both from the same country, rather than had I been from another country, which could have led to a greater disconnect. However, it is important to mention that my research was focused on the Southeast Florida context, which was relatively unfamiliar to me prior to my research, as I live in a different region of the US. The setting of the interviews is valuable for the positionality of this research. The setting of the group conversation could have also influenced the outcomes of the discussion since it took place in a foreign environment, rather than in a setting that respondents are more familiar to back in the US, such as their office space. Regarding the three one-on-one Skype interviews, the setting is also valuable because the respondents were all located in the US, while I was in Europe. It is also valuable to mention that since they were being interviewed from their own offices it could also allow them to be more comfortable in their setting, rather than if it was in a neutral environment.

4.4 Research ethics

In my interview process it is also important to mention the ethical implications of my research. Prior to the group interview, I explained to the interviewees that this research is for my master thesis as well as for an internship at Arcadis. In the interview of the two Arcadis employees it could have supported our conversation as we are both working for the same company and share a mutual interest. However, in the group interview it could have been viewed as a disadvantage, in that some others that I interviewed may have felt more reserved, than had my research been only conducted for a master thesis alone. Especially between the two academic professors in the group discussion, they both expressed their reservations about being interviewed since the research was being combined with an Arcadis internship. For this reason, the members of the group interview came to a consensus prior to the interview that their field of work could be shown in my research; however no specific names were to be shown. So, for this reason, when direct quotes from this group interview are used, they will be given generic names, such as Lawyer 1 or Governance Leader 1. Among the three one-on-one interviews, two of which are Arcadis employees, there were no reservations on direct quotations and their names will be shown

5 Findings

This chapter will discuss the findings based on the research sub-questions "*What governance arrangements presently exist in regard to CCA of SLR and what is the overall governance capacity in Southeast Florida on these issues?"* and "*What are the main barriers and opportunities to the critical aspects of governance capacity of Southeast Florida that could weaken or strengthen the efforts to adapt the region to SLR?* The findings of these research questions are based on data collection of the four components of governance capacity (and their sub-components) to identify the barriers and opportunities in each of these four components. Section 5.1 will describe the findings on managerial capacity, while 5.2 will focus on the political capacity. Furthermore, section 5.3 will compile and explain the main findings on the barriers and opportunities of the managerial and political capacity. The findings on resource and learning capacities will be explained in section 5.4 and 5.5, while section 5.6 describes the overall barriers and opportunities to governance capacity based on these two capacities. In order to respond to the sub-*question "What governance recommendations could be constructed from existing barriers and opportunities to improve governance capacity in Southeast Florida?"* Section 5.7 will then express findings on which overall barriers and opportunities should be improved on based from selected governance conditions to progress the overall governance capacity. After this selection, this research will subsequently shift to a discussion in chapter 6 on the most suitable governance conditions based on theory and findings to improve these overall barriers to governance capacity in Southeast Florida.

5.1 Managerial capacity

This section will describe findings on the integration, organization and use management strategies to better understand the barriers and opportunities toward the managerial capacity in Southeast Florida. The integration of adaptation will look at whether horizontal policy integration of CCA planning exists at the local, regional and state level. Subsequently, 5.1.2 will analyze the multi-level organization between the local, regional and state level, while 5.1.3 will address specific management tools and strategies used for CCA in Southeast Florida. Integration of adaptation to SLR into governance of Southeast Florida

5.1.1 Integration of adaptation

The following analysis will look at the extent to which adaptation to SLR is integrated at the state, regional and local level. This section will investigate whether a collaborative approach, in

which political institutions, organizations and citizens standing at various ranks of governance are derived together to examine, cooperate and conciliate while establishing new policies and plans (Bauer et al., 2011). It is important to mention although this research is focused on the regional level of Southeast Florida, Termeer et al. (2011) explains that it is important to not exclude local and state actors from adaptation strategies and therefore the following section will be divided into an analysis of the local, regional and state in integrating SLR adaptation strategies.

Local level

On the local four- county level of Southeast Florida (Miami-Dade County, Monroe County, Broward County, and Palm Beach County) Daoust and Governance Leader 1 explained that Miami-Dade and Broward County received the most notoriety for being the leaders in SLR adaptation. In 1990, Miami-Dade County was a founding member of the International Council for Local Environmental Initiatives (ICLEI) and in 2006, Miami-Dade became a pioneer in SLR adaptation strategies with the implementation of the Climate Change Advisory Task Force (MDCCATF), the first of the four counties to implement a task force. The MDCCATF was developed to look judicially at climate change impacts and inform the Board of County Commissioners on potential mitigation and adaptation actions to respond to these impacts (Eisenhauer, 2014). The MDCCATF is an example of horizontal policy integration, as it is comprised of 25 members and seven committees acting for different sectors, which are agreed upon from the Mayor, Commissioners, and County Manager. Among the seven committees, they comprise over 150 members which go over climate change adaptation and mitigation strategies that focus on the built environment, economy, and natural system (Score, 2010). The MDCCATF has diverse organizations involved within Miami-Dade County, which includes the Steering Committee, the Built Environment and Adaptation Committee, the Economic, Social and Health Adaptation Committee, the Greenhouse Gas Reduction Committee, the Intergovernmental Affairs Committee, the Natural Systems Adaptation Committee, and the Science Committee (Bolson, 2010). These committees collaborate to develop a consolidated report on how the area can address and respond to climate change. Following after the MDCCATF, the three other counties followed suite and have developed climate change task forces as shown in Table 4.5, Miami-Dade has further developed a specific SLR task force started in 2013. Among the task forces, the roles of each task force are to create mitigation and adaptation recommendations for the county government, which can help them cope with climate change impacts (Score, 2010). According to Score (2010), MDCCATF was the first task force to release a report of recommendations in 2010, which included mitigation and adaptation strategies. These include strategies to conduct climate

change education and outreach and integrate climate change impacts into the County's comprehensive plan.

Table 5.1: Climate change adaptation task forces in each of the four counties of Southeast Florida (SFRCC, 2011)

Task force	Year established
Miami Dade County Climate Change Advisory Task Force (MDCCCATF)	2006
Miami-Dade Sea Level Rise Task Force (MDSLRTF)	2013
Broward County Climate Change Task Force (BCCCTF)	2008
Monroe County Climate Change Advisory Committee (MCCCAC)	2011
Palm Beach County Go Green Climate Change Initiative	2012

Each of these task forces has expressed the significance for developing SLR adaptation strategies among their objectives (SFRCC, 2012). The expansion of the climate change task forces in Miami-Dade in 2006 and Broward into 2008 signaled towards a regional joint initiative of adaptation strategies and the Southeast Florida Climate Compact (SFRCC) was established in 2009 (Interview Governance Leader 1, 2015). In interview, Daoust (2015) indicated that since the counties were merged together in 2009, they have worked collectively through the SFRCC and it has actually spurred more attention to the issues than each individual county level government could have received. Furthermore, the respondent added that through collective thinking each county would have a stronger voice, which is why they are investing heavily in the SFRCC (Interview Daoust, 2015). Therefore, the next section will explain the findings on the integration of SLR adaptation at the regional level between the four counties through the regional governance structure of the SFRCC.

Regional level

The integration of CCA planning on the city level, such as in New York City and San Diego have developed CCA strategy plans, however Southeast Florida was the first multi-county region to do so (Eisenhauer, 2014). While adaptation strategies vary from county to county, Governance

Leader 1 explained that the SFRCC has accepted that the region is an integrated system and demonstrated the requisite for horizontal collaboration across county borders. The respondent further explained that the regional approach to addressing SLR is the most appropriate means in developing adaptation strategies for SLR and that the SFRCC presents a new type of regional climate governance designed to allow local governments to set the agenda while obtaining support from state and federal agencies (Interview Governance Leader 1, 2015). According to Adams and Gregg (2010) Southeast Florida has become a model for regional cooperation on the issues of CCA and further expressed that the counties have been able to put aside their differences and work as a cohesive unit on what is a difficult and sometimes controversial issue of CCA planning. SFRCC calls for the counties to work cooperatively and table 5.2 shows the overall objectives of the Compact.

Table 5.2: Objectives of the SFRCC (Adams & Gregg, 2010).

SFRCC Objectives
develop a climate response strategy for the region;
encourage federal funding to support regional action;
develop a coordinated response to proposed state climate legislation and policies; and
dedicate staff time and resources to create a Southeast Florida Regional Climate Change Action Plan to include mitigation and adaptation strategies

State level

Based on the interviews and document analysis, the lack of integration of CCA strategies at the state level has been expressed as a main barrier to improving the governance capacity to adapt to SLR in Southeast Florida. Prior to current Governor Rick Scott (2011-2017) was elected governor, there was a period (2007-2009) when adaptation to climate change in Florida was being given more attention under Republican Governor Charlie Crist (Interview Environmental Lawyer 2, 2015). In July 2007, Crist joined several other United States governors to take significant legislative action by signing a climate policy into force for the state of Florida. The executive orders signed by Crist described long term greenhouse gas reduction goals, and insistent action in tackling the adaptation to climate change, and therefore established a state Action Team on Energy and Climate Change (FECC) to organize these efforts (Isaac, 2007 in: Bolson, 2010). A policy report was produced by the FECC called the Florida's Energy & Climate Change Action Plan (FECCAP) and published in 2008 (FECCAP, 2008). Within the FECCAP, adaptation

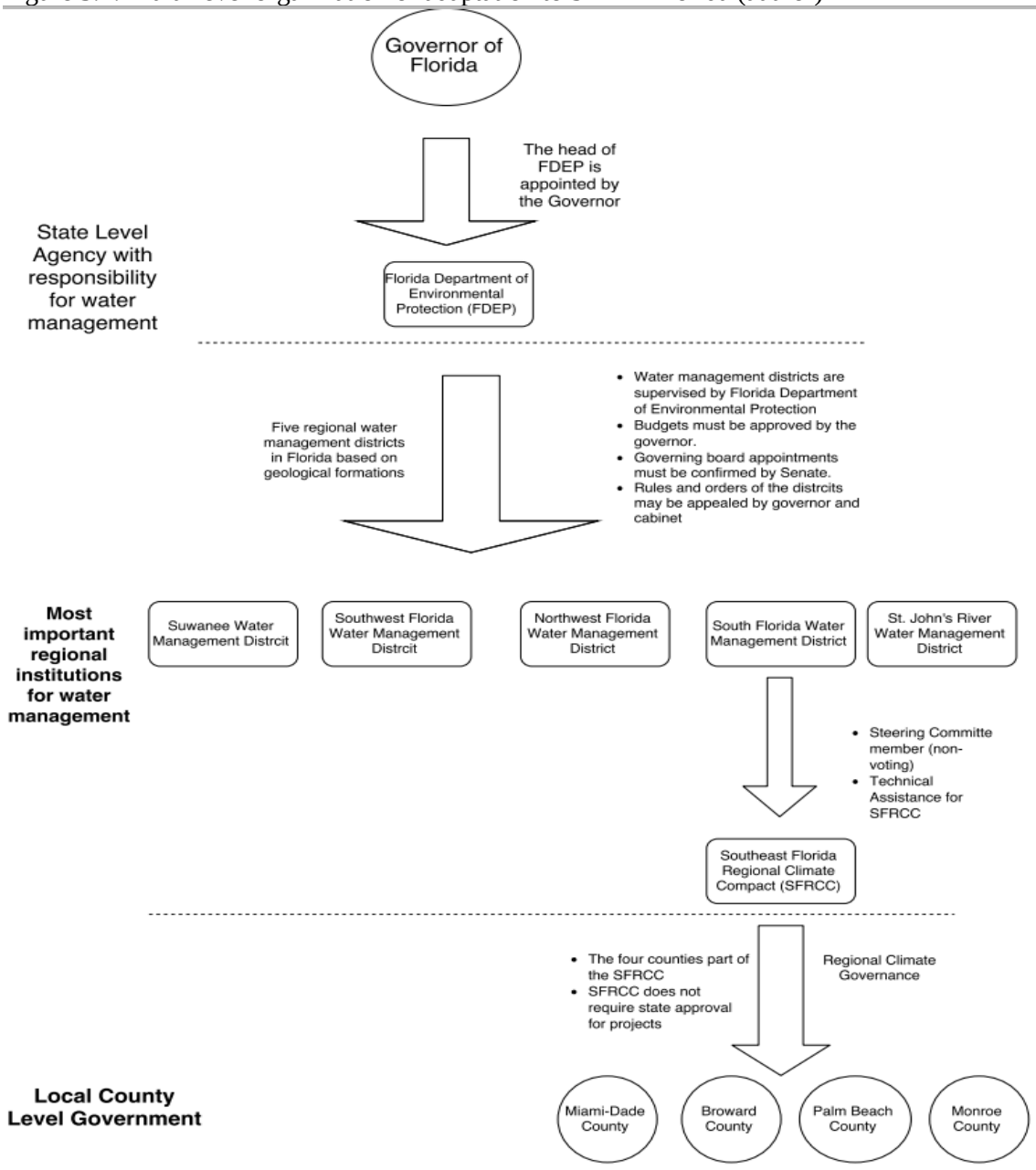
strategies associated with climate change was a main component of the plan. However, the FECCAP recommendations from 2008 have yet to be implemented, which according to one respondent has been caused by the decisions of Governor Scott, who took office in 2011 (Interview Governance Leader 1, 2015). Eisenhauer (2014) further substantiated this claim and mentioned that Governor Scott repealed the FECCAP recommendations in 2011 after entering office and decreased the states' involvement in adaptation strategies for climate change. Governor Scott was mentioned in the interviews as being destructive for making progress regarding CCA on the state level. Scott is a right wing politician who was elected governor of Florida in 2011 and reelected to serve a second term in 2014 till 2017.

Furthermore, all respondents expressed that the state government is lacking in overall involvement regarding the development of CCA strategies. Two respondents expressed that based on policies of Governor Scott, they do not think that regional CCA plans in Southeast Florida will be enacted until Governor Scott leaves office when his term ends in 2017. Furthermore, Governor Scott appoints the Lieutenant Governor, and Scott appointed Republican Carlos Lopez-Cantera in 2014 and will serve his term until 2017. (Environmental Lawyer 1, 2015; Environmental Lawyer 2; Governance Leader 1, 2015). Based on the findings it appears as though the state government is disconnected with CCA planning. Building on these results, the next sub-section (5.1.2) will analyze the interaction and organization of governance between levels in Southeast Florida and therefore identify whether the state is controlling policies of CCA planning of institutions at lower levels.

5.1.2 Organization of adaptation

As described above on the integration of SLR adaptation at the local, regional and state level, this will examine the extent of multi-level organization between each level. Building on theory of horizontal and vertical coordination (Bauer et al., 2011) and the multi-level concept (Rip and Kemp, 1998; Geels and Kemp, 2000; Loorbach, 2010) will be useful in indicating the organization between different governance levels. Given this cross-disciplinary nature of climate change and associated adaptation responses, adaptation to climate change involves many levels of decision-making (Wolf, 2011 in: Bauer & Steurer, 2014). Grounded on this theory of multi-level organization, the figure below shows the organization between state, regional and local level in Southeast Florida, which is based on findings from the interviews and document analysis in Southeast Florida.

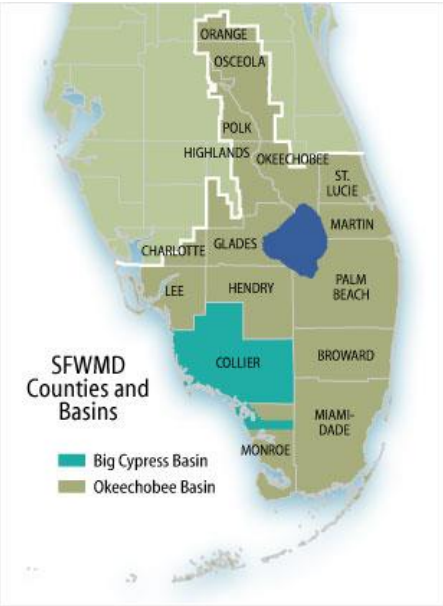
Figure 5.1: Multi-level organization of adaptation to SLR in Florida (author)



The organization of responsibilities for addressing CCA in Southeast Florida is explained here in Figure 5.1, in showing that the power is top-down from the state to the regional water management district (WMD). The 1972 Florida Water Resources Act (Chapter 373 of state statute) produced Florida's five water management districts (WMDs) along hydrologic boundaries to deliver four key services: upgraded water quality, flood control, reliable water supply, and restored natural systems (SFWMD, 2006 in: Bolson, 2010). Each of the five WMD's is governed by a nine member Governing Board (GB) whose members are appointed by the

Governor and approved by the Florida Senate for four-year terms (Scholtz and Stiftel, 2005). These findings represent a top-down structure, in which the state government is controlling the regional WMD's. The four counties of Southeast Florida (Broward, Miami-Dade, Monroe, Palm Beach) are part of the South Florida Water Management District (SFWD) which encompasses an area covering entire or sections of sixteen counties in Southern Florida and a total of 16,164 square miles, and are shown in figure 5.2. The SFWMD area is the geographically largest WMD in the state and a population of 7.5 million residents (43% of the state population). A total of 1,800 people work for the WMD and in 2010 it had a fiscal year budget of $1.5 billion (SFWMD, 2010 in: Bolson, 2010). The SFMD is a steering committee partner with the SFRCC and provides technical assistance to the SFRCC (SFRCC, 2013).

Figure 5.2: Map of South Florida Water Management District (SFRCC-IMVA, 2012)



During the interviews, the influence of the Governor Scott and the state government on the WMD's was discussed (as mentioned in the previous sub-section). Moreover, several respondents expressed that the Governor Scott is strongly influencing the direction of the five WMD's throughout Florida. In the group interview, one respondent adamantly voiced that under the current state government administration they do not think that the SFWMD will be conducting research on SLR adaptation until Rick Scott is out of office in 2017 and the five others in the group agreed with the statement. However, the respondent further explained that the SFRCC, which is different from the SFWMD, have the power to ratify CCA policies without approval from the state of Florida since they have the four county commissioners that can enact legislation

(Interview Governance Leader 1, 2015). Environmental Lawyer 2, who is a resident of Palm Beach County, Florida within the SFRCC jurisdiction, communicated support of the regional adaptation approach of SFRCC and explained that at the local level of CCA, each of the four counties can do little in terms of adaptation projects, however at the scale of the SFRCC Regional Climate Action Plan (RCAP) adaptation could actually be realistically implemented. In a one-on-one interview with Daoust, the respondent explained that the importance of local government should not be overlooked and county level governments have driven power on CCA. Though, the respondent emphasized that since the counties were merged together into the SFRCC it has spurred more attention to the issues than he thinks individually each county government would have received. Furthermore, the respondent remarked that the four counties have a stronger voice in the SFRCC, which is why they indeed are investing heavily in it (Interview Daoust, 2015).

Based on these findings, it indicates the state government influences the control of the regional WMD's. Bolson (2010) came to similar findings after conducting research on water resource decision-making in South Florida for a Ph.D. dissertation at Florida State University. She found that there have been worries about climate change impacts on water resources in Florida for decades; however the WMD's inability to act without the approval of the Governor's Office to examine climate change issues is a huge limitation on developing CCA strategies at the regional level. Additionally, Bolson's (2010) research supported several statements made by the respondents and expressed that the influence of the state level has the power to direct how regional and local level water agencies consider climate policymaking, such as the five WMD's.

This current research has shown that the autonomy of SFRCC is acting as an opportunity because they can act without the authorization of state government, however it could face the influences of its steering member, the SFWMD, which is shaped by the state government. These findings on the organization of adaptation between the state, regional, and local has explained the complexities of multi-level interactions regarding CCA and exposed an intricate governance system that has numerous barriers.

5.1.3 Use of management tools and strategies

The third critical aspect is concerned with the use of management strategies and tools to manage CCA in Southeast Florida. This includes the analysis of management strategies and tools to promote the effectiveness of governance of CCA in Southeast Florida. On the local level, the MDCCTF mandated in 2010 that all county departments incorporate climate change mitigation

objectives including decreasing greenhouse gas emissions in their strategic plans and limiting land uses in areas at risk from SLR as well as a county-wide education and outreach program on climate change (MDCCTF, 2010 in: Eisenhauer, 2014). However, according to Eisenhauer (2014) recommendations for large-scale adaptation planning for SLR and public education did not yet happen in Miami-Dade County and suggests that activity of the MDCCTF has shifted to the regional SFRCC.

At the regional level, the main adaptation strategy plan that is employed by the SFRCC is the RCAP and each of the task forces in the four counties are involved (see Table 5.1). The RCAP provides a regional framework for mitigation and adaptation measures to prepare for the impacts of climate change on Southeast Florida and according to Eisenhauer (2014) it is the most comprehensive regional effort to deal with CCA to date in the US.

"The overall objective of the RCAP was and remains to integrate climate adaptation and mitigation into existing decision-making systems and to develop a plan that can be implemented through existing local and regional agencies, processes and organizations (RCAP, 2012:vi)

The development of the RCAP included a diverse group of people aside from government employees, including more than 90 people from non-profit organizations, PPP's and universities, who took the time to submit comments to a previously published draft (RCAP, 2012). In contrast to the Room for the River projects in the Netherlands, which is a prime example of multi-level governance adaptation strategy effort, which involves the coordination of local, regional, NGO's and citizens (Termer et al., 2011). The RCAP represents an example similar to the Room for the River project, in that it comprises collaboration from diverse sectors with the goal of developing adaptation strategies. Regarding SLR adaptation, the RCAP section, which refers most to SLR adaptation, is "Sustainable Communities." Based on the 17 recommendations, 10 of them are concentrated on adaptation to SLR (Bolter, 2014). In the group interview, the RCAP was discussed and according to Governance Leader 1, a member of the SFRCC, expressed that there are now great challenges associated with turning the RCAP recommendations into reality and that implementations will require greater financial resources and long term visions from politicians. Not a single recommendation from the RCAP has been implemented as of 2015, since the RCAP was decreed in 2012. Furthermore, Governance Leader 1 indicated that MDCCTF and RCAP are not able to implement the recommendations and states, *"both the MDCCTF and SFRCC are having to butt heads* with *organizations such as the realtor organizations or the building organizations that don't want to move fast or forward. They are worried that long term plans and*

projections might involve the devaluing of property in Southeast Florida" (Interview Governance Leader 1, 2015). This statement can be further substantiated by Eisenhauer (2014) who indicated in an interview with a Miami-Dade county official about the MDCCTF CCA recommendations and received a parallel response in that builder and real estate associations have influenced the decision making since they did not want the county to develop adaptation planning strategies because of the possible impact on the industry.

5.2 Political capacity

This section will present findings on the critical aspects of accountability, transparency, political will and leadership to cultivate an understanding of the barriers and opportunities of the political capacity in Southeast Florida. Through an understanding of these critical aspects it will help to identify the limitations of the political sphere of governance in Southeast Florida associated with CCA.

5.2.1 Accountability and transparency

Indicators of accountability that were analyzed include the existence of an open and transparent CCA planning process. Based on the acquired results from interviews and document analysis it has been deemed appropriate to group together accountability and transparency of governance capacity in Southeast Florida. Tanner et al. (2009) emphasizes that a governance system should be committed to maintaining a relationship of accountability to its citizens and transparency in terms of the management of its programs. Based on document analysis and findings from the interviews it has been found that accountability is incapable to achieve without incorporating transparency. Therefore, in this sub-section it has chosen to combine accountability and transparency together into one section of the findings.

In the context of the SFRCC, the transparency was found to be quite low. In the group interview, there were a total of six respondents and it was mentioned that they all currently live within the four counties, excluding for one person who was from California. The one interviewee from California, therefore was not able to respond in the questions specifically to the context of Southeast Florida, but gave more general responses. For further research into transparency, document analysis was analyzed based on Bolter's (2014) research on the perceived risk of SLR in Broward County, Florida through the use of 487 online surveys. Bolter (2014) states based on this margin of error, this sample size is considered to be representative of the demographic population of Broward County (1.82 million), which presents similar demographics to the region

of Southeast Florida. Regarding transparency, her findings on the SFRCC showed interesting results on the usage of the term SFRCC. In the survey there were 401 results for the optional question that asked: *"Which sources of information, if any, do you feel have informed you the most about sea-level rise?"* Of this open question, the results in Table 5.3 showed the word count for national, regional, county and city level groups based on times it was mentioned (Bolter, 2014).

Table 5.3: Information sources regarding SLR (Bolter, 2014)

	Group	Word Count
National	National Oceanic and Atmospheric Administration (NOAA)	9
	Union of Concerned Scientists (UCS)	4
	National Aeronautics and Space Administration (NASA)	3
	Federal Emergency Management Agency (FEMA)	3
	U.S. Green Building Council (USGBC)	2
	US Environmental Protection Agency (EPA)	2
Regional	Southeast Florida Regional Climate Compact (SFRCC)	7
	Seven50	2
	Southeast Florida Regional Planning Council	1
County	Climate Change Task Force	4
	Local Mitigation Strategy	1
	Technical Advisory Committee	1
	Broward County Planning	1
	Broward County Water Resources Task Force	1
City	Fort Lauderdale	3
	Hollywood	2
	Cooper City	1
	Pembroke Pines	1

Members of the public were surveyed, and based on the overall demographic information of Broward County the margin of error for the sample size was 4.44% at $\alpha = 0.05$. Based on these results, the SFRCC received the second most mentions of any group aside from NOAA. Bolter (2014) expressed that although one specific information source was not written in the surveys by a significant number of people, it shows that a limited number of the public are aware of the SFRCC in Broward County or decided to mention it, however Bolter (2014) expresses that it still shows rather that there is rather low awareness of the SFRCC overall. Among the other two regional organizations, it should be mentioned that Seven50 (seven counties, 50 years) is a blueprint for regional economic development, while the Southeast Florida Regional Planning

Council (SFRPC) is a planning and public policy agency (Bolter, 2014) and both of which collaborated with the SFRCC in developing the RCAP (RCAP, 2012).

This research will now look at the accountability and transparency of the largest annual meeting on CCA as it was mentioned in the interviews and document analysis. The conference is a regional summit called the Southeast Florida Climate Leadership Summit (SFCLM), which is coordinated by the SFRCC, which is designed to gather key partners to hear about new developments, ideas, and research relating to regional climate impacts for the four counties (Eisenhauer, 2014). The first summit was held in 2009, and 2015 marks the 7th annual meeting in December (SFRCC, 2015). The summit attracts speakers from academia, private research groups and federal agencies and also serves as panelists on CCA topics. As the main regional climate summit in Southeast Florida, among the nine respondents, only Daoust and Governance Leader 1 were aware of its existence while the other four Floridians that were interviewed all mentioned that they were surprised to hear of its existence annually since 2009. Governance Leader 1, who has attended the conference in past years expressed that the publicity around the summit was very poor and unattractive to citizens due to its cost of $250 for three days. Eisenhauer (2014) who has conducted research on the Summit argued that the transparency of SFRCCC activities are inadequate and that the annual summits are open to the public but there is a considerable fee to attend. Furthermore, they are held during the working day, as well as not being publicized and receive minimal media attention. Eisenhauer (2014) claims that these factors mentioned above greatly hinder the number of representatives of the public who attend the summits each year.

5.2.2 Political will

In this sub-section, the extent of political support for CCA in Southeast Florida will be analyzed, and it will address the possibility of developing long-term adaptation strategies, given the short-termism of the politicians influence on political will. In the interviews, when questioned about political will in Southeast Florida to establish CCA strategies, the interviewees routinely responded with specific names of politicians at the city and county level who are strongly supporting proactive responses to SLR. Among the political support of CCA, Broward County government was mentioned numerous times in the interviews and was explained as having the greatest political support of any of the four SFRCC counties. Bolter (2014) explains that Broward County has become a leader in coastal hazard planning and has established a set of goals and objectives to manage the impacts of climate change. In one interview, Daoust (2015) explained that the strong political support of CCA in Broward County is due to the fact that climate change

task force commission members have no term limits, while Miami Dade County requires term limits on task force members. Daoust (2015) explained that the lack of term limits in Broward County allow the members to focus more on long-term CCA recommendations than in Miami-Dade. However, the respondent further mentioned among politicians that the political will is still limited among the four counties as there is continued focus on short-term political goals, which are conflicting with the need for long term adaptation objectives. Moreover, the political response at the moment to SLR in Southeast Florida is to develop short-term solutions, such as water pumping stations in Miami Beach, which can provide a "*band-aid*" for about 35 years, rather than thinking about how to address SLR in the long term (Interview Daoust, 2015). Based on these comments, it can be stated that political support exists in Southeast Florida, but the commitment is to develop short-term solutions. Building on these accounts, Ovink stated the following in the interview: *"Politicians have to be able to approach long term CCA strategy with short term interventions and this can be problematic. If you do not have the engine of connecting long term with your day to day policy to regulate and finance projects, than institutional capacity will fail in places like Florida."* Developing long-term solutions presents a challenge when the focus is limited to short term solutions, which can be influenced by the term limits of politicians, who are often focus on the short-term. Term limits were only enacted in Florida in 1992, based on Florida Term Limits Amendment 9, which established term limits of politicians in office to eight years. The positions that are required to have term limits are the Florida cabinet, senator, U.S. Representative, and the Governor (dos.myflorida.com, 2015).

The term limits could potentially hinder political will and makes it difficult to develop long-term adaptation strategies and connect them with short-term goals as mentioned by Ovink in the interview. In addition, Governance Leader 1 explained that there is a clear disconnect between the developments of the best long-term CCA investment versus a political process that is short term regarding its rewards. Most elected officials have a limited time in office since Amendment 9 (1992) was established and in a system that puts pressure on those in power to have votes, they will most likely continue to make short term gain types of solutions. As term limits are in place, Governance Leader 1 further explained that as we close in on the window of opportunity as SLR increases in Southeast Florida, we will have to become more proactive instead of reactive to CCA, which will therefore increase political will (Interview Governance Leader, 2015; Interview Daoust, 2015). Derived from the interviews held with Daoust, Ovink and Governance Leader 1, it can be said that the political process is influencing CCA planning initiatives and that the current political will is currently weak as the focus is on short-term solutions in Southeast Florida.

Subsequently, this research will express findings on the extent of leadership in various parties involved in pushing the adaptation agenda.

5.2.3 Leadership

Leadership is analyzed by looking at the extent of top-down (political leaders) and bottom-up (political staff members) leadership in pushing the adaptation agenda in Southeast Florida. As explained in the managerial capacity section of the findings, the state leadership is currently disconnected from local and regional CCA initiatives in Southeast Florida. The word 'governor' was mentioned several times in relation to leadership in the interviews by (Daoust, 2015; Governance Leader, 2015; Landscape Architect, 2015; Environmental Lawyer 1, 2015; Environmental Lawyer 2, 2015; Ovink, 2015) and was expressed as a failure to address SLR adaptation in Southeast Florida. Specifically in interview, Ovink expressed confidence in this type of initiative and stated:

> "*The governor's office [Rick Scott] has not taken an initiative [on CCA strategies], but on the local level there is growing awareness about addressing the impacts of SLR, whether it is Miami-Dade County or the regional compact [the SFRCC]. People are there on the ground and there is an opportunity now to help organize grassroots bottom-up leadership through local government and build capacity among them"*.

The comment of Ovink is supported throughout the other interviews, in that there is substantial bottom-up leadership in Southeast Florida, but specific names of bottom-up political leaders were never mentioned more than once, which could mean that there is not one specific leader. Though, several of these local leaders that were mentioned as being influential on progressing toward the establishment of CCA plans, and all members of the SFRCC, such as Harvey Ruvin, who established the MDCCATF, as well as Broward County Mayor Krisitin Jacobs and Jennifer Juardo, Broward County Director Environmental Planning and Community Resilience (RCAP, 2012).

Based on the findings of leadership from the interviews and document analysis, there is a sufficient number of leaders from the city and county level. This statement is affirmed by Eisenhauer (2014) who acknowledged that despite the lack of state leadership in Florida around CCA, local and regional leaders have formed the innovative SFRCC and are joining scales across political divides and providing a platform for local frontrunners in CCA (Eisenhauer, 2014). It is

evident that there is no shortage of bottom-up leadership; however, the lack of state leadership is hindering progress. Going forward, section 5.3 will join together the managerial and political capacities and express the main barriers and opportunities from each sub-component of governance capacity.

5.3 Barriers and opportunities to managerial and political capacity

Table 5.4: Main barriers and opportunities to managerial capacity (author)

Managerial capacity	Overall barriers and opportunities
Integration of adaptation Extent of integration of CCA in local, regional and state	• **Opportunity: Integration of CCA in agendas of the local and regional level** (Interview Daoust, 2015; Interview Governance Leader 1, 2015; Interview Ovink, 2015) • **Barrier: State of Florida has limited integration of CCA in its agenda** (Interview Environmental Lawyer 1, 2015; Environmental Lawyer 2; Governance Leader 1, 2015)
Organization of adaptation Extent of organization of adaptation planning	• **Opportunity: Horizontal and vertical organization at local and regional levels exist** (Interview Daoust, 2015; Governance Leader 1, 2015) • **Barrier: Fragmentation between the state of Florida and regional and local levels as a barrier, blocking multi-level organization** (Interview Governance Leader 1, 2015; Interview Daoust; 2015; Bolson, 2010)
Management strategies & tools Amount of strategies and tools for adaptation planning	• **Opportunity: Strategies and tools at local and regional level, including RCAP** (Interview Governance Leader 1, 2015; Interview Daoust, 2015; RCAPC, 2012) • **Barrier: No current SLR adaptation strategies at state level of government as well as barriers from real estate and builder organizations** (Interview Governance Leader 1, 2015; Eisenhauer, 2014)

As explained in table 5.4 and according to the respondents and analysis of documents, there are several key barriers and opportunities to managerial capacity. At the state level, the Florida

government has been unresponsive to SLR, and is not integrating adaptation. In addition, it has been found that CCA has not been of great significance in the political agenda of Governor Scott since he came to office in 2011. The influence of the state government on the regional WMD's has been found to show a hierarchical control over the appointeeship of the five WMD's based on findings from respondent (Daoust, 2015) and document analysis (Bolson, 2010). According to Governance Leader 1 in interview, and document analysis findings from Eisenhauer (2014) real estate and building organizations also present barriers to the expansion of CCA planning as they worry about the devaluing of at-risk properties. Apart from the sources of Bolter (2010) and Eisenhauer (2014), the findings on the impacts of WMD appointeeship and real estate and building organizations on CCA planning has not been found by other authors. In contrast to the barriers, the SFRCC presents an opportunity for the managerial capacity, as they are an autonomous dedicated regional body with the goal of developing adaptation to climate change in Southeast Florida. The autonomy of the SFRCC presents an opportunity, as they do not need to receive approval from the state government in order to establish a CCA plan. The integration of the SFRCC at the local and regional level presents an opportunity through the regional adaptation plan (RCAP). Regarding multi-level governance of CCA, the organization between the local (county) and regional (SFRCC) shows the actuality of vertical and horizontal interaction however fragmentation from the state level is a significant obstacle for progress. Though, these findings presented above indicate that the SFRCC will face copious barriers in the attempt of generating adaptation plans going forward.

Table 5.5: Main barriers and opportunities to political capacity (author)

Political capacity	Barriers and opportunities
Accountability and transparency Extent of accountability and transparency in Southeast Florida	• **Barrier: Lacking citizen involvement and overall transparency of process of CCA planning and limited accountability of state level politicians** (Bolter, 2014; Eisenhauer, 2014; Interview Governance Leader 1, 2015)
Political will Political support of CCA and influence of political term limits	• **Opportunity: Political support from local and regional bodies**, (Interview Daoust, 2015; Bolter, 2014) • **Barrier: Limited policy support from state of Florida** (Interview Daoust, 2015) • **Barrier: Term limits have put emphasis on short-term adaptation, rather than long-term planning** (Interview Daoust, 2015; Interview Ovink, 2015; Interview Governance Leader 1, 2015
Leadership Extent of leadership from bottom-up and top-down	• **Opportunity: Strong bottom-up leadership** (Interview Daoust, 2015; Interview Ovink, 2015; Governance Leader, 2015; Interview Landscape Architect, 2015; Interview Environmental Lawyer 1, 2015; Interview Environmental Lawyer 2, 2015; Eisenhauer, 2014) • **Barrier: Limited top-down leadership** (Interview Daoust, 2015; Interview Ovink, 2015; Governance Leader, 2015; Interview Landscape Architect, 2015; Interview Environmental Lawyer 1, 2015; Interview Environmental Lawyer 2, 2015; Eisenhauer, 2014)

As shown in table 5.5 above and according to the respondents and document analysis there are several barriers and opportunities to political capacity of CCA in Southeast Florida. As was found previously in the managerial capacity findings, the state government represents a barrier to developing CCA, specifically among aspects of political capacity it was found to be a limitation in terms of the top-down leadership and political support. Among leadership aspects in Southeast Florida there are substantial opportunities for CCA progress through grassroots efforts existing in Southeast Florida from city and county governments, though no mention of state leadership

initiatives. Yet, political local and regional bottom-up leadership was found to be a strong opportunity for CCA though the influence, thought at the moment it seems that the political will of local politicians is still focused on short-term CCA solutions due to political constraints. Therefore, term limits presents a limitation as local politicians may be actively trying to develop CCA solutions, and evidence has shown that they are fixated on the short term. The main opportunity in terms of political capacity is foremost the committed bottom-up leadership, but faces significant barriers without support of state government as well as the short-term adaptation focus.

5.4 Resource Capacity

The resource capacity will explain findings on the financial, human and knowledge resources to better understand the barriers and opportunities to governance capacity in Southeast Florida. In 5.4.1 it will address financial resources of the Southeast Florida in establishing adaptation plans. In sub-section 5.4.2 it will describe the findings on the quality and quantity of human resources, while 5.4.3 illuminates on the extent of knowledge resources in the region.

5.4.1 Financial resources

This sub-section entails the analysis of the available budget for CCA in Southeast Florida. It has been mentioned in the interviews that the four counties have limited financial resources for CCA (i.e. Interview Daoust, 2014). Since the ratification of the SFRCC in 2010, they have been adamantly working for state and federal funding. According to the RCAP (2012) the Compact partners have developed policy and advocacy goals through joint positions, resolutions, letters and funding proposals and advocacy in Tallahassee, Florida and Washington, D.C. (For example, to seek support for greater recognition of adaptation strategies in federal climate, elected officials and other leaders representing the SFRCC jointly requested funding in Washington, D.C. in 2010, by explaining the region's vulnerabilities and needs related to climate change impacts (RCAP, 2012). However, there is no direct federal or state funding mechanism for local or regional CCA projects in the US, which poses a large barrier for regional adaptation in Southeast Florida. Without funding from the state government, it will be very difficult to enact adaptation plans. Furthermore, Governance Leader 1 mentioned: "The SFRCC does not need the approval of the governor to do a project within the four counties but they have no money to do so." According to the SFRCC website, they are currently relying on funding from the and Kresge Foundation, Institute for Sustainable Communities to support the work of the SFRCC, though the SFRCC are

still not receiving any from the state or federal levels. The Kresge Foundation awarded a $975,000 grant to the SFRCC in 2012 at the Fourth Annual Regional Climate Action Summit as a major grant to the Institute for Sustainable Communities (ISC) to provision the work of the SFRCC over three years (Amor, 2012). Apart from this single grant, the cities, counties and region of Southeast Florida are left to create their own CCA policies and plans with the exclusion of the state and federal funding.

5.4.2 Human resources

In this sub-section the quantity of people involved in addressing CCA in Southeast Florida and the quality of their skills and know-how are analyzed. As mentioned in the managerial capacity findings, a total of more than 90 volunteer members of the public have taken part in the development of RCAP in 2012 (RCAP, 2012). According to Daoust (interview, 2015) we are looking at a very proactive and well-educated public in Southeast Florida who are seeing the impact particularly if living in coastal areas such as Miami Beach or coastal Broward County. More specifically, Eisenhauer's (2014) research found that the quality of the skills among many SFRCC members was quite poor regarding adaptation, and that some of the RCAP staff members have science backgrounds, including PhD's in natural sciences, while others had no science background or previous training. One respondent to Eisenhauer's research who is a member of the SFRCC emphasized that it is important that the (SFRCC) widens the knowledge circle and incorporate members from other fields into the SFRCC, such as urban planners and engineers. However, the respondent provided no specific approaches in how the SFRCC could further attract members from other sectors and the members of the SFRCC are largely comprised of local government officials, some of which do not have science backgrounds (Eisenhauer, 2014). Building on human resources, the next sub-section will look at findings on knowledge resources of those involved in CCA in Southeast Florida.

5.4.3 Knowledge resources

The indicator that will be analyzed is the support of external experts to increase CCA knowledge of the Southeast Florida region outside of the government realm. The knowledge base for CCA is gradually expanding in Southeast Florida (as has been put forward in previous sections) outside of the government realm as the state and federal government has not yet provided funding for the region. At universities, non-profits, and public-private partnerships there has been increasing adaptation knowledge growth in recent years. Florida International University (FIU) established the Urban Long Term Research Area (ULTRA) network, which seeks to understand how

biophysical processes of climate change interact with Miami's socioecological structure (ULTRA, 2015). Another FIU organization is Eyes on the Rise, which aims to raise awareness and to educate South Florida communities about the impact, challenges and threats of sea level rise to create possible solutions for a sustainable future. Florida Atlantic University (FAU) environmental studies program holds a The Florida Center for Environmental Studies hosted the "Risk and Response" Sea Level Rise Summit in Boca Raton, Florida with over 300 attendees from private and public agencies. Although there are several new knowledge based academic initiatives in Southeast Florida, Professor 1 expressed in the interview that there is a limitation to the power of these scientific initiatives in the realm of CCA, and stated: *"There has been an increased student interest in CCA and new academic departments related to climate change are around now that did not exist ten years ago. Education is now a larger part of governance in Southeast Florida. Though we are pretty good from a scientific perspective in collecting data, but when scientists start to recommend policy [on CCA] to government officials we start to lose credibility because of various reasons."* Although, the knowledge base continues to grow at universities in Southeast Florida over recent years and new research initiatives related to SLR continue to be advanced, Professor 1 indicated that a barrier exists between researchers and politicians. Moreover, Professor 2, as a researcher from Southern California on policy related to SLR could not make comments on this as she is unfamiliar with the Southeast Florida context and emphasized that the governance system is substantially different than from Southern California.

Aside from the academic knowledge resources, there are also non-profit resources in Southeast Florida including the Climate Leadership Engagement Opportunities (CLEO) Institute. The CLEO Institute is a not-for-profit organization founded in 2010 and based in Miami, Florida and its mission is "promoting an informed and engaged public, better poised to become involved and support climate resilience locally, regionally, nationally and globally". The CLEO Institute mentions that it has engaged and educated more than 18,000 individuals in various climate initiatives, ranging from students, businesses, and government officials and the Southeast Florida community. CLEO participates in symposiums, workshops and has extensive interest in partnering on climate change engagement initiatives with several universities, non-government organizations, and county level governments (CLEO Institute, 2014).

Public-private partnerships (PPP's) are also a knowledge resource for CCA adaptation and in the interview with Governance Leader 1 from the Florida Earth Foundation it was explained that as a PPP they put together large scale education and outreach programs about CCA in Southeast Florida. The interviewee explained that his role as an educator is to provide venues and programs

that can educate the public about action and figure out what we need to do to modify our behavior in order to adapt to the changes caused by climate change.

These were examples of findings based on knowledge resources related to CCA in Southeast Florida and they all provide opportunities for improving the governance capacity. In the learning capacity section it will further address education resources to identify whether learning networks to educate people are successful in Southeast Florida.

5.5 Learning capacity

The learning capacity section will describe findings on risk perception and learning networks to develop an understanding to the barriers and opportunities to these critical aspects. In sub-section 5.5.1 risk perception findings will illuminate on how risk was perceived among the interview respondents, citizens, stakeholders and elected officials in Southeast Florida. Subsequently, 5.5.2 will display findings on presence of learning networks within the region.

5.5.1 Risk perception

These findings deal with whether the perception of risk toward SLR is seen as an opportunity for CCA or a barrier in Southeast Florida among stakeholder, citizens and politicians. Findings on risk perception of SLR links back to the political and resource capacities as perception can impact political will as well as the knowledge resources in Southeast Florida. For example, if the results on risk perception show widespread doubts among politicians over the actual risk of SLR then it can be inferred that political will is low and little action will be taken to achieve CCA. Furthermore, if risk perception of SLR is low, it could influence the amount of knowledge resources as fewer people would have awareness of SLR. Interestingly, among eight out of the nine interview respondents, they each separately stated that they had a high perceived risk of SLR in Southeast Florida. The one respondent from California did not provide a response, as they were unfamiliar with the situation regarding SLR in the region. Each of these eight respondents pointed out that among citizens that the perception of risk of SLR is not aligned with the actual risk among citizens in Southeast Florida. The most common response by the respondents when questioned about risk perception of SLR among citizens was that SLR is not enough of an immediate threat for people to take action. More specifically, Environmental Lawyer 1 expressed in the interview that SLR represents another issue for general public to deal with as they are mainly focused on hurricane risk, since they feel hurricanes are more tangible and that SLR is further down the road.

Among the main limitations to risk perception of SLR in Southeast Florida that was found among the interviews was the doubt of whether SLR exists. A number of respondents mentioned that if citizens were forced to take on flood insurance, then this would help to raise the perception of risk to being more proactive. Citizens' risk is a program created by the citizens of Florida which provides artificially financed support to keep flood insurance prices low for citizens, and the insurance rates are nowhere near high enough to actually grab the attention of people. However, once SLR starts to cause increased damages along coastal areas of Southeast Florida, the insurance rates will increase and people will have to either move or pay much higher rates, which could increase the perception of risk among citizens (Interview Environmental Lawyer 1, 2015; Interview Westerhof, 2015).

According to Professor 1, citizens in Southeast Florida do not even have an understanding of what SLR will entail. Professor 1 explained the following: *"There is a disconnection for the most part between SLR and climate change. People try to equate those two because there is uncertainty surrounding the whole idea of climate change or at least that viewpoint is out and about. People are suspicious whether or not climate change really exist and if it does not exist then maybe SLR does not exist and so they are not focused on the data and the reality is in spite of how you think or what you think the underlying causes of SLR that it is going to continue to rise and you cannot dispute the data*".

Professor 1 pointed out the uncertainty of the risk of citizens and their suspicion that SLR does not exist. This is troublesome information in regards to the learning capacity and numerous interviewees mentioned in the group interview that educating citizens is the proper means to increase the perception of risk of SLR. Therefore, the limited perception of risk of citizens could influence the amount of human and knowledge resources on CCA in Southeast Florida as portrayed in the findings.

Stakeholders and government officials have also shown to be disconnected from SLR adaptation. Concerning the perception of risk among state leadership, the findings on Governor Scott have shown that he has lacking interest in CCA, which indicates that he has a low perception of risk regarding future SLR impacts. Although, there is no document analysis which has assessed the risk perception of Governor Scott, it is apparent based on the findings that SLR is perceived as a small risk to Governor Scott. Additionally, findings from respondent (Governance Leader 1) and Eisenhauer (2015) emphasize that several stakeholder organizations, such as real estate and building organizations perceive SLR as a minimal risk as they are opposing CCA planning in

Southeast Florida. Therefore, these findings demonstrate how the limited perception of Governor Scott as well as other stakeholders could in turn cause limitations on the political will to address SLR.

This section has so far been limited to findings on risk perception of SLR based on nine interviews, so additional document analysis from Bolter (2014) was analyzed to improve an understanding of risk perception in Southeast Florida. Bolter conducted her site-specific research to Broward County, but explained that the results can be generally applied to other parts of the Southeast Florida region due to its similar demographics. A total of 487 online surveys were used to collect public opinions and views about sea-level rise. Below, figure 5.3 and table 5. 6 display the results from Bolter's research.

Figure 5.3: Sea Level Rise Knowledge in Broward County, FL (Bolter, 2014; n= 487)

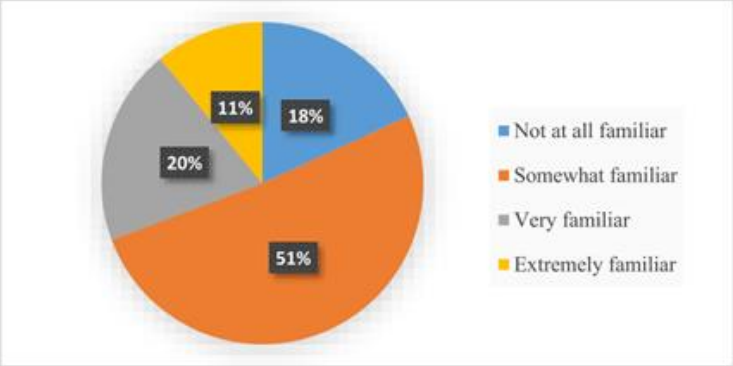


Table 5.6: Sea level rise knowledge data in Broward County, FL (Bolter, 2014; n=487).

Sea-Level Rise Knowledge	Number	% total
Not at all familiar	88	18.1%
Somewhat familiar	248	51.1%
Very familiar	96	19.8
Extremely familiar	53	10.9%

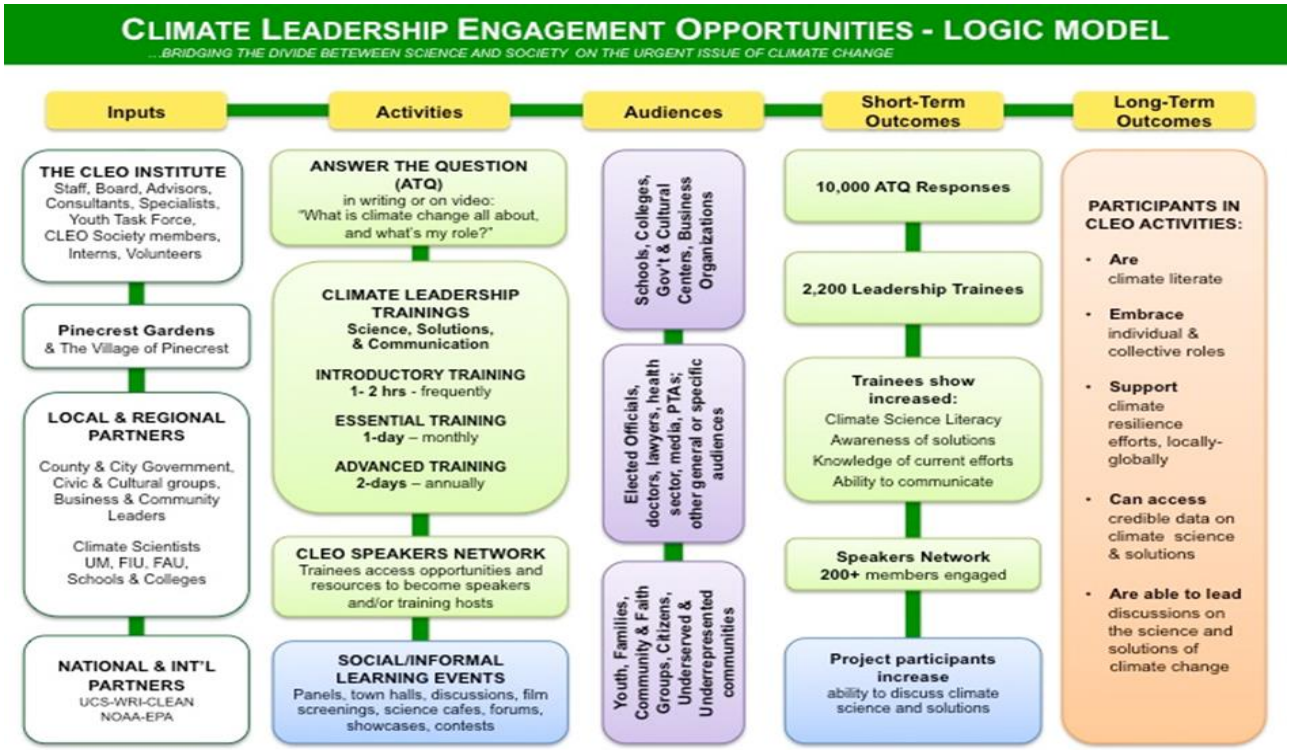
These data findings show that 51.1% of those surveyed have somewhat familiar knowledge of SLR, while only 10.9% of people were extremely familiar with SLR (Bolter, 2014). The final results from her research characterized risk perception in Broward County to determine whether

individuals overestimate, underestimate or correctly estimate risks of SLR. Bolter concluded that perceived risk of SLR is misaligned with the actual vulnerability to SLR. Furthermore, the researcher recommended that in improving awareness of citizens about SLR there should be increased risk communication and outreach programs (Bolter, 2014). Going forward, the importance of education of the risk of SLR has been affirmed in interviews and by Bolter (2014) and the next sub-section will address whether there are available learning networks in place to help boost the learning capacity among government officials, stakeholders and citizens.

5.5.2 Learning networks

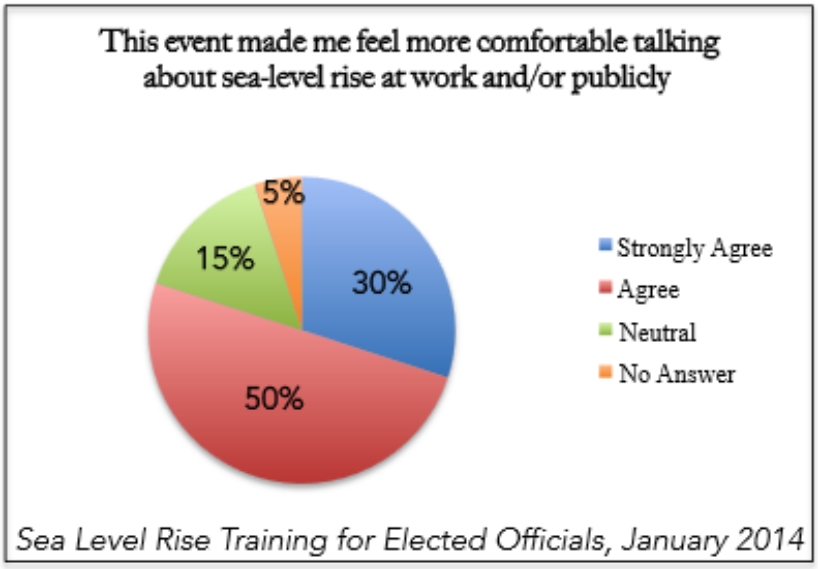
In this sub-section, an analysis is done on the presence of learning networks for the circulation of knowledge, for the transaction of experiences through networks, and the use of stakeholder input for enhancing learning processes. It was confirmed by many respondents that education is critical for improving citizen understanding of the risks of SLR. In Southeast Florida there are workshops, trainings, and databases for citizens. As mentioned in 5.4.3, the non-profit CLEO Institute has been found to be a large knowledge resource on SLR in Southeast Florida and is a partner with the SFRCC, the four county governments of Southeast Florida, local universities, among other organizations. As the members of the SFRCC are comprised of government officials and are focused on developing CCA strategies, the CLEO Institute states its main goal is to bridge the divide between science and society (CLEO, 2014). Below, figure 5.4 displays the Logic Model, which is the format used by the CLEO Institute for climate leadership engagement. The Logic Model shows an in-depth explanation of the aims and various objectives of the trainings that the CLEO Institute organizes.

Figure 5.4: Climate Leaders Engagement Opportunities (CLEO) Logic Model (CLEO, 2014)



Explicitly, the CLEO Institute offers learning for youths, universities, private stakeholders and elected officials, and host's workshops such as the "Sea-Level Rise in Florida Workshop" for elected officials. Based on figure 5.5 the workshop has been very helpful in improving the comfort level of elected officials around the topic of SLR (CLEO, 2015). Although the CLEO Institute was not mentioned in the interviews, the document analysis provides valuable information showing that it is indeed a large learning network in Southeast Florida and should be further empowered and integrated with the SFRCC.

Figure 5.5 Impact of CLEO SLR training for elected officials (CLEO, 2014)



The Florida Earth Foundation (FEF) is another network, which is active in Southeast Florida and as a PPP, the FEF it aims to connect the domestic and international community of water experts, policy makers, students and stakeholders to exchange knowledge and develop solutions for the benefit of a Florida, the US and Internationally (FEF, 2015). The FEF includes knowledge exchange programs, such as the nation-to-nation USNC Professional Program, in which a group of American professionals from varying disciplines are brought to the Netherlands to learn about the SLR adaptation. In this research, six members of this learning program were interviewed and these respondents all expressed that this type of knowledge exchange is a valuable means to increase learning about adaptation. Learning about the Dutch water management approach has provided the professionals with a valuable outside perspective, which they can bring back to Florida.

In comparison, the FEF offers a more international perspective in its knowledge exchange format-learning network, such as the USNC Comparative Water Law Course in The Hague and the UNESCO-IHE partnership in Delft. On the other hand, the CLEO Institute is more focused on working on the regional level of Southeast Florida. Constructed on these two approaches of learning, they offer both international and domestic learning formats, which could provide significant usefulness for the Southeast Florida region in educating residents.

5.6 Barriers and opportunities to resource and learning capacities

Table 5.7: Barriers and opportunities to resource capacity (author)

Resource Capacity	Barriers and opportunities
Financial resources Levels of funding for SLR adaptation in Southeast Florida	• **<u>Barrier:</u> Limited levels of funding in Southeast Florida for adaptation planning** (Interview Governance Leader 1, 2015; SFRCC, 2012)
Human resources Amount of staff, and know-how of skills related to CCA	• **<u>Opportunity:</u> Proactive and well-educated public regarding SLR adaptation** (Interview Daoust, 2015) • **<u>Barrier:</u> Possible limitations in know-how of staff, specifically among SFRCC members** (Eisenhauer, 2014)
Knowledge resources Extent of external knowledge outside government realm regarding SLR adaptation	• **<u>Opportunity:</u> Ample knowledge resources among (university research centers, non-profits, PPP's)** (Interview Professor 1, 2015) • **<u>Barrier:</u> Scientists lose credibility when recommending policy to government officials** (Interview Professor 1, 2015)

As shown in table 5.7 above, the lack of financial resources for CCA in Southeast Florida and the existence of other political priorities were perceived to be main barriers. The SFRCC has been applying for federal and state funding since 2010 and is still waiting on this funding. Additionally, human resources in terms of quantity regarding CCA were rather impressive given the quantity of volunteer workers in developing the RCAP in 2012 and it was not mentioned as a limitation among respondents. However, the lack of skills of staff to deal with new ways of working on adaptation planning could potentially be seen as a barrier according to Eisenhauer (2014) since many of the government officials working for the SFRCC had no previous training. Regarding the knowledge resources, the opportunities exist from the resources studying CCA to SLR, ranging from university research centers, non-profits and PPPs. However, as expressed by

Professor 1, scientists are not actually recommending policies on CCA, as a bridge exists between them and the government officials.

Table 5.8: Barriers and opportunities to learning capacity (author)

Learning Capacity	**Barriers and opportunities**
Perception of risk of SLR Limitation or opportunity for CCA	• **Opportunity: There is an understanding of risk of SLR in Southeast Florida among eight of the respondents** (interviewees, 2015) • **Barriers: Limited understanding of risk of SLR among citizens, stakeholders (builders and real estate organizations) and government leaders** (Interview Daoust, 2015; Interview Governance Leader 1, 2015; Interview Environmental Lawyer 1, 2015; Interview Westerhof, 2015; Eisenhauer, 2014; Bolter, 2014)
Learning networks Learning is promoted by research projects, organizations, digital formatted learning	• **Opportunity: Some learning networks are present through research centers, non-profits and PPP in Southeast Florida** (CLEO Institute, 2015; FEF, 2015)

Among the survey of Bolter (2014) and the overwhelming opinions of the interviewees that Southeast Florida faces a high risk from SLR, it is perceived that the opinion of the public is acting as a barrier to improving the governance capacity. Increased public risk awareness of SLR has the potential increase the governance capacity as citizens might provide greater pressure on policymakers, therefore improving the capacity. Each of the interviewees agreed that citizens are not in tune with the risk of SLR and Bolter's research has found that the perceived risk is not aligned with the actual risk in Broward County. The survey of Bolter showed that only 51% of people were "somewhat familiar" with SLR. Both the respondents and the document analysis mentioned that education is a key method to improve citizen awareness of SLR risk. The availability of the CLEO Institute and FEF provided evidence that they are giving opportunities to

help engage citizens on SLR in the Southeast Florida region. These examples of learning networks represent a means in which to educate the public and therefore an opportunity to improve the learning capacity and moreover the overall governance capacity. However, there are still a limited number of opportunities for educating and engaging people to the risks of SLR in Southeast Florida and it should be improved in order to raise awareness toward the perception of risk. Currently, the FEF and CLEO Institute are the only two main resources for educating the risk of SLR in Southeast Florida and need to be empowered based on the relatively low levels of risk perception among many citizens, stakeholders and elected officials.

5.7 Constructing governance conditions

Based on the overall findings across the four sub-components of governance capacity, the barriers and opportunities have now been defined. However, in order to increase the governance capacity each of these designated barriers and opportunities will receive conditions, and if they are fulfilled than it should leave to successful governance of CCA in Southeast Florida. Before shifting to discussions (chapter 6), which will discuss the theoretical conditions for improvement of these barriers, this section will provide an indication of which aspects requiring learning conditions. Within the managerial and political capacities, it provided explicit findings on barriers that should require learning improvements in order to improve the overall governance capacity. Among the main barriers explained in section 5.3, there were substantiated findings that there was limited integration, organization and leadership from top-down political leader, Governor Scott and his state administration. Based on these findings, the governance conditions (chapter 6) will discuss methods that could help to improve coordination between various political levels. Though, grassroots bottom-up leadership from the local and regional level has been found to be a resilient opportunity for the overall governance capacity in Southeast Florida as they are working towards the implementation of plans such as the RCAP (2012), but the barriers seem to overshadow these efforts. Among the resource capacity, funding and knowledge resources were described as being insufficient in Southeast Florida and chapter 6 will discuss theoretical approaches that could support in these conditions. Furthermore, the findings on the learning capacity have shown that there is a limited perception of risk among a considerable set of citizens, stakeholders and elected officials. Based on the findings of limited citizen risk perception, Bolter (2014) expressed that education seems to be the most fitting means to improve the engagement of people, and therefore given the findings and theoretical framework the subsequent chapter will construct an analysis and discuss which governance conditions should be recommended.

6 Discussions

The framework has proven to be an effective way for uncovering information into the governance capacity in Southeast Florida and furthermore this chapter will provide a discourse based on findings (chapter 5) and the theoretical framework (chapter 3) in order to construct governance conditions to improve the barriers to governance capacity. Barriers and opportunities were found for each of the four sub-components of the framework, which were further described in the previous chapter. Section 6.1 will analyze these barriers and opportunities and discuss how specific governance conditions, could provide more appropriate conditions to improve CCA.

6.1 Governance conditions for SLR adaptation

Based on the research findings of the barriers and opportunities to governance capacity, governance conditions have been conceptualized for Southeast Florida. Therefore, if all the governance conditions are fulfilled than the governance capacity should tip to the effective governance of adaptation to SLR in Southeast Florida. These conditions will be used in potentially shifting barriers into opportunities regarding the governance capacity of Southeast Florida and could provide prospects for future research on this topic. On course with the organization of the framework of analysis these conditions will once again be ordered per sub-component, although this is not indicating any order of importance to any specific sub-capacity.

6.1.1 Managerial conditions

Managerial conditions:

- Improving integration of CCA at local, regional and state level by expanding the horizontal integration of adaptation concerns across different sectors and integrating adaptation interests into present agendas for climate change adaptation of SLR
- Incorporation of management techniques (multi-level) coordination
- Each level of government (local, regional, state) should endorse management tools and strategies for adaptation (e.g. climate compact, task forces, steering committees) and insights approaches being done elsewhere (Dutch “Room for the River,” European NAS)

In terms of *managerial capacity*, a governance arrangement should be developed to address SLR adaptation, though in Southeast Florida integration of CCA in agendas has been found to exist only at the local and regional level, while the state has restricted it from its agenda. Agrawal, (2008) explains that the process of CCA can come through an assortment of social and technical problems, ranging from social confrontations, narrow governance and unproductive institutional

arrangement. At the state level in Florida it has been found that there is an unproductive governance arrangement in which Governor Scott controls power to direct decision-making regarding CCA at the state level. Gupta et al. (2010) express that horizontal integration is an appropriate method of escaping these problems since the material and abilities of these diverse actors can aid in advance the policy development. Compared to a hierarchical approach as shown in Florida, this horizontal approach is far less so and incorporates a diverse number of actors. Managerial conditions should endorse as much horizontal integration across policy fields at the state level of government, which could possibly lessen the authority of Governor Scott.

With regards to the multi-level organization of CCA, it was found that organization exists between the local and regional levels in Southeast Florida, though fragmented from the Florida state government, which presents a barrier to the governance capacity. CCA has not been of great significance in the political agenda of Governor Scott since he came to office in 2011, which has therefore limited the organization of multi-level governance. Though, in the context of CCA, the notion of multi-level governance is particularly relevant, as it involves interaction between various administrative levels (Hooghe and Marks, 2003). In the multi-level concept model of Rip and Kemp (1998) the key meaning of the model is that there should be co-evolution among each level, which can help to alter the profile of the regime and restructure it. Furthermore, Loorbach (2010) indicates how varying levels of governance (strategic, tactical, and operational) can coordinate with one another. However, in the interview process, none of the nine respondents had prior knowledge of transition management, so the topic not once led to significant discussion. Based on these findings from literature on the organization of governance arrangements, managerial conditions should therefore endorse multi-level governance (Geels and Kemp, 2000; Loorbach, 2007, 2010) as it provides ideas for improved coordination across levels.

Among the findings on management strategies and tools in Southeast Florida regarding CCA, the RCAP exists at local and regional level, yet there are no adaptation strategies at state level of government. Findings from literature showed the Dutch "Room for the River" as a prime example of a multi-level governance adaptation strategy as it involves coordination of government, NGO's, PPP's and citizens (Termeer et al., 2011). The European national adaptations strategies have also been established in several countries and provide further insights to Southeast Florida on specific types of adaptation strategies (Swart et al., 2009). Managerial governance conditions consequently support the use of management strategies, such as the use of steering committees

and climate change task forces who can therefore work to advance CCA plans in Southeast Florida.

6.1.2 Political conditions

Political conditions:

- Increased citizen participation in SFRCC and local and state policymaking regarding CCA
- Increased political support from state agencies in Florida to integrate CCA as an important part of their policy
- Endorsing a mixture of bottom-up and top-down initiatives for CCA planning and should not be limited to just one of these types.

Based on the results it was found that there is an overall deficiency in transparency of the CCA process in Southeast Florida, as well as limited accountability of Governor Scott regarding CCA policies. The interviews and document analysis have shown that there is a lack of transparency among the SFRCC, which functions as the main regional climate initiative in Southeast Florida. A main discovery on the failures of the SFRCC in being transparent involves the failure of the transparency of the SFRCC regional climate summit hosted in Southeast Florida each year. Among the nine respondents of the interviews, only Daoust and Governance Leader 1 were cognizant of the summits existence, while the four other respondents in Southeast Florida had never heard of it before. Transparency is critical among elected officials for improving CCA policy and the TAIR explains that by improving the transparency of the decision being made by policy makers it could empower citizens to tackle climate change collectively. Therefore, widening the circle and improving citizen involvement in the SFRCC and bolstering coordination between stakeholders, citizens and government officials could increase accountability amongst the SFRCC. Based on literature, governance conditions endorse citizen involvement as it can help to hold policymakers accountable and ensure a more collaborative governance approach in Southeast Florida (McGee et al., 2010). As mentioned above, the state level presents barriers in its lacking accountability to CCA, and it is recommended that citizens advocate for SLR adaptation to state government, which could possibly lead to increase the state's accountability to the issue.

The political will and leadership have been found to have greater opportunities for SLR adaptation on the local and regional level than on the state level because of the amount of grassroots leaders in Southeast Florida. The main barriers that were recognized were the negative influence of short-termism of political terms in developing long-term CCA strategies and limited

top-down political support for CCA. Paulson Jr. (2015) mentions that long-term CCA strategies can be hindered by short-termism of the political process, and to overcome this CCA should openly be endorsed as a significant and vital part of climate policy. However, top-down political leadership has also been found to pose a barrier and without this support the political capacity will be inadequate to enact CCA policy. As mentioned in the managerial conditions, the most effective way to develop increased attention around CCA is to have a combination of multi-level governance through bottom-up and top-down leadership at the same time. Leadership concepts aim toward the theme of joint problem solving through connectivity of organization of multi-level governance networks (Rip and Kemp, 1998; Geels and Kemp, 2000; Loorbach, 2007, 2010). Among adaptation literature, leadership has received a large contribution around CCA since it has the possibility to raise awareness to adaptation issues (Crosby and Bryson, 2010). Therefore, the best opportunity for creating energy around CCA is by ensuring there is bottom-up and top-down leadership occurring at the same time. Though, Southeast Florida currently does not have the capacity at the state level, and the political conditions endorse that it is improved on, which could significantly help to increase the overall governance capacity.

6.1.3 Resource conditions

Resource conditions:

- Upsurge of political support for CCA from state and federal level so that Southeast Florida receives sufficient funding resources for CCA implementation
- Widening of the circle of the SFRCC to include more non-governmental members
- Growth in SLR and CCA education and training programs (workshops, summits, trainings, lectures, knowledge exchange) to intensify knowledge of citizens, stakeholders, and government officials in Southeast Florida

As explained in chapter 5, the SFRCC has applied for state and federal funding, though still has not received any funding. Therefore, the financial resources of the SFRCC are reliant on the amount of political support for CCA, and could benefit significantly from an upsurge in political conditions. As discussed in literature, Adger (2001) emphasizes that financial resources are a necessity for developing adaptation projects and if funds remain insufficient than CCA plans cannot be implemented. Clearly, the limitation on funding for the SFRCC poses a large barrier for progress and in order to increase funding, greater political support for the SFRC must be improved, which could in turn lead to funding.

The human and knowledge resources regarding adaptation planning are relatively new developments in Southeast Florida. It was found that the majority of the members of the SFRCC are government employees and many have limited knowledge regarding CCA (Eisenhauer, 2014). Though, based on the knowledge resources in Southeast Florida regarding CCA, it was found that there is substantial knowledge at the university, non-profit and PPP's researching CCA. The considerable amount of knowledge resources could provide improvements to the quality of the work force of the SFRCC. It has been mentioned that a strong knowledge base is an essential prerequisite for developing and implementing effective adaptation measures, and recommends education and training programs for citizens, stakeholders, and government officials (Satterthwaite et al., 2008; CAKE, 2015). Within the Southeast Florida context, the CLEO Institute and FEF have been found to be large knowledge resources in Southeast Florida for educating groups of people on CCA, such as offering programs including "Sea level rise workshop" for elected officials in the region. Based on theory and findings in Southeast Florida, the resource conditions should endorse greater concern allocated to the growth of human and knowledge resources regarding CCA and replying with greater comprehensiveness of initiatives such as the SFRCC as well as amplified numbers of education and training programs.

6.1.4 Learning conditions

Learning conditions:

- Institutionalize learning in Southeast Florida through increased development of more non-profits and PPP's with the goal of educating citizens, stakeholders, government officials on SLR
- Among education programs, specifically addressing uncertainty of SLR risk through learning techniques (workshops, summits, task forces, conferences, trainings, local and regional partners)

The ensuing conditions are important for the *learning capacity*. Based on the findings on the perception of the risk it was found that the perception of risk among the respondents was higher than that found of the citizens. Each interview respondent stated that they have a strong awareness of the risk of SLR, which can be credited to the fact that they are all work in fields related in some way to CCA. Among the respondents they stressed that while they have a strong awareness of the risk of SLR in Southeast Florida, they all mentioned that the overwhelming perception of risk among citizens in Southeast Florida is quite low. Based on further document analysis findings from Bolter (2014) the research concluded based on a survey on perception of SLR that the perception among citizens was low and not on balance with actual risk faced in

Broward County, Florida. Furthermore, the barriers from Governor Scott's administration on addressing SLR show that he has a relative low perception of risk of SLR, otherwise it is assumed he would act proactively regarding SLR. As the perception of risk has been found to be a limitation among citizens and state government, theories on risk perception provide valuable reasoning to why these barriers may occur as well as learning conditions for how they could be improved. According to Kraus and Slovic (1988) there is a strong connection between the characteristics of risk and how they are in turn recognized. For example, if a risk is regarded as being manageable than it is less threatening than a risk that cannot be managed. Among theorists, SLR is acknowledged as having a high level of uncertainty and as there are numerous factors, which have foremost influences on risk perception to SLR such as political belief, age and education. The response of Governor Scott to SLR has been to disregard it, and based on theory, his passivity could be influenced by the inherent uncertainty of SLR. Furthermore, among the respondents, Environmental Lawyer 1 emphasized in interview that hurricanes are perceived as being more of a threat among citizens than SLR, which could be attributed to the greater uncertainty of SLR in comparison to hurricanes. The uncertainties of climate change have been shown to be a major limitation on public engagement (Shome and Marx, 2009). Furthermore, Lorenzoni et al. (2007) the low position of climate change as a worry among people is a result of the widespread perception amongst the public that the issue is a risk which is far off in the distance.

Theory has provided valuable explanations for why the perception of risk is limited in Southeast Florida and several sources expressed that SLR risk perception is limited due in fact to the high uncertainty of SLR. Among the respondents, education was emphasized as a tool to reduce uncertainty and was substantiated by document analysis of Bolter (2014) who also expressed education as a means for engagement of citizens regarding SLR. Building on concepts of the uncertainty of risk, Pahl-Wostl (2009) explains how incremental changes in learning could help to increase learning and reduce uncertainty to the risks of climate change. In three types of learning processes (single, double and triple loop) there are varying amount of actions to reduce risks. The first-loop is focused on scientific knowledge to find a truth, while in the triple-loop there are new learning methods to manage uncertainty (e.g. participatory scenarios, risk dialogues, workshops) (Pahl-Wostl, 2009). The triple-loop learning process provides potential methods to improve the perception of risk in Southeast Florida, and based on actual findings, learning initiatives are emerging in Southeast Florida. The CLEO Institute and FEF are the largest learning networks in the region and are continuing to increase a shift of greater attentiveness of people regarding SLR

who can help to truly embrace uncertainty as an opportunity. Therefore, constructed on theory and actual findings in Southeast Florida, the learning conditions endorse the approach of addressing the uncertainty of risk perception through improving on and expanding the learning network.

6.2 Potential growth of governance conditions

Through analyzing the theoretical framework and actual findings on barriers and opportunities to the governance capacity in Southeast Florida, the previous section has offered conditions that should lead to successful governance of adaptation to SLR. Southeast Florida faces a widespread list of barriers to SLR adaptation and turning these barriers into opportunities will take a significant period of time. However, based on this discussion it has been found that a significant number of barriers relate back to the leadership of Governor Scott. Within the managerial and political conditions, barriers to integration, organization, management tools and strategies, accountability and transparency, leadership and political will are all limited to some extent by state leadership. Among the resource conditions, it was found that state funding is inhibiting growth of regional adaptation planning from the SFRCC since they are obtaining no state financing. Therefore, based on the interconnectedness of the barriers to governance capacity, numerous governance conditions could be fulfilled swiftly if there is stronger interest in CCA from Governor Scott. In chapter 7, final conclusions on the research questions will be made, as well as some policy recommendations and discussion on the prospects for future research on this topic.

7 Conclusion

Climate change adaptation planning has been developed further in recent years in many parts of the world and has become more accepted among many government institutions as the effects of climate change are now being felt. Urbanized areas are increasingly threatened by climate change as they are frequently located in deltas nearby rivers and oceans and consequently more susceptible to flood risk, and SLR. Within the academic literature, it is commonly acknowledged that adaptation to climate change is a 'wicked' problem that requires a governance approach involving a diverse array of organizations in society (government, private sector and citizens). Furthermore, governance of CCA has been regarded in this research as a fundamentally cross-sector approach that can provide a framework for steering adaptation planning. Grounded on these postulations, this research has attempted to provide insight into the governance conditions needed to adapt to SLR in Southeast Florida through analyzing and comparing the sub-capacities of governance capacity. The central research question was:

In Southeast Florida, how do organizations and political institutions respond to sea level rise, and is the current regional governance capacity suitable to adapt to it?

The sub-questions based on the main research question:

- What are the potential economic, environmental and societal, impacts of SLR inundation in Southeast Florida?
- What governance arrangements presently exist in regard to CCA of SLR and what is the overall governance capacity in Southeast Florida on these issues?
- What are the main barriers and opportunities to the critical aspects of governance capacity of Southeast Florida that could weaken or strengthen the efforts to adapt the region to SLR?
- What governance recommendations could be constructed from existing barriers and opportunities to improve governance capacity in Southeast Florida?

To begin with, a response to the main research question and sub-questions can be specified through an interpretation of the findings. Then, I suggest policy recommendations based on the research findings and theory from the governance conditions in the previous chapter. Lastly, there is a reflection on this thesis, through a look back at possible limits in information in previous chapters, and I will also suggest areas of further research.

7.1 Conclusions

In the first chapter of this thesis, a research question was posed: "*In Southeast Florida, how do organizations and political institutions respond to sea level rise and is the current regional governance capacity suitable to adapt to it?"* The question is multilayered and the previous chapters go in depth into the findings, through the use of sub-questions.

It was important to first examine to what extent Southeast Florida faces actual risks from SLR. Among the categories of societal, environmental and economic, each of these could face widespread impacts from as small as a 1 foot increase in sea level heights. What stood out in analysis of this data was that all of the economic and environmental risk projections are probable within the 21st century, which is combined with increasing poverty, population growth and average age throughout Southeast Florida. Clearly, these risk factors warrant the choice to conduct an examination into the governance capacity of the region to adapt to SLR.

This research analyzed the current governance arrangement and the governance capacity to adapt to SLR in Southeast Florida. Several barriers and opportunities concerning the governance capacity have stood out while examining the sub-components. Regarding opportunities, with a strong leaning toward grassroots, bottom-up initiatives among local and regional government officials, as well as non-profit, PPPs and citizens, Southeast Florida has become a model in the US for its governance of CCA. This research has contributed to an improved understanding of the diversity of local level practices in Southeast Florida, such as the SFRCC, CLEO Institute, FEF and several university research centers all focused on addressing SLR in the region. However, it has been recognized throughout this analysis of the sub-components of governance capacity that barriers significantly outweigh the opportunities for SLR adaptation and the response of state leadership in Florida to SLR is hindering capabilities to develop CCA. Based on findings from respondents, and several links drawn from theory discussed in this thesis, Southeast Florida in its current state is not able to adapt due to the existing top-down political leadership. Therefore, it is assumed that based on the current policies of Governor Scott that regional CCA are not expected to be implemented in Southeast Florida until Governor Scott leaves office after his term ends in 2017, which has been further substantiated by (Environmental Lawyer 1, 2015; Environmental Lawyer 2; Governance Leader 1, 2015). Bearing all of this in mind, it is still very promising to see that grassroots, bottom-up efforts operating in Southeast Florida, though it is essential that state leadership gets further involved, otherwise CCA will continue to stall in Southeast Florida. Previously explained in theory, multi-level governance is key for building long-term CCA in

Southeast Florida, and if collaboration is improved, CCA projects are more likely to be started and consequently increase the security for people living in Southeast Florida.

7.2 Policy recommendations

While the obvious need is for state government to integrate into the development of regional CCA planning strategies, it remains improbable that the state government is interested, specifically Governor Scott. The findings have shown that it is very difficult to engage Governor Scott on the issue of SLR, and as discussed in the governance conditions (chapter 6), the state government is responsible for numerous barriers to governance capacity. Based on the response of Governor Scott to SLR in Florida it seems to be counterproductive to force the issue upon him and his state agencies. Though, as was discussed in the previous chapter, developments should be built upon opportunities from bottom-up political leadership as well as various CCA initiatives (workshops, trainings, climate change task forces, universities research centers, etc.). Through endorsing these initiatives it could improve the awareness of SLR and can fulfill the existing potential. Coupling these types of social initiatives with an improved governance environment, such as enhanced multi-level governance and more top-down leadership on the topic of CCA, Southeast Florida could move toward the implementation of regional CCA plans. These policy recommendations are organized from short- to long-term.

The first recommendation is to require a statewide adaptation plan in Florida, which could help to improve multi-level governance in the state on CCA. Similar to the Dutch "Room for the River" projects, the state of Florida had the Florida Energy & Climate Action Plan (FECCAP), which involved a collaborative effort of state government, universities, non-profits and PPPs to address climate change. However, after Governor Scott took office in 2011, the funding for the FECCAP was withdrawn and there is currently no statewide adaptation plan in place. Reestablishing the FECCAP as a top-down Florida state government leadership offers an opportunity to improve coordination with the well-established bottom-up leadership including the SFRCC, local governments and a conglomeration of organizations, such as the FEF and CLEO Institute.

The second recommendation is therefore, to develop state and federal funding for the statewide FECCAP and SFRCC. Although the focus of this paper was limited to the Florida context, the findings have shown that it would be beneficial for Florida to seek federal support. The FECCAP has been inactive since 2011 due to the loss of state funding, while the SFRCC are receiving no state funding at the moment. Therefore it will require an upsurge in political support for CCA

from the state government as well as the federal level so that the FECCAP and SFRCC can receive sufficient funding resources for CCA projects. Through opportunities such as grassroots, bottom-up CCA initiatives, Southeast Florida are making progress on adapting to SLR, though they too need support from top-down initiatives, such as the state FECCAP and federal support. However, the FECCAP is currently not provided with funding from Governor Scott and it is recommended that members of the FECCAP and SFRCC also apply for federal funding. The SFRCC applied for federal funding in 2010 and received none, however President Obama recently applauded the efforts of the SFRCC and during his Earth Day speech in the Florida Everglades (April 22, 2015) when he stated, "Five years ago, local leaders down here, Republicans and Democrats, formed the bipartisan Southeast Florida Regional Climate Change Compact -- an agreement to work together to fight climate change. And it's become a model not just for the country, but for the world"(whitehouse.gov, 2015). This statement shows that Obama acknowledges the legitimacy of the SFRCC, which offers the potential for funding opportunities.

My third recommendation is to integrate information about SLR into education from the elementary to university level in Southeast Florida as a means of cultivating involvement on SLR issues. At the elementary level, class projects or field trips could be taken to areas of Southeast Florida that have or will have be impacted by SLR, or students could receive lectures from professionals involved in CCA. Organizations such as the CLEO Institute have now established Youth Task Forces for educating students on climate change and further developments could help in providing the younger generations with a stronger understanding of SLR and climate change in general. The younger generation in Southeast Florida will see the direct impact of SLR in their lifetimes and it will be valuable for them to cultivate knowledge on the topic from a young age. The universities located in Southeast Florida should also get further involved in researching CCA. Through numerous academic disciplines such as art, architecture, geography, ecology, landscape design, among others, there are prospects to improve the knowledge around CCA in Southeast Florida. By integrating the universities into developing CCA it gives prospects for innovation in Southeast Florida and could help to improve the overall governance capacity of the region.

I focused the recommendations on multi-level governance, coordinated top-down/bottom-up leadership, funding and learning opportunities. It is clear that in order to improve the governance capacity it lies within a collective consciousness of its occupants, which can enable progress for CCA. In Southeast Florida a dedicated group of people are continuing to improve its governance capacity to adapt to SLR and based off the findings and discussions, these recommendations

could help to foster the ability of adaptation measures to be implemented in the forthcoming decades.

7.3 Discussion and further research

There are several limitations in this research and it is important to consider them in this section. As adaptation to SLR is a relatively recent development in Southeast Florida, literature on the topic specific to the region was limited, therefore interview collection became a significant part of the data. The subjective views of the respondents that I interviewed during this research naturally influenced the findings, as my interviews were limited to stakeholders involved in some respect to CCA in Southeast Florida. Going forward, the data collection process could be improved on by conducting further research in Southeast Florida and interviewing citizens, stakeholders and elected officials from various levels of government. As data collected was limited to the Netherlands it made it increasingly difficult to gain a further understanding of the specific sub-components of the governance capacities, such as the perception of risk from SLR in Southeast Florida, without conducting research on the ground. However, document analysis such as the research of Bolter (2014) and Eisenhauer (2014) provided key secondary data, which helped to validate my findings in the interviews. Based on these circumstances, the findings proved to be substantial, however, if someone were to conduct further research on this topic I would recommend that they conduct research on the ground in Southeast Florida.

Applying this framework involved several limitations, such as the slight overlap in some of the critical aspects of the various sub-capacities such as knowledge, human and learning resources. It was difficult to determine which additional sub-capacities or critical aspects should be used in the model prior to conducting the research. Based on the five sub-capacities of Mees and Driessen (2010), the choice of managerial, political, resources and learning seemed to best fit the direction of this research, with the exclusion of the legal capacity. Clearly, for further research additional sub-capacities could be developed, but for the scope of this research it was limited to these four capacities of governance. Furthermore, the sub-capacities are all receiving equal weighting in this research, though for future research it could potentially be more valuable to give greater weight to some capacities over others based on their significance. Additionally based on the findings, it could be beneficial to research specifically into one sub-component of governance capacity, since they all have shown to face numerous barriers. Furthermore, based on my findings, I would recommend that if only one sub-component were to be analyzed it should be the political capacity, as it has shown to have the largest impact on the overall governance capacity.

This framework has presented a foundation of understanding into the current governance capacity of Southeast Florida to adapt to SLR and as numerous countries are increasingly beginning to approach CCA from a regional perspective, this framework provides a general frame for analysis across the globe.

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Appendixes

A. Interview Guide

Managerial Capacity (Integration, organization, strategies and tools)

- What kinds of CCA integration techniques are being employed at the local, regional and state level?
- How is CCA integrated into other policy areas?
- How is the coordination between government sectors that play a role in adaptation to SLR in Southeast Florida?
    - (If so) Why is the coordination between sectors difficult to achieve?
    - According to transition theory, is transition management an potential means to achieve stronger multi-level coordination?
- How is the coordination among the counties across borders in Southeast Florida on CCA?
- What types of management tools and strategies are being used in Southeast Florida to improve collaboration and therefore plans to adapt to SLR?

Political capacity (accountability, transparency, political will, leadership)

- Is the CCA process in Southeast Florida transparent among (local, regional, state)
    - What is your knowledge of SFRCC regional climate summit?
- To what degree are policy makers being monitored? (local, regional, state)
- What is the overall political support of adaptation to SLR? (local, regional, state)
- How does short-termism of politicians influence the development of long-term CCA strategies?
- What is the role of state leadership in CCA in Southeast Florida?
- What is the level of political support among local and regional leaders?
    - Which local leaders are leading in progressing the CCA agenda?

Managerial capacity (financial, human, knowledge resources)

- What are the funding resources for CCA in Southeast Florida? (federal, state & private)
- Does your agency/non-profit/university/firm have sufficient knowledge of how to adapt to SLR?
    - Does the SFRCC have sufficient knowledge on how to address SLR?
    - What type of knowledge is absent in Southeast Florida regarding adaptation to SLR?

Learning capacity (risk perception & learning networks)

- What is your perception of the risk of SLR in Southeast Florida?

- How is the risk of SLR perceived by citizens, elected officials, and private stakeholders in Southeast Florida?
    - (if so) what are the main limitation to the risk perception attributed to?
- To what degree are learning networks existing in Southeast Florida to improve engagement/perception of individuals to the risk of SLR and reduce uncertainties?

B. Example Interview Transcript

Interview with Robert Daoust (June 1, 2015)

What kinds of CCA integration techniques are being employed at the local, regional and state level?
The Army Corps already had billions of dollars of infrastructure committed across the US and they had major projects already construct that happen. They're responsible for protecting New Orleans. So of course following Katrina the federal government through the Corps had a responsibility to restore and improve the flood protection infrastructure around so if you want to look at the City of New York and New Jersey following Hurricane Sandy where the corps they're not going to go out and build a gigantic new flood control structure the questions can be cooked and if you're never going to happen it's who can. They're never going to build that kind of a structure but it's not already in place because the responsibility of protection falls on the federal government and they don't want to do it. So instead you have a plan like plant in my city in the morning with that one and why I think it's something I worry about small scale projects that are implementable together and I think that what's going to happen down here in Florida and it is happening down here is the latest poll you they're looking individual projects for example the city of Miami Beach is doing it. The demonstration project to look at is the living shorelines like a repressed brush a glide to provide additional flood protection for just thirty. You've got projects going on and in Miami where you've got things going on in terms of increasing levels. He's got new pump stations being built by Fort Lauderdale yet incremental little projects. The thing missing is an integrated overall plan right. I agree with the design is what.

How is the coordination between government sectors that play a role in adaptation to SLR in Southeast Florida?
It is important to look at the way that even there are differences even amongst the counties of Broward, Miami-Dade, Monroe and Palm Beach which are all quite different in terms of culture and are used to being autonomous in how they do things. It is all quite new for them to be working together in the SFRCC.

According to transition theory, is transition management an potential means to achieve stronger multi-level coordination?
I am not familiar with the transition theory approach.

How is the coordination among the counties across borders in Southeast Florida on CCA?
I think that the local counties believe that collectively they have a stronger voice as part of the SFRCC which is why they're investing heavily in the climate compact (SFRCC). Miami Dade and Broward have been the leaders in adaption and I think much like other larger issues of the day for example Everglades restoration. this is a parallel you know there with not a lot of momentum for Everglades restoration at the federal or the state level it was very much just you know a wild like control issue. There was not a lot of attention on our military predation it was occurring to the Everglades. What happened was the local people who live in south Florida and that utilize the Everglades started a grassroots effort that then found its way up.

What types of management tools and strategies are being used in Southeast Florida?
I think what they have is integrated adaptation strategies are in Miami Beach which is a very expensive short term Band-Aid with a 35 year limit. It's going to be effective. It's already shown to be effective. It did not flood during the last high tide so it's going to be a short term solution but the city and the county both recognize that they need to be thinking longer term and how do you address those things longer term and obviously one of the there's a lot of complicating factors how the city of Miami Beach they have a hundred and sixty three miles of sea walls. So obviously code ordinance changes that is looking at changes and finished more elevation of course one of the big issues is how do you city of Miami Beach.

What is your knowledge of SFRCC regional climate summit?
The climate summit occurs each December and brings together a group of people from various organizations as well as government officials

Are policy makers being monitored in Southeast Florida
Actually the state policymakers are controlling regional water policy to a greater degree under Governor Scott as they are able to appoint the agency leader of water boards. Under Rick Scott I believe the governor appoints the governing board of each of the water management boards and has increased policy power under Rick Scott.

What is the overall political support of adaptation to SLR in Southeast Florida?
There are county level climate change task forces in each of the four counties which have support of the SFRCC. However, the various level of support of adaptation is influenced by the level of autonomy and if you look at Miami Dade County has a strong task force though Broward County did not they rotate the ship between the various commission members me out is that in Broward County have much more leeway and autonomy than in Miami Dade County

How does short-termism of politicians influence the development of long-term CCA strategies?
Many of the solutions, such as for example in Miami Beach are focused on short term solution but the city and the county should recognize that they need to be thinking longer term and how do you address those things longer term and obviously there are a lot of complicating factors. Regarding, Rick Scott Rick Scott in four years it's over he can hit term limited out. So we're going to have a change in government and nobody is really aligned with his strategies when it comes to South Florida and I think in three years there's going to be recognition that you know his way is not necessarily the right way progressing South Florida's CCA and after he leaves office people can come back to work on the issue.

What is the role of state leadership in CCA in Southeast Florida?
State government is a drag on SLR, and I would say SLR is happening here in South Florida and as people are living here they are impacted by things like recurrent flooding, inability to travel down a road if you live on Miami Beach. This is something that local governments pay attention and I think eventually state and federal government will follow suit.

Which local leaders are leading in progressing the CCA agenda?
That's a key here though if you look at it you know you've got Broward County Jennifer Delgado who works for environmental protection growth management is active she's been a longtime proponent of the SRCC involved from the very beginning. She drives things but she looks at things and executes them way in a way that conscious for the county because the county has limited financial resources. So she is working closely with the South Florida Water Management District in order to leverage their abilities scientific capabilities to the climate compact. If you look at Miami Dade you've got Harvey he's the biggest spokesperson t commission. She's the one that got the ordinance that they must look at sea level rise as part of any of their capital planning projects efforts but Miami Dade and is really an individual led effort and it's about finding resources that work with the next hour the pocket book again where because they're not like the water management district where they can bring money are a voluntary each in of government. So things I mean can be done within this governance structure but it is difficult.

What are the funding resources for CCA in Southeast Florida? (federal, state & private)
Simply put the SFRCC does not need the Governor's approval to do a project within the four counties going to have it but they have no money to do so.
Does your agency/non-profit/university/firm have sufficient knowledge of how to adapt to SLR?
Well in terms of people we have a very knowledgeable group of people that are engaged in the issue of SLR and working in the current governance situation of South Florida.

What is your perception of the risk of SLR in Southeast Florida?
SLR is a large threat to South Florida and coastal areas of Miami Beach and Broward County where I live are already seeing the impacts of higher flooding levels during high tide.

How is the risk of SLR perceived by citizens, elected officials, and private stakeholders in Southeast Florida?
Actually I think you're looking at a very proactive and well educated citizenry which are seeing the impacts of SLR particularly if you live in coastal areas like Miami Beach or coastal Broward County where I live I think there's a willingness of the public to address the risk and want to see some kind of solution

what are the main limitation to the risk perception attributed to?
As I mentioned the limitations comes from Scott and the administration which is quite a drag for SLR adaptation, but there are a lot of people on the ground doing work

C. List of Relevant Websites

For more information on the topics discussed in this thesis, please visit the sites listed below.

Southeast Florida Climate Compact

http://www.southeastfloridaclimatecompact.org/

South Florida Water Management District

http://www.sfwmd.gov/

Florida Earth Foundation

http://www.floridaearth.org/

Climate Leadership Engagement Opportunities

http://www.cleoinstitute.org/

South Florida Regional Planning Council

http://www.sfrpc.com/

Broward County Climate Change Task Force

http://www.broward.org/NATURALRESOURCES/CLIMATECHANGE/Pages/Mission.aspx

Miami-Dade County Climate Change Task Force

http://www.miamidade.gov/environment/boards/climate-change-task-force.asp

Miami-Dade County Sea Level Rise Task Force

http://www.miamidade.gov/environment/boards/climate-change-task-force.asp