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Evaluation of a Climate Change Training Program for Local Government Employees

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Evaluation of a Climate Change Training Program for Local Government Employees

by
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Approval Page

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Clara M. Kashar

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Abstract

Evaluation of a Climate Change Training Program for Local Government Employees. Clara M. Kashar, 2018: Applied Dissertation, Nova Southeastern University, Abraham S. Fischler College of Education. Keywords: andragogy, climate literacy, employee development, local government, program evaluation

A local government in South Florida launched a training program to improve employee engagement on climate change using best practices in adult learning and climate communication to bridge the gap between climate science and action in government operations. The purpose of this program evaluation was to determine whether that climate change development and training program for local government employees met its stated goals and objectives. This evaluation blended a component of Stufflebeam's Context, Input, Process, Product (CIPP) model with Kirpatrick's Four Levels model. To conduct the evaluation, the researcher used a mixed methods approach for analyzing both quantitative and qualitative data. The research objective was to assess an increase in climate literacy, gather perspectives on the training program, and explore application of on-the-job use from employees who have completed the training program.

CIPP results indicated that the effectiveness of the training program was not altered by whether the training was internally or externally developed. Level 1 findings showed employee reactions to the training program were generally positive. Level 2 findings revealed that although learning occurred as a result of the training program the employees' climate literacy score did not increase significantly. Level 3 and Level 4 results showed use of the climate knowledge and tools on the job and uncovered three necessary components for furtherance of employee action: ongoing engagement, enhancing tools, and building capacity through leadership. The findings of this study are being used to inform decision makers with the intent of improving the training program.

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Chapter 1: Introduction

There are various indicators of a changing climate and multiple effects from global climate change that are well documented in the scientific literature. Disasters and impacts due to climate change are on the rise (Kagawa & Selby, 2012); therefore, higher temperatures, drought, and wildfires will be more common with global warming (The White House, 2015). Scientific evidence points to a future with "built-in potential for disaster" (p. 208) and climatologists are predicting increases in extreme weather events (Kagawa & Selby, 2012). Research has shown that human activities are the prime cause for increases in atmospheric levels of carbon dioxide, a heat-trapping gas, due to energy produced from coal-fired power plants, burning of oil, consumption of gasoline for fuel, and deforestation (*Highlights of Climate Change Impacts in the United States*, 2014). Pollution from runoff and exhaust, contamination from hazardous waste sites, and destruction of habitat through urban sprawl are a few of the human-induced pressures straining earth's ability to naturally restore itself (Yigitcanlar, 2009).

Local governments and their communities are critical in humanity's response to climate change. Policy and urban infrastructure decisions by local government shape their community's lifestyle choices; integral to impacting urban emissions (Hoornweg, Sugar, & Lorena Trejos Gomez, 2011). In Europe, more than 7,500 local and regional authorities (www.convenantofmayors.eu) have signed the Covenant of Mayors pledging to reduce carbon emissions. In the United States, 1,060 cities (www.usmayors.org) have committed through the Compact of Mayors Climate Protection Agreement to meet or exceed Kyoto Protocol targets to reduce GHG emissions. The influence of local government is important to note as urbanized areas "account for more than 80 percent of the world's GHG emissions" (Hoornweg, Sugar, & Lorena Trejos Gomez, 2011, p. 1).

This chapter presents an overview for a program evaluation of an employee development training for local government employees on climate change. Within this introductory chapter, the researcher describes the problem being evaluated, defines major concepts and terms, and introduces professional evaluation standards (Joint Committee on Standards for Educational Evaluation, 1994). The researcher establishes a descriptive foundation substantiating local government's role in the global climate crisis and the importance of conducting this program evaluation with a leading institution, Broward County government, serving as the research setting.

Statement of the Problem

Climate change is a real and current threat. Decisions local governments make today have future impacts. In order for local government staff to understand how to integrate climate impacts into their decisions, "it is important to increase decision makers' awareness of future impacts of climate change" (Tang, Wei, Quinn, & Zhao 2012, p. 98). Many local governments have made significant commitments to reduce greenhouse gas emissions and increase community resilience. However, there seems to be a gap between the commitments and the achievements reached. This gap, according to research from Tang, Wei, Quinn, and Zhao (2012), may stem from policy makers' lack of ability to assess and understand climate science information. To address this gap, there are governmental organizations implementing climate science education and offering training programs. According to Ostrom (2010), seeing the natural resource under discussion and being able to frame it to personal wellbeing increases the likelihood of local action. The issue with greenhouse gases and climate mitigation, however, is that the benefits to action are often distant in time and place. Significant change is demanded now, not in the next 30 years from now with the next generation. To drive change, many

local governments in the South Florida region are developing climate change engagement programs and delivering employee climate change training to foster understanding in the community and advance skills of the local workforce. In Southeast Florida, 109 local governments participate in a regional network for climate action and engagement (Southeast Florida Regional Climate Change Compact, 2017). At least four of those local governments have begun implementing training programs for their employees on climate change. Already dealing with the effects of global climate change, the region recognizes that climate change will be forced to redesign how local government functions. According to Daniel Kreeger, Executive Director of ACCO, South Florida needs to ramp up education and capacity building:

> If South Florida wants to continue to be prosperous in 50 years, it cannot look like what it does today and local government has a role. Elected officials, and local leaders, need to find balance between today and tomorrow. Every wrong decision city staff makes is exacerbated in cost, and to community vitality. Government staff need to have the capacity to make decisions now with an awareness of understanding of future climate conditions, a skill that has not been traditionally part public administration education, in order to prepare for a thriving community of the future. (D. Kreeger, personal communication, August 25, 2017)

This evaluation study attempted to assess the effectiveness of a local climate education program. The Climate Change Toolbox (CCTB) training program was implemented as a professional development program for increasing engagement and understanding of climate change at the study site in the spring of 2016. The problem this evaluation study addressed is the CCTB training program, which, has not been evaluated. Therefore, division leadership is limited on determining the impact of the program and

for reporting the effectiveness of the training to county administration and stakeholders. There was a question as to whether employees would respond positively to climate training, and if it could lead to enhanced engagement on local climate issues and increased action using tools and resources. Agency leadership determined a program evaluation would be an appropriate way to assess the effectiveness of the program. The goal of this research was to assess the level of climate change literacy of local government employees and to explore the extent that climate change is being integrated in on-the-job decision making while also revealing barriers of inaction in order to improve the CCTB training program.

Local government's role. Mark Watts, the CEO of C40, stated, "The solutions to big problems like climate change are going to be delivered in cities and often by city leaders as much as by national leaders" (Watts, 2014). As Mark Watts stated, cities and city leaders are an important component of the ability of national governments to meet climate change goals (Bulkeley & Betsill, 2003) and respond to the issue (Bulkeley, 2010). Local governments have demonstrated leadership by setting ambitious goals, understanding their duty and portion of the global issue, and pushing for environmentally sound policies and initiatives. Protecting local natural resources is a major concern for many cities as the increase in population also comes an increased use of energy resources that in turn increases pollution (Kwon, Jang, & Feiock, 2014). Recognition of economic risk for local and national governments is emergent; moreover, there is worldwide recognition that governments are obligated to safeguard the welfare of their citizens, both legally and morally (Wilby & Keenan, 2012). Greenhouse gas mitigation goals have been implemented across the United State; however, "Climate policy does not self-implement" (Rabe, 2010, p. 14), emphasizing the mutually supportive roles of culture and life,

government policy, and civic activism (UekÖtter, 2014). Local governments are linked intrinsically to their communities and "have unique advantages for implementing policies" (National Research Council, 2010, p. 49). Daniel Kreeger, Executive Director of ACCO, expressed the direct connection of local government decisions and climate change:

> Civil servants are in a position to sufficiently address climate change in the interest of their community. The challenge currently is that local governments are not accustomed to leading, they have typically been a reflection of the will of the people. Local governments are beginning to understand that the livelihood, health, and prosperity of their community will be effected by climate change, and that their community will have expected that their local governments have taken action in a responsible way. (D. Kreeger, personal communication, August 25, 2017)

Today a little over half of the world's population resides in cities, and by 2050, that number is expected to grow to two-thirds (www.un.org). The concept of sustainable cities was introduced in the 1987 Brundland Report (Bulkeley & Betsill, 2005). With the publication of the report, sustainable development took center stage (Holgate, 2007). City governments understood the benefits of sustainability. By committing to greenhouse gas reductions, local action could improve environmental conditions, attract external funding, and entice potential businesses and people looking to locate in an eco-friendly locale (Kwon, Jang, & Feiock, 2014). As more and more of the global population urbanizes, the spotlight will be on cities to deal with the global climate issue. Societal benefits of natural ecosystems and economic benefits from tourism and recreation to seaports and fisheries are integral to global societies and economies (United States Environmental Protection

Agency). Consequently, mitigation and adaptation will require climate literacy, funding, and forward thinking for more long-term measures.

The research problem. Local governments have a role to respond to climate change, perhaps more thoroughly and quickly than the federal government. According to Tang, Wei, Quinn, and Zhao (2012) "the local jurisdictional level is an appropriate scale to address climate change related problems" (p. 81). In fact, due to the complexities of worldwide climate change and legal factors, the majority of adaptation efforts are transpiring at more regional and local levels (*Highlights of Climate Change Impacts in the United States*, 2014). Decision makers in local government are making decisions now that affect the future. Velazquez, Esquer, Munguía, and Moure-Eraso (2011) posited that local and global efforts are minimized "because learning enough to make this concept operational has not been possible" (p. 36). There is no globally relevant set of guidelines for communities and organizations to follow. According to a National Research Council (2010) report, decisions are being made, **"**by people who may be unfamiliar with the details and weight of scientific evidence" (p. 29). New regulations for building codes, updates to land-use plans, and infrastructure and habitat fortifications are some of the adaptation techniques being used currently by local governments throughout the United States toward climate change (*Highlights of Climate Change Impacts in the United States*, 2014). Moreover, as Daniel Kreeger, Executive Director of ACCO pointed out, it is the duty of local government to prepare a community for climate change:

> Local government is accountable for maintaining the health and vitality of their community and have access to information that their constituents do not. Therefore, local governments have a moral and ethical responsibility regarding climate change. If governments choose the path of inaction, at some point it will

> be a liability issue. For example, insurance companies will sue if the local government does not effectively address issues like the suit filed in the New Orleans levy breach during Hurricane Katrina. (D. Kreeger, personal communication, August 25, 2017)

Substantial research on climate change and communicating climate change exists as well as substantial research within the field of andragogy and professional development. However, comprehensive evaluations of learning programs are rare (Throgmorton, Mitchell, Morley, & Snyder, 2016). In addition, there is relatively little research on climate change education as it relates to professional development for adult learners in the workforce. The evaluation of the CCTB training program for employees in South Florida hoped to provide insight for other local governments in engaging staff to meet their climate commitments.

Audience/stakeholders. The study findings may be valuable to the global conversation on climate change education and communication. In addition, the information may be valuable to local governments throughout the United States working toward meeting their climate commitments by educating staff. Locally, the findings will go toward improving the training program at the program site. The results of the evaluation were shared with the program team, division leadership, and department directors as well as the Climate Change Task Force. In addition, other local South Florida governments, community environmental nonprofit groups and organizations, and trainers and educators may benefit from applying these evaluation techniques to elicit and share the impact of similar programs.

Program

In 2014, Broward County Board of County Commissioners passed a resolution "supporting President Obama's Climate Action Plan, Congressional action on climate change, continued engagement with the Southeast Florida Regional Climate Change Compact and federal government, adding goals for using renewable energy, reduction of energy usage, and incorporating renewable energy projects into County buildings and operations" (Climate Action Resolution, 2014) addressing many recommendations made in the Broward County Climate Change Action Plan (CCAP) as well as the Regional Climate Action Plan developed by the Southeast Florida Climate Change Compact. The Environmental Planning and Community Resilience Division is responsible for tracking greenhouse gases, reporting mitigation efforts, implementation of the CCAP, and developing programs to meet the County's climate mitigation and resilience goals.

Broward County administration recognized the need for all employees to work together and apply their skills and knowledge to address the environmental challenges faced by the County. The Environmental Planning and Community Resilience Division was tasked with the development of an employee professional development program on climate change. The intention was for attendees to learn from county staff experts on how global climate change translates to local challenges and opportunities and engages in activities to connect their role and how to apply tools and resources. The Climate Change Toolbox (CCTB) Training was developed and piloted in the spring of 2016. Trainings were related to specific needs and tailored specifically for different divisions and departments, including: Libraries, Cultural Division, Parks & Recreation, Public Works, Water & Wastewater Services, Airport, Port Everglades, Human Services, Transportation, Environmental Protection and Growth Management. The trainings were

held at the respective division's or department's facilities. The County's internal "Learning Center" was used so that employees earned professional development credit, and the training showed on their training transcript. The following learning objectives were established and used to guide the development of the CCTB training program:

- Understand global climate change and the local the impacts to South Florida and hear Broward County's current programs and projects to prepare for, mitigate, and adapt to the climate crisis.
- Recognize how climate change relates to your division or department, and that each Broward County employee plays a role in how resilient our community can be.
- Discover the tools and resources available in the online Climate Toolbox and how to apply them.

The Environmental Planning and Community Resilience Division spent time understanding the situation, hand-picking trainers, and setting priorities for the training program that initially launched as a pilot effort in February 2016. The CCTB training program is ongoing; it was repackaged in 2017 into a monthly series with courses available every summer.

Professional evaluation standards. The intent in forming the Joint Committee on Standards for Educational Evaluation was to protect the evaluation process and also to improve the quality of evaluation research (Yarbrough, Shulha, Hopson, & Caruthers, 2011). Hence, committee members identified 30 evaluation standards whereby effective program evaluations will produce findings consistent with several standards (Joint Committee on Standards for Educational Evaluation, 1994). Moreover, committee members developed criteria for an effective program evaluation that currently include: (a) utility, (b) feasibility, (c) propriety, (d) accuracy, and (e) evaluation accountability (Joint

Committee on Standards for Educational Evaluation, 1994). Utility criteria pertain to the usefulness of the findings to program stakeholders to establish expectations of the evaluation (Joint Committee on Standards for Educational Evaluation, 1994). Feasibility criteria pertain to a concern for efficiency and manageability of the evaluation (Joint Committee on Standards for Educational Evaluation, 1994). Propriety criteria pertain to expectations of ethical standards expected of the program evaluators and consistency while conducting the evaluation (Joint Committee on Standards for Educational Evaluation, 1994). Accuracy criteria pertain to the evaluation findings to be both truthful and dependable (Joint Committee on Standards for Educational Evaluation, 1994). Evaluation accountability criteria pertain to the evaluation process and that the processes include adequate documentation (Joint Committee on Standards for Educational Evaluation, 1994). Collectively, the standards provide flexibility, integrity, validity, and credibility to the process and findings of program evaluations (Yarbrough, Shulha, Hopson, & Caruthers, 2011).

Purpose of the Evaluation

The purpose of this program evaluation was to determine whether the Climate Change Toolbox (CCTB) training program met its stated goals and objectives and to inform decision makers with the intent of improving the program; not to judge its merit or worth. The goal of the CCTB training program was to improve employee engagement on climate change using best practices in adult learning and climate communication to bridge the gap between climate science and action in local government. Fundamentally, education programs exist to create change, and an educational program evaluation "should be designed to determine whether change has occurred" (Frye & Hemmer, 2012, p. 288). Through the CCTB training program, local government wants to create an

informed workforce capable of making wise decisions. The questions the stakeholders want answered are what worked, and what did not and why, and how the training can be improved? The evaluation was requested by the Environmental Planning and Community Resilience Division in an effort to further develop, implement best practices, and evaluate the effectiveness of the CCTB training program. The research objective was to assess an increase in climate literacy of participants, gather perspectives on the training program, and explore application of on-the-job use.

Definition of Terms

Climate change. The Environmental Protection Agency (2016) defined *climate change* as "significant change in the measures of climate lasting for an extended period of time" (para. C). For example, typical climactic patterns, such as rainfall or temperature, in a region see noted changes lasting for at least a decade (Environmental Protection Agency, 2016). It is common to use the term climate change interchangeably with global warming.

Greenhouse gases (GHG). The Environmental Protection Agency (2016) referenced GHG as any gas that absorbs infrared radiation in the earth's atmosphere. Common GHGs inventoried by local governments are carbon dioxide, methane, and nitrous oxides which typically account for 89% of GHG emissions.

GHG Inventory. A GHG Inventory is the process of collecting data to compile the total amount of greenhouse gases that are emitted into the atmosphere each year. This annual total is also known as a *carbon footprint*. The carbon footprint can be evaluated for an individual, family, building, organization, company, or community (Environmental Protection Agency, 2016). Local governments will produce GHG emissions from both operational and community-wide activities. It is a commonly held practice for local

governments committed to climate action to publish GHG inventory reports annually, biannually, or in some cases every five years.

Climate commitment. There are a number of options industry sectors have to demonstrate leadership on climate change. For example, the education sector has the American Colleges and Universities Presidents' Climate Commitment, the business sector has the Carbon Disclosure Project, and the local government sector has the Compact of Mayors. In general, climate commitments require the top leadership of the organization to commit to reducing GHG emissions or carbon neutrality, and require reporting through GHG inventories. Signatories of the Compact of Mayors commitment are required to report GHG emissions from municipal operations. Climate commitments matter because they facilitate accountability of local climate action driving action and furthering investment in local governments toward mitigation and adaptation initiatives.

Climate literacy. The U.S. Global Change Research Program (2009) defined a climate-literate individual as one who understands one's role in the interaction of climate on himself or herself and society. More specifically, a climate-literate individual exhibits skills that include the following:

> "1) understands the essential principles of Earth's climate system; 2) knows how to assess scientifically credible information about climate; 3) communicates about climate and climate change in a meaningful way; and 4) is able to make informed and responsible decisions with regard to actions that may affect climate" (U.S. Global Change Research Program, 2009, p. 2).

Andragogy. The term *andragogy* applies to any form of adult learning. Technically, it is defined as the method and practice of teaching adults. The application

of research on anagogical learning has been used extensively in the design of organizational training programs**.**

Professional development (PD). The definition of PD is broad ranging from formal learning to informal or individualized and can be institutionally based or on the job. The length of a PD program also varies in range. To foster knowledge and skills, local governments commonly develop, offer, and implement PD programs to employees.

Training Program. This is an educational session designed and implemented to achieve specific learning outcomes through a series of training activities. "Training has obvious beginning and ending points, a well-defined and consistent structure geared toward education, and provides a structured flow from topic to topic." (Garfin et al., 2011, p. 110). The training program for this project was designed to improve skills that would contribute to employee climate literacy and improvement in relationship to the organization's climate commitment.

Kirkpatrick Levels 1-4. The Kirkpatrick model was founded on four guidelines, known as Levels 1-4, for analyzing and evaluating a training program. Each level represents a different dimension from participant satisfaction to impacts to the organization: (a) Level 1 Reaction, (b) Level 2 Learning, (c) Level 3 Behavior, and (d) Level 4 Results. An evaluation begins with Level 1 and moves through the other levels in order as resources allow. Data from lower levels can be used as a foundation for analysis of the higher levels.

Chapter 2: Literature Review

The world is in a state of change unlike any human being has encountered. Climate change represents an example of what Rittel and Webber (1973) called a "wicked" problem, an issue that is difficult to define, intertwined with other issues, and that disregards boundaries. A multi-faceted approach is needed. Climate change intervention strategies must be comprehensive so that a particular action does not just reduce emissions in one location or process for one period of time (McDonough & Braungart, 2002; Pauli, 2010).

Societies desire a world of predictability and safety, a world that is routine and orderly where the existence of danger is naught (Maslow, 1943). Furthermore, the public should be educated and engaged in the mitigation and adaptation process as well. Assimilating local knowledge and creating organized structures for the engagement of the community is needed (Wilby & Keenan, 2012). This begins at the local government level where officials make decisions for their jurisdictions daily that have long-term consequences. For communities across the globe, constructing a sustainable future involves integrating a balance of community, environment, and economy into decisions (Yigitcanlar, 2009). Improving urban ecosystems and adapting to changing environmental conditions needs encouragement for more "community-capacity building" (Yigitcanlar, 2009). Local governments supply basic needs for their residents, but must understand that sustainability of those basic services rely on the continued ability to utilize local natural resources and adapting to environmental challenges (Friedrich & Kretzinger, 2012). Public awareness of sea level rise is one component for moving environmental consciousness forward. Environmental degradation like air or water pollution can be physically apparent, more so than future sea level rise (Zhou, 2013).

According to Zhou (2013), when people can perceive damage to the local environment, they then show environmental concern.

According to the National Association of Counties report, "Local governments are accountable to the local citizenry and, as such, they are often best equipped to deliver services and administer programs" (Ortiz, 2016, p. 10). The National Association of Counties (www.naco.org) unites county governments with a platform for collective advocacy and resources. The United States has 3,069 county governments serving 310 million people with over $550 billion spent on services annually to ensure health, safety, and prosperity of their communities (Ortiz, 2016). Of that budget, $83 billion goes toward health and hospitals, $22 billion toward waste management, and $122 billion toward infrastructure (NACo, 2017). The National Association of Counties upholds "well-maintained infrastructure is essential for creating jobs, sustaining economic growth and improving quality of life for residents" (Ortiz, 2016, p. 4). In 2016, major disasters were declared in nearly 900 counties representing over $40 billion in damages (NACo, 2017). The impacts associated with climate change are relatively new issues and ever changing: therefore, as new information comes in, counties and cities need to be able to adjust. Local governments may not want to put themselves at a competitive disadvantage (Parker, Karlsson, Hjerpe, & Linnér, 2012). However, local government employees are relevant stakeholders in addressing climate change issues facing communities. In fact, local government employees play a critical role in the development of action plans, and the management and implementation of public policy for a community's response to today's environmental challenges. "It has never been more important for counties to take proper steps to protect their people and property from all potential hazards" (NACo, 2017).

Local authority plays a crucial role in adopting solutions for community issues (Meijerink & Stiller, 2013, p. 241), for example, drainage and sea wall height code requirements. Therefore, local government needs to provide a consistent framework, to ensure staff and the community have the capacity to mitigate and adapt to a changing climate. If concrete actions are to take place, a level of trust needs to be secured through "credible standardized information," (p. 12) which includes active debate and communication on need and methods for response (Hoornweg, Sugar, & Lorena Trejos Gomez, 2011). Organizations concerned with climate adaptation, and increasing their governance capacity to adapt, should dedicate resources toward developing knowledge and enhancing collaboration (Meijerink & Stiller, 2013).

Professional development is an important tool in today's workplace. Specific knowledge and skills are often necessary, employees must be able to adapt to changing environments in the workplace, and training is often necessary to advance in an organization (Steensma & Groeneveld, 2010). As reported by the Association for Talent Development (ASTD, 2017), in 2016, U.S. organizations spent $1,273 per employee on training with employees dedicating an average of 34.1 hours toward development. Both values have seen an increase each year over the past four years (ASTD, 2017). For organizations to remain viable, an increasingly larger number of employees are going to need to learn new skills to remain productive. According to Arms (2012), an effective learning and development program is central as a way to "future proof" (p.17) the workforce. Organizations are unique in their norms and values that will guide policies and protocols. One thing that is consistent is that "people are the main strategic resource of any organization" (Livitchi, Hacina, & Baran, p. 156, 2015). Employee learning in local government regularly occurs through Professional Development (PD) programs.

Effective PD programs ideally offer collaborative training and support in order to conquer challenges collectively (Beavers, 2009). In developing employee PD programs, a key factor to consider is that adult learners process new information differently than children (Beavers, 2009). There is a significant amount of research regarding pedagogy, pioneered by Dewey in the 1930s. Parallel to Dewey's work, however, is the work of Malcolm Knowles, known widely as the pioneer of adult education and for his description of andragogy. The theory of Knowles' illustrated adults learn in a different manner than children, and that andragogic principles can be considered when developing programs for adult learners.

Literature reviewed for this research referenced challenges and opportunities of educating adults, and communicating climate change using the adult learning theory as the theoretical framework of this program evaluation. First, an overview of adult learning theory is provided. The literature review then provides an overview of best practices in professional development using adult learning principles including: (a) involving leaners in the development; (b) allowing experiences to shape the training; (c) ensuring positive impact; and (d) incorporating problem-centered activities. Next, the researcher discusses strategies for communicating climate change. Discussion ensues around barriers to sustainability implementation and environmental behavior change. Finally, the researcher reviews publications relative to conducting program evaluations, and examines evaluation models to prepare for application of the program evaluation methodology to the research questions.

Theory of Adult Learning: An Overview

Learning is inherently part of being human. Adults learn by guiding their behavior from generating concepts and principles based on experiences in their life (Steensma &

Groeneveld, 2010). In furtherance, "the new behavior leads to new experiences and these experiences start a new cycle in which the concepts and principles are modified to improve their effectiveness" (Steensma & Groeneveld, 2010, p. 322). Andragogy is the techniques used to teach adult learners; the term is synonymous with the phrases *adult education*, *adult pedagogy*, and *adult learning*. The concept of andragogy has been used as a teacher theory for around two centuries. The first original formulator was Alexander Kapp, a German teacher, in 1833. Kapp's approach to andragogy affirmed that adult education required special methods, philosophy, and teachers. However, the term andragogy did not get much attention in North America until 1970's when advanced by Malcolm Knowles, an adult education scholar (Reischmann, 2004). The term andragogy is linked with Knowles since his first publication on andragogy, titled *Andragogy*, which at the time was a controversial and provocative title. Knowles's concept of andragogy was defined as helping adults learn and centralized by two factors: (a) the idea self-driven learning, and (b) facilitating rather than teaching content to learners (Knowles, 1970; Reischmann, 2004). According to Knowles, andragogy is built on four crucial assumptions regarding the characteristics of adult learning, the traits of adult learners, and the contrasts from child learners. Knowles (1970) termed the following assumptions as the four principles of andragogy: (a) need for adults to be actively involved in the planning and appraisal of their instruction; (b) daily experiences act as resources for adult learning; (c) adults are interested in learning things that directly affects them personally and have positive relevance in their life; and (d) adult learning is problem–based and not content-based. A fifth assumption was added in 1988 to include the self-driven factor wherein adult learning relies on past experiences and that motivating oneself to learn becomes increasingly high and more intrinsic as a person matures. Moreover,

Reischmann (2004) described andragogy using formal and informal education terminologies, intentional and autodidactic learning. Recent scholarly articles define andragogy as a discipline in the department of science for the study of technology, practice, theory, and research for guiding, teaching, and instructing adults. In the field of human resources development, andragogy's role elaborates human capacity and explores potential and ability of the workforce (Henschke, 2010).

Knowles' approach was faced with some issues raised by other scholars who argued that the approach limited the framework for adult learning (Beavers, 2009). They argue that Knowles did not specify whether the theory was for learning or teaching methodology nor defined steps on how to undertake these practices. Hence, the approach cannot be made practically but only theoretically (Sopher, 2003). Today, many scholars comprehend "adult education" as a small aspect of the wider concept of education of adults (Beavers, 2009).

Adult Learning Principles in Practice

To make employee training successful, trainers and program developers need to be aware of the andragogy learning principles, adult learning theory, and adult learning styles (Henschke, 2010). Adult learners "prefer problem-centered instruction applicable to real-life situations rather than instruction based on abstract concepts" (Attebury, 2015, p. 303). Therefore, workplace learning should involve learning from experiences, knowledge sharing, and solving problems related to the activities of the organization (Knowles, 1984). Using the theory of adult learning and andragogical principles, adult learning in the workplace should comprise of learning from past experiences, sharing-of-the-ideas by the participants, and participating in active learning. However, the delivery methods of professional development (PD) work against the principles of andragogy

(Henschke, 2010) and have a tendency to emphasize teaching knowledge (Rowland-Jones, 2012). For more effective PD programs, program developers should align the learning content with the learner's expectations (Arms, 2012) and ensure the PD trainer's role is facilitative versus instructive. In addition, Beavers (2009) explained if there is conflict between the learner and the content, adult learners will resist learning. There are common applications and practices incorporated with the four andragogy principles that PD research literature reveals as best practices to guide program development.

Involve learners in developing the training program. There is the need for adults to be actively involved in the planning and appraisal of their instruction. Aligning the content with the expectations and values of the learner aids in the effectiveness of the PD program (Arms, 2012). Adult motivation is essential in every learning process, and there should be a reason why the adults have to go through the learning process. This is to give meaning to the whole experience and make it meaningful and worthwhile. According to Smith (2011), "Deciding what and how to teach is a negotiated process with the learners" (p. 18). One adult education approach is to use focus groups with representation from the different staff levels to determine expectations, share ideas, and brainstorm prior to the development of the training program. Further, the trainers are the front line for the educational program and must endorse the program's mission in tandem with the learners (Smith, 2011). For example, the trainer or trainers could involve the learners in setting the program's agenda by having the participants list their expectations of the training, and then polling the participants to prioritize the list.

Allow experience to shape the training program. Adults are process-based learners rather than content-based learners (Taylor & Kroth, 2009). Therefore, daily experiences act as resources needed for adult learning. Note the wide array of experiences

based on newer employees versus veterans; an effective professional development plan should consider the capital of experience in the crowd. Real-life scenarios in the learning process can help adult learners visualize the application of the training. According to Arms (2012), the program should not rely on trainers presenting a topic, but rather "strong courses should be engaging, experiential, balanced and team-exercise-driven (p. 18). Moreover, incorporating experiences will give practicality and relevance to the training program.

Attebury (2015) suggested that "adult learners need to feel safe" (p. 304) and that the sharing of experiences allows the trainer to show respect and "draw upon their students' existing knowledge" (p. 304). Practitioners can build upon Knowles' principles of adult learning to help employees make the most out of the learning opportunity provided through experiential learning. Kolb's experiential learning is the process linking professional development, education and work (Kolb, 2014). The model theorizes a cycle for adult learning that each training activity should take the learner through to be effective (HR Council, 2012): experience, reflecting, thinking, and applying. For a training activity, the facilitator could initiate the learning cycle by illustrating a concrete example. For instance, if the training is to develop the employee to write a well-researched report, the learning cycle could start by showing the employee a copy of a report that is a best practice example. Next, there should be time for reflective observation which could include discussion. Henderson et al. (2010) found that strategies to help faculty be more reflective about their own teaching methods and outcomes were important to the curricular change process at a higher education institution. Last, the learning activity should include active experimentation such as a simulation or scenario to apply the new concept.

Ensure a positive impact from the training program. Seemingly, ensuring a positive impact is the most important aspect of professional development. Instructors passionate about the topic and course can have a positive impact on the PD program; a program should not seem like it comes from a box (Arms, 2012). For employee training to be successful, the facilitators should guide the employees through the training process, allow them to take tasks in the order that they want to, seek employees' input, and provide avenues for appraisal of the work of the employees. In addition, PD facilitators need to be aware of participants' time and work commitments. According to Arms (2012), with shortened attention spans and higher stress levels in the workplace innovative and well-designed PD programs are moving to brief brainpower-leveraging modules. It may sound counterproductive, however Macdonald (2009) acknowledged the use of reflection for learning to accomplish "changes in attitudes" leading to "changes in practice" (p. 23). This could mean a significant amount of time to enable the learner to go through the entire learning cycle and reflection for each training activity. Henderson et al. (2010) posited a single workshop may not suffice and recommended an approach to PD that includes ongoing sessions or continued learning opportunities. For instance, short online courses such as webinars, or online forums and software tools. The use of technology or gadgets is not a requirement for well-designed training programs (Arms, 2012). One example of continued learning could be an employee service-learning opportunity regarding the topic. A case study on Ford Motor Company's Employee Volunteer Program showed employee learning through volunteer opportunities in the community allowed time for reflection and development of skills that may not be required in the workplace and had the additional effect of increasing employee commitment (Anonymous, 2010). Therefore, to ensure a positive impact the PD

facilitator needs to balance time for reflection and time management which may include continual skill-building opportunity offerings.

Incorporate problem-centered activities in the training program. Adult learning is problem-centered. It is important for adult learners to critically analyze, reflect, and ponder on the knowledge they acquire through PD. When assignments relate to the real-world happenings, adult learners will be appealed to it, and once they learn, they will be able to apply the same practically. For adults, active participation and experimentation provide a problem-centered approach to PD, which brings more relevance to the staff (Terehoff, 2002). Moreover, action learning, defined by Strappenbelt (2010), and acknowledged by Raelin and Coglan (2006), supports the ability for the adult learner to employ information and transfer knowledge. Mature learners want to engage in learning experiences that help them solve problems on a daily basis; this is possible by "planning activates to enhance concrete skills" (Attebury, 2015, p. 309). Jones (2015) reiterated that a key to adult learning is the immediacy and relevancy of the content.

Communicating Climate Change

Climate change has unique challenges that make communicating the issue different than other environmental issues. Climate change is not a visible problem; and, in furtherance, the challenge of communicating climate change is that solutions do not have a noticeable or immediate effect making this urgent problem seem distant (Gifford, 2008; Moser, 2010; Scannell & Gifford, 2013). Therefore, "climate change is difficult to perceive and understand for most lay audiences" (Moser, 2010, p. 36). However, in recent years major natural disasters such as Superstorm Sandy in 2012, Hurricane Harvey

in 2016, and Hurricanes Irma and Maria in 2017, have elevated the conversation around climate change particularly in hurricane-prone South Florida.

Communicating climate change research has witnessed a steep rise recently since mid-1980 when human-induced climate change initially appeared on the public agenda (Moser, 2010). There are currently a number of organizations such as Climate Nexus (www.climatenexus.org), Climate Central (www.climatecentral.org), Climate Access (www.climateaccess.org), Yale Climate Connections (www.yaleclimateconnections.org), and Climate Outreach (www.climateoutreach.org) fostering cooperation between climatologists and social scientists to advance communication on the global issue (Fischhoff, 2015). There are interdisciplinary journals publishing climate communications research such as *Climate Change*, *WIREs-Climate Change*, and *Nautre Climate Change*. Therefore, communications strategies and guidelines for effective climate change messages are emerging (Scannell & Gifford, 2013; Moser, 2016; Moser & Dilling, 2007). Social science researchers and practitioners gathered at the American Association for the Advancement of Science for a dialogue on the state of research into public attitudes and behavior about climate change. The discussion occurred in reaction to the sluggish response to the collective action of Americans on climate change (Fischhoff, 2015). A report was published from the discussion for improving public engagement and identifying knowledge gaps. Key strategies indicated in the report for communicating climate change include emphasizing consensus of climate scientists, fostering empowerment for action, engaging peers to establish norms, being aware that persuasive arguments can backfire and need to be tested, and making climate-friendly behavior convenient (Bowman, 2016).

More research is needed on audience-specific messaging and impact on active engagement (Moser, 2010). Climate change is a complex problem that poses significant challenges when communicating the issue. Moser (2010) posits key components for effective climate communication that include a consideration for the purpose and scope, audience, message framing, message conveyed, messengers, and modes employed. The final element of the climate change communication process is to evaluate whether the communication had the intended effect (Moser, 2010). The evaluation of the Climate Change Toolbox training program may illuminate some challenges and opportunities of the messenger and the audience unique to government employees yielding valuable insights to the body of climate communications research. A research study explored attitudes in Britain and noted principals for productive discussion around politically polarized issues: ground conversations in conservative values, use effective framing, communicate through credible networks, and understand younger and older audiences are distinctive (Corner, Marshall, & Clark, 2016).

Understanding the audience. First, in order to be an effective communicator, the primary concern should be who the audience is (Moser & Dilling, 2010). Specific to communicating climate change, research from the Yale Climate Connections has identified six audiences titled the "Six Americas" representing the American general public. One strategy based on Six Americas "is to target messages to specific groups and address the particular barriers to climate action that they face" (Scannell & Gifford, 2013, p. 63). The Six Americas study was first complied in 2008 with over 2,100 America adult participants. The study postulated distinct levels of how Americans respond to global warming: (a) Alarmed, (b) Concerned, (c) Cautious, (d) Disengaged, (e) Doubtful, and (f) Dismissive (Leiserowitz & Smith, 2010). In furtherance, the participants differ in their

belief, concern, and engagement on the issue (Leiserowitz, Maibach, Roser-Renouf, & Feinberg, 2013). The Alarmed account for 16% of the study participants, and understand that global warming is occurring, is human-caused, and strongly support action; whereas, the Dismissive (13%) strongly oppose action and think climate change is a hoax (Leiserowitz, Maibach, Roser-Renouf, & Feinberg, 2013). In addition, those in the Alarmed and Concerned levels tend to trust scientific organizations, whereas at the other end of the spectrum "the Doubtful and the Dismissive are most likely to trust their own family and friends" (Leiserowitz & Smith, 2010, p. 4).

Over 60% of the American public fall into the Cautious to the Alarmed levels (Leiserowitz, Maibach, Roser-Renouf, & Feinberg, 2013) meaning the majority of participants judge climate change to be real threat. The latest research from Yale University and George Mason University revealed that "seven in ten Americans (70%) think global warming is happening" (Leiserowitz, Maibach, Roser-Renouf, Rosenthal, & Cutler, 2017, p. 3). However, the uncertainty of the science remains to be a barrier to climate action. A challenge for climate communication is the complexity of global nature itself and uncertainty grounded in the science (Moser, 2010). In a report written for Climate Outreach, Corner, Lewandowsky, Phillips, and Roberts (2015), proposed that uncertainty surrounding climatology is a significant barrier for the general public regarding climate action, whereas for those in public sector "the focus on uncertainty can obscure the important messages underneath" (p. 4). Climate communicators should expect, and anticipate how the audience might react to, uncertainty of climate science and tactically emphasize science as an ongoing debate and use analogies to connect the ubiquitousness of uncertainty in everyday life (Corner, Lewandowsky, Phillips, & Roberts, 2015).

This uncertainty of the science has been used as a political argument for inaction. "One of the greatest obstacles for public engagement and government action on climate change has been the polarization of attitudes around political worldviews" (Corner, Marshall, & Clark, 2016, p. 12). Concern about human-caused climate change has varied widely in the United States (Gifford, 2011), and "understanding of the causes and the stakes remains limited" (Moser, 2010, p. 32). Research compiled by ecoAmerica puts communicating climate change into a fifteen-step process. As pointed out in by ecoAmerica, "Research reveals that you can take the same set of six facts, arrange them in different ways, and end up with very different results" (ecoAmerica, 2016, p. 5). Moreover, recommend following the first eight steps in order for best results: start from your audience's perspective, connect on common values, acknowledge ambivalence, then move from impacts to solutions, empower and focus on personal benefits, and last solicit action (ecoAmerica, 2016).

Message framing. Framing a message is using a strategy to effectively communicate a complex subject such as climate change. Framing messaging to link it to a local issue that people care about can be more effective (Moser & Dilling, 2010). Moreover, a person's values, needs, and beliefs play a role in their decision-making (National Academies of Sciences, Engineering, and Medicine, 2017). According to Rowson and Corner (2015), climate communications need a "radical reframing" (p. 7) so that the problem is not solely an environmental issue. Rowson and Corner (2015) introduced the "Seven Dimensions of Climate Change" as a guide for communicators to reframe the issue. The seven dimensions include: science, behavior, technology, culture, law, economy, and democracy (Rowson & Corner, 2015). The report calls for moving away from the science debate over climate change to a social fact of needing to do

something about it by taking a multi-lateral approach of what climate impacts mean for businesses, governments, and communities, and engaging a range of feasible solutions (Rowson & Corner, 2015).

The FrameWorks Institute identified frames for climate messaging by conducting interviews with over 18,000 Americans. FrameWorks specializes in helping nonprofits rethink communications for their cause and finds what messages appeal to their specific audience (www.frameworksinstitute.org). The Institute and has tested tools for communicating climate clearer and more effective, led to the creation of the National Network for Ocean and Climate Change Interpretation (NNOCCI) and offers an online course on "Framing for Climate Interpreters" (FrameWorks Institute, 2018). Explanatory analogies can increase understanding of the issue and equip use of logical reasoning when incorporated in messaging. Four analogies have been studied and tested to have this effect: (a) earth's atmosphere is like a heat-trapping blanket, (b) regular versus rampant carbon dioxide levels, (c) climate's heart regulates the world's climate system, and (d) ocean acidification is like osteoporosis of the sea (NNOCCI, 2016). In addition, a hopeful message supports further engagement (NNOCCI, 2016).

Climate change is a wicked problem, but to communicate through a message of fear can be demobilizing. In fact, a message of fear may capture attention of an audience but without effective framing and solutions will do little to empower action, and may negatively affect engagement (Moser & Dilling, 2010). Therefore, empowering action includes a need to understand there are solutions. "By cutting our carbon pollution and investing in clean energy and efficiency solutions in our communities, we can start building a safer and stronger America today" (Climate Solutions for a Stronger America, 2014, p. 2). In research developed for Climate Solutions for a Stronger America (2014), a

three-pronged approach consisting of communicating a threat, identifying a villain, and demonstrating a solution together creates a persuasive narrative called "The Message Triangle" (p. 4). Moreover, the message is strengthened when local examples are used (Climate Solutions for a Stronger America, 2014). Similar to the ecoAmerica (2016) study, the underlying theme to the message triangle is to connect each approach to human values. For example, communicating solutions like clean energy saves money, reduces pollution, and creates jobs connects to the human value of empowerment (Climate Solutions for a Stronger America, 2014). In order to connect values, it is necessary to understand the audience, relate the issue locally, and connect emotionally which may mean sharing a personal story (Climate Solutions for a Stronger America, 2014).

The messenger. The Six Americas study shows the messenger communicating climate change is an important consideration. As participants moved further from Cautious and Uncertain toward Doubtful and Dismissive of the issue, the messengers they are most likely to trust are in their personal networks (Leiserowitz, & Smith, 2010). Therefore, how the message is communicated is important, but the messenger also becomes a key component in framing the message. Trustworthy messengers are those with values that closely match the values of the audience (Corner, 2015). Therefore, the role of the messenger becomes critical.

The Cultural Cognition Project (www.cultural cognition.net) has a team of scholars examining group values impact on risk perception and science communication. The research on cultural cognition represents the tendency of a person's cultural identity to conform their beliefs. Kahan (2012) suggests "people acquire their scientific knowledge by consulting others who share their values and whom they therefore trust and understand" (p. 255). Simultaneously, an individual reasons from their cultural identity

and collective knowledge (Kahan, 2015). This theory helps to explain the polarized issue of global warming. In furtherance, Kahan (2015) confirms that a person level of science literacy is not the only reason for their acceptance of climate science. If one is to be a climate messenger, then a clear understanding of the social and psychological dynamics should be understood. Climate communicators therefore need to tap into cultural reasoning to engage in and out of the classroom (Kahan, 2015). For further perspective, being correct or incorrect about climate change will probably have little to no effect on the typical person's daily life whereas "the impact of taking a position that conflicts with their cultural group could be disastrous" (Kahan, 2012, para. 6).

Communication channels and tools. Communication channels are more diverse and fragmented then they have been in the past (Moser, 2016). For example, social media is "the interactions among people in which they create, share, and/or exchange information and ideas utilizing social exchange theory in virtual communities" (Pechrová1, Lohr, & Havlíček, 2015). With numbers of users growing, and interaction through digital media becoming standard, organizations are forced to rethink social media as "just a channel" for communication and move toward integrating into the framework of the organization (Kane, 2015). Organizations can use social media applications for internal and external communications, engagement, and learning. Regardless of which application an organization uses, a study by Pechrová1, Lohr and Havlíček (2015) examined common strategies used by organizations: keeping messages short, taking creative humorous approaches, and implementing applications within the media such as games. The study found using games or holding competitions built loyalty of users, it found that long messages can be justified in extraordinary circumstances, and that a

balanced approach of posting a mix of text posts, links, photos, and videos works best rather than solely posting for the funny factor (Pechrová1, Lohr, & Havlíček, 2015).

One traditional tool that still works today is story telling. Stories are a communication tool that can inspire action and retain relationships to a movement (Meisel, 2013). According to Meisel (2013), effective storytelling emphasizes an individual or a group of people being courageous. Storytelling builds on the researched tactics for communicating climate change by ecoAmerica (2016) and Climate Solutions for a Stronger America (2014) by showcasing solutions through concrete examples that can connect with underlying values. Meisel (2013) posits using people-focused stories help overcome challenges by focusing on a positive message that allows a listener to connect themselves or their community to a real person acting on solutions now.

Another tool to help frame a message is visualization. According to Scannell and Gifford (2013) people may respond particularly well to visual displays of risks, and therefore impact one's sense of urgency into action. Moreover, visual communication of local impacts, versus global impacts from climate change, that also explore meaningful solutions are the most effective at illustrating urgency for taking local action now (Scannell & Gifford, 2013). Thus, using photos and video footage to communicate climate change can make the threat of climate change real and present to the learner. A local government example for use of a visualization tool is Marin County's "Here Us Now" program. To increase public engagement on their adaptation planning, a viewing device called an "OWL" was used to visualize impacts of sea level rise to the region (Moser, Daniels, Pike, & Huva, 2017). The OWL is "a 360-degree rotating audio-visual platform that enables users to view visuals, respond to survey questions and leave audio comments" (Moser, Daniels, Pike, & Huva, 2017). The OWL tool allowed users to

experience and see what rising seas looked like in their community. Over 3,700 responses were collected and analyzed that found the visualization raised concern for the issue and an increased desire for further active engagement (Moser, Daniels, Pike, & Huva, 2017). However, the study could not determine that the participant's sense of control or ability to do something increased as a result of the tool (Moser, Daniels, Pike, & Huva, 2017).

If the overall communication strategy is intended to change behavior then what is intended and who has control over the decisions must be considered (Moser, 2006); in addition, relevant communication and support mechanisms must be practiced to translate understanding into action (Moser, 2010). Generally, climate change knowledge is global and therefore cannot be linked locally for those with limited knowledge (Moser, Daniels, Pike, & Huva, 2017). Communications channels and tools are important to helping communicators approach an audience with a message.

Climate Change Training

There is significant research on how to communicate about climate change to the general public (Moser & Dilling, 2004; Moser & Dilling, 2007) and communications resources for journalists, educators, and local government through major institution websites such www.metcalfinstitute.org and www.iclei.org. The Climate Literacy and Energy Awareness Network (CLEAN) network is a collection of educational resources and guidance on teaching climate and energy suitable for secondary through higher education classrooms (https://cleanet.org). To help schools define and measure, a number of certifications and benchmarking tools have been developed (Porter & Cordoba, 2009). However, the same cannot be said for employee environmental education programs. Local government benchmarking tools include STAR Communities, ICLEI, but these ratings or certifications lack resources, definitions, or measurements for

education of staff. Across university campuses "curriculum 'greening,' networking, facility-oriented energy-saving programs, sustainability awards, and teacher training" are the successful mix of elements for sustainability (Warner & Elser, 2015, p. 3). These same elements could be applied to employee education programs. Being able to communicate climate change is important; however, policy action and behavior change is not a direct result of awareness (Moser & Dilling, 2007). "Education represents an important strategic resource in the fight against climate change and preparation for its current and future impacts" (United Nations Educational, Scientific and Cultural Organization [UNESCO] & United Nations Environment Programme [UNEP], 2011, p. 55). Even though communication and education are distinct, one cannot detract the importance of both for organizations to operate more sustainably.

Climate change education is the process of building climate science literacy. Climate change is a topic in a constant state of variability and change that poses a challenge for any climate training program (Garfin et al., 2011). Though largely still unexplored, climate change education is a key component in mitigating disaster risk (Kagawa & Selby, 2012). The emphasis of climate change education has been on presenting greenhouse gas emissions as the cause of climate change, rather than understanding that collective behaviors are at the root of the issue and "damaging the global environment and societal fabric" (Kagawa & Selby, 2012, p. 209). Similarly, Garfin et al. (2011) found "substantial gaps in training on decision making under uncertainty, vulnerability assessment, and climate change adaptation planning" (p.110) and that the majority of climate literacy training available online is "geared toward the general public" (p. 110). Balmford and Cowling (2006) argued that it is critical for conservation efforts to connect people with nature to address environmental threats by a

caring, educated population. Participants in the Ardoin and Heimlich (2013) study indicated education as an awareness tool with many of the decision-maker participants "stressing that education is an important strategy" (p. 106). One participant described a benefit of environmental education is that it "can paint visual pictures, capture hearts and minds, and be the catalyst for change" (as quoted in Ardoin & Heimlich, 2013, p. 106-107). Both practitioners and educators participating in the Ardoin and Heimlich (2013) study overwhelmingly corresponded conservation action with education. In contrast, the environmental education field lacks "strong evaluative and empirical evidence demonstrating the positive relationship between education and conservation outcomes" (Ardoin & Heimlich, 2013, p. 113).

The public sector, specifically government institutions and institutions of higher education have taken the lead role on integrating climate education and training of staff. The Tufts Environmental Literacy Institute was an annual week-long professional development program to train faculty at the institution to incorporate environmental themes into their curriculum (Tufts University, 2017). Applying environmental learning across the curriculum would expose students to environmental issues reportedly rather than students having to elect an environmental studies course or elective, thereby hoping to integrate conservation throughout the institution's course catalogue. Similarly, the Piedmont Project at Emory University focuses on training its faculty to incorporate is the sustainability and environmental themes across the curriculum (Emory University, 2017). Barlett and Rappaport (2009) conducted a survey of faculty from both the Tufts Environmental Literacy Institute and Piedmont Project programs and concluded the participant's subject-matter confidence and willingness to vary teaching methods to incorporate environmental issues increased as a result of training.

The U.S. Forest Service requires employees to complete introductory-level climate change training (U.S. Forest Service, 2014). Unit specialists are encouraged to complete additional specialized training depending on their discipline. Resources are available on the website for employees including research articles, videos, interactive materials, and advanced training opportunities. The National Parks Service is another example of an agency that provides and promotes climate change training to its employees. The National Parks Service has a dedicated webpage to communicating climate change (https://nps.gov/climatechange) and offers "NPS Climate Training" that is an online virtual course. Through their Natural Resource Stewardship and Science Climate Change Response Program they aim to train park staff to connect visitors to the natural areas to promote preservation and stewardship of national parks (Richman & Welling, 2011). According to the agency, "NPS staff are ideally positioned to raise public understanding of climate change and its effects on parks" (Richman & Welling, 2011, para. 2).

There are also organizations dedicated to the climate education of the workforce. The Association of Climate Change Officers (ACCO) has two functions: first, the advancement of the occupation of climate leadership such as climate officers, and second, catalyzing integration of climate change competencies in non-climate occupations (www.acco.org). According to Daniel Kreeger, Executive Director of ACCO, now is the time for local governments to build capacity to adapt to a changing climate:

> Lean, adaptive and resilient are the three features of the city of the future. Now, local leaders and staff need to understand the ecosystem of their decisions and the impact to the future of their community. This does not mean that every employee needs to be a greenhouse gas manager, but each employee does at least need to

> understand what greenhouse gases are and how decisions affect them. Local governments need to make this foundational knowledge mandatory. (D. Kreeger, personal communication, August 25, 2017)

ACCO is working with the National Parks Service, New York, Los Angeles, Minnesota, Colorado, and Maryland. In Colorado, the region is developing a compact of 33 cities and counties (www.compactforcoloradocommunities.org). The compact started in May 2017, as a regional approach to meet and learn from local-government peers. ACCO is working with the compact to put requirements for communities to train senior personnel and embed building capacity for climate change in decision making (D. Kreeger, personal communication, August 25, 2017). Depending on the size of the city or county the compact lays out requirements for number of trainees. "First in the country, to my knowledge, where Mayors are saying employees have to have climate competencies" (D. Kreeger, personal communication, August 25, 2017) and ACCO is helping to roll out the training.

Climate Leadership Engagement Opportunities, otherwise known as The CLEO Institute, is a non-profit organization based in South Florida dedicated to climate change education (www.cleoinstitute.org). The organization works to connect local scientific experts with the public-at-large through various events from movie screenings, science cafes, and town halls. In addition, The CLEO Institute offers "Climate Leadership Trainings" at varying levels from a two-hour introductory training to an advanced two-day training program (The CLEO Institute, 2016). The trainings cover an introduction to climate science, the seriousness of the issue, and solutions, and are "interactive, research-based, and tailored" (p. 7) for different audiences (The CLEO Institute, 2016). In recent years, The CLEO Institute has worked with a number of local governments to provide

training to staff such as cities of Fort Lauderdale, Miami Beach, Wilton Manors, West Palm Beach, and Surfside. Caroline Lewis, Executive Director for The CLEO Institute, has eight years exclusively promoting climate literacy in South Florida, and when asked about the need for climate literacy of government staff, her response was:

> When infrastructure becomes more important than people that is when a city requires a climate literacy training. Climate literacy training prepares staff with a standard amount of knowledge, so they can start to connect the dots between what's happening and what's causing it [climate change] and the necessity to keeping humanity and biodiversity out of harm's way. Climate literacy helps them be better problem solvers for their communities. (C. Lewis, personal communication, January 14, 2018)

A sense of urgency is leading many public institutions to make climate education and training part of government operations. Informed decisions are based in scientific knowledge and understanding and can lead to new technologies (Lubchenco, 1998). Public administrators "are trained, encultured and even indoctrinated in certain ways of thinking, reasoning and communicating" (p. 11) that may hinder policy action on complex problems like climate change (Rowson, & Corner, 2015). New research, faster and more effective transmission of new and existing knowledge to policy- and decision-makers, and better communication of this knowledge to the public will all be required to meet this challenge (Lubchenco, 1998). However, simply communicating the science alone may not meet the greater goal (National Academies of Sciences, Engineering, & Medicine, 2017). In order for communication to lead to action there must support mechanisms in place for changing policies, updating infrastructure, and remodeling the economy to benefit the greater community (Moser and Dilling 2007; Moser & Dilling,

2010). In fact, Moser, Daniels, Pike, and Huva (2017) found ongoing engagement and providing regular updates to be an important when dealing with the slow pace of government, absence of coordination across government agencies, and lack of state and federal support.

Various studies discuss the conflicting beliefs among practitioners in the gray area between environmental education and environmental advocacy. In fact, many environmental educators see influencing policy for environmental issues as a fine line between advocacy for the environment (Disinger, 2005; Jickling, 2003). Education versus advocacy friction is something the environmental education field struggles to clearly define (Ardoin & Heimlich, 2013). Ardoin and Heimlich (2013), defined education as an "activity of facilitating and shaping experiences to allow learners to challenge, shape, extend, and change their own beliefs and values" (p. 104) rather than "imposing facts, beliefs, and values upon others" (p. 104).

Changing attitudes and behaviors. The purpose of this study was to create an informed workforce capable of making decisions based on climate science, a change in behavior is at the core. For example, the county wants employees capable of using the sea level rise projection tool, but also change the way the employees currently design buildings and infrastructure. Pugh (2001) stated that PD is more than the transmission of facts but it also includes changing attitudes and behaviors to develop the whole individual (p. 80). Therefore, it may be helpful to look at studies on environmental behavior change.

Using specific learning strategies to modify behavior for problem solving is also called the moralistic paradigm (Almers, 2013). Whereas, strengthening the capacity to learn and make decisions based on reflection is the educational paradigm (Almers, 2013). The amalgam of both the moralistic and educational paradigm is action competence.

> Action competence for sustainability is in this context defined as a willingness and capability to influence living conditions, as well as lifestyles, in a way that involves intergenerational and global responsibility, which necessarily constitutes differently in different cultural contexts (Almers, 2013, p. 118).

Therefore, the learner would be capable and prepared make decisions and take action with "when new knowledge or insights evolve" (Almers, 2013, p. 118). However, knowledge and interest in a topic may be a precursor to intent, but that does not mean it always leads to an actual change in someone's behavior (Dickenson, Crain, Yalowitz, & Cherry, 2012). In the Almers (2013) study, six core themes of competence related to sustainability emerged, including: emotions igniting a desire to change, competence and confidence in one's ability to contribute, and a sense of belongingness. Behaviors and attitudes, according to Dickenson, Crain, Yalowitz, and Cherry (2012) can be influenced depending on how climate communications are framed. Therefore, employing tactics in how we educate and engage groups with climate education becomes important i.e. using imagery to generate emotion, developing confidence through skills, and creating supportive group learning. Communication can be framed by creating a "conceptual structure evoked when a topic is introduced for interpretation" (Dickenson, Crain, Yalowitz, & Cherry, 2012, p. 147).

The effects of global climate change are dire to the planet (Li, 2014). However, trying to appeal to people through a message of fear, or fear appeals, can be counterproductive (Dickenson, Crain, Yalowitz, & Cherry, 2012; Feinburg & Willer, 2011; Li, 2014). The Dickenson, Crain, Yalowitz, and Cherry (2012) study also refuted that framing through a positive message is superior to negative messaging. Li (2014) found when trying to persuade college students that fear messages have greater appeal if

high efficacy solutions are presented with the message. Therefore, one can posit there is no universal message for communicating climate change that will affect all groups and regions similarly. Context is key in framing a climate communication message. For example, the ubiquitous social media image of the polar bear on the melting ice cap used to form emotion for the plight of the species due to global warming "may be too removed from the life experiences" (p. 148) of most Americans to be an effective communication tool (Dickenson, Crain, Yalowitz, & Cherry, 2012). Although, animals can be valuable for supporting behavior change when "co-framed" with a fear message as demonstrated in the Dickenson, Crain, Yalowitz, and Cherry (2012) study.

Behavioral change communication tools are becoming increasingly popular. According to Karatasou, Laskari, and Santamouris (2014), the focus of research has been mostly on the residential sector encouraging efficient behaviors through effective strategy. Unfortunately, the effective strategy has been focused mainly on information, assuming if most people knew better they would change for the better. As stated by Stokes, Mildenberger, Savan, and Kolenda, (2012) that assumption is misguided, and ineffective (Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009; McKenzie-Mohr, 2000). Social norms, social diffusion, goal setting, feedback, incentives, prompts, commitments, and convenience are being used to address barriers to pro-environmental behaviors in the framework of community-based social marketing (McKenzie-Mohr & Schultz, 2014). Applying the community-based social marketing model, the University of Oregon designed a campaign to reduce paper use and increase recycling rates and "green" purchasing. The campaign, using prompts, a pledge, and training, was successful in changing the behaviors of over 70% of the faculty and staff surveyed (Cole & Fieselman, 2013). Moreover, Abrahamse et al. (2007) encouraged households to reduce

energy using a combination of web-based tailored information, goal setting, and feedback found households conserved a significant amount of direct energy when exposed to the combined interventions.

Achieving sustainability through adoption pro-environmental individual behaviors can have a significant impact on the ability to mitigate climate change. In order to facilitate these behaviors, the challenge for social scientists is comprehending motivation, thought process, and structural factors that impend conservation (Steg & Vlek, 2009). Moreover, the process of community-based social marketing can maximize the effect of an environmental program, but it is vital that both barriers and benefits are individually selected and targeted (McKenzie-Mohr & Schultz, 2014). However, behavior is complex. The difficult challenge of changing habits will take clear, strong incentives in order to see the behavioral changes necessary to mitigate climate change (Lin, 2013).

Barriers to behavior change. According to Gifford (2012), many citizens are engaged, but there are psychological barriers which inhibit them from taking further action (Stokes, Mildenberger, Savan, & Kolenda, 2012). According to McElligott et al. (2013), common barriers include not having a clear understanding of the organization's environmental mission or consistency of the efforts. A Stokes et al. (2012) study analyzing barriers specific to energy conservation behavior found discomfort, inconvenience, laziness, safety, and futility to be some barriers to change. Furthermore, Gifford stated in *Dragons of Inaction* that "structural barriers must be removed wherever possible" (Gifford, 2012). An example of a structural barrier would be the inability to purchase an electric vehicle due to a lack of charging infrastructure. The results of the Arnocky, Stroink, and DeCicco (2007) study suggest self-construal is an essential component in predicting environmental behaviors. Karatasou et al. (2014) concluded

many factors shape energy behavior and that behaviors are complex in that they can be shaped from higher levels to the individual level. Studies indicate combining "top-down" initiatives with "employee driven action" achieve the maximum result (McElligott et al., 2013). Both structural barriers and individual barriers will have to be removed to address energy consumption. Therefore, an engagement approach needs a well-defined implementation strategy, ensuring organizational values or unique characteristics are taken into account (McElligott et al., 2013).

The first step in any problem is admitting there is a problem. Using the theory of planned behavior Stokes et al. (2012) reported key barriers for conservation at academic institutions. In "identifying the predictors of pro-environmental behaviors" an effective model in actions that are either civic or individual is the theory of planed behavior (Fielding, McDonald, & Louis, 2008). In the Park and Ha (2014) study the norm activation model and the theory of planned behavior were combined to test the intention to recycle. The study found the intention to recycle was directly impacted by "personal norms together with attitude and perceived behavioral control" (Park & Ha, 2014). In addition, align the environmental initiative with the organization's individual culture to ensure success (McElligott et al., 2013). Lin (2013) suggested if usefulness and convenience is perceived, pro-environmental behaviors will be accepted and recommended to "keep it simple" for fostering conservation.

Steg (2008) reviewed psychological literature for informational strategies on household conservation, and found that only modest changes result from informational campaigns. Communication needs to be a "two-way flow of knowledge" (p. 4415) for effective engagement (Owens & Driffill, 2008). Abrahamse, Steg, Vlek, and Rothengatter (2005) reviewed thirty-eight studies compiled to evaluate the effectiveness

of interventions and found knowledge levels are increased by information but do not result in behavioral changes or savings. The review further found rewards encourage energy reduction, however are not effective for long-term (Abrahamse et al., 2005). For example, Wilby and Keenan (2012) discussed a survey of Europeans that demonstrates financial incentives like a reduction in home insurance rates would compel homeowners to construct flood protection measures on their dwellings. Therefore, an important step for climate communications or climate education program is to assess the barriers of inaction.

Program Evaluation Standards

Program evaluation refers to the systematic collection and analysis of information of activities, characteristics, and results of a given initiative to make an informed decision about it (NWCPHP, 2008). The concept can be applied any institution from non-profit to for-profit organizations. Urban and Trochim (2009) underscored the importance of program evaluations by stating that program evaluation "is at the heart of efforts to integrate the domains of practice and research" (p. 538). The availability of multiple resources for reference on how to conduct an effective program evaluation are widely available. The evaluation process is often interchanged with research and monitoring. The differences lie in the purpose and timing of each. For program evaluation, the purpose is mostly for efficiency determination for a specific model with the aim of improving it based on whether or not it is working. On the other hand, research is mainly for testing theories and generating common knowledge contributed to the information base. Monitoring tracks implementation progression through intermittent data collection with the goal of providing early indicators of the presence or absence of progress. Hence, the main role of program evaluation is to improve, in place of basic research, which only

aims at proving (Patton, 2015). The common practice of not viewing program evaluations from a systems perspective, however, circumvents the potential effectiveness of the evaluation and practice (Urban & Trochim, 2009). The program evaluation field cannot be characterized in the typical sense of a profession. However, there are evaluation standards, guidelines and ethics developed over the past couple decades that have "professionalized" the field (Rossi, Lipsey, & Freeman, 2004).

Standards exist to maintain an acceptable level of confidence in program evaluations and to provide guidance to evaluators. Under the direction of the American National Standards Institute, the Joint Committee on Standards for Educational Evaluation (Joint Committee) publishes and reviews guiding principles and standards for program evaluation (www.jcsee.org). The Joint Committee includes representatives from professional associations such as the American Evaluation Institution, American Psychological Association, and American Educational Research Association (Rossi, Lipsey, & Freeman, 2004). Originally developed as standards within the field of education identifying the four categories of utility, feasibility, propriety, and accuracy as effective attributes for program evaluation (Joint Committee on Standards for Educational Evaluation, 1994). The standards were revised to include an additional component to increase applicability beyond secondary school settings. The five components include categories of utility, feasibility, propriety, accuracy, and evaluation accountability (Joint Committee on Standards for Educational Evaluation, 1994).

The Joint Committee has developed propriety, utility, feasibility, and accuracy standards specific to personnel evaluation, in line with the general educational evaluation standards, that was used to guide this research project. Fitzpatrick, Sanders, and Worthen (2011), conveys that the propriety standards were designed to establish ethical conduct in

program evaluations. Moreover, propriety standards that are specific to personnel require consideration of the welfare of the organization's personnel being evaluated, also called the *evaluatee* (Joint Committee on Standards for Educational Evaluation, 2017). The following is adapted from the work of members of the Joint Committee on Standards for Educational Evaluation on personnel evaluation standards (2017, propriety standards section, para. 1):

1. Service orientation personnel standards establish "evaluations should promote sound education, fulfillment of institutional missions, and effective performance of job responsibilities" to meet educational needs.

2. Appropriate policies and procedures standards establish "guidelines for personnel evaluations should be recorded and provided to the evaluatee" develop evaluations that are "consistent, equitable, and fair."

3. Access to evaluation information standards establish limits on access to evaluation documents to "persons with established legitimate permission to review and use the information."

4. Interactions with evaluatees standards establish evaluators "should respect human dignity and act in a professional, considerate, and courteous manner."

5. Balanced evaluation personnel standards establish that the evaluation report should include "information that identifies both strengths and weaknesses."

6. Conflict of interest standards establish that "existing and potential conflicts of interest should be identified and dealt with openly and honestly."

7. Legal viability personnel standards establish evaluations should meet all legal requirements including "local board policies and regulations."

Utility standards were designed to establish expectations involving the usefulness of the results derived from program evaluations (Fitzpatrick, Sanders, and Worthen, 2011). In addition to the value of an evaluation, personnel standards specify evaluations should be timely and influential (Joint Committee on Standards for Educational Evaluation, 2017). The following is adapted from the work of members of the Joint Committee on Standards for Educational Evaluation on personnel evaluation standards (2017, utility standards section, para. 2):

1. Constructive orientation personnel standards establish "evaluations should be constructive, so that they not only help institutions develop human resources but encourage and assist those evaluated" providing a valuable service in accordance the mission and goals of the organization.

2. Defined uses standards establish "both the users and intended uses of a personnel evaluation should be identified at the beginning of the evaluation" to ensure the appropriate questions and issues will be addressed.

3. Evaluator qualifications standards establish the expectation that the evaluation approach is "developed, implemented, and managed by persons with the necessary qualifications, skills, training, and authority, so that evaluation reports are properly conducted, respected and used."

4. Explicit criteria standards establish that "evaluators should identify and justify the criteria used to interpret and judge evaluatee performance" in order to warrant "clear and defensible rationale for results."

5. Functional reporting standards establish "reports should be clear, timely, accurate, and germane, so that they are of practical value to the evaluatee and other appropriate audiences."

6. Professional development standards establish "evaluations should inform users" to support educational personnel in advancing "the institution's missions and goals, fulfill their roles and responsibilities."

Feasibility standards are intended for efficiency of the implementation of the program evaluation (Fitzpatrick, Sanders, & Worthen, 2011). Joint Committee on Standards for Educational Evaluation (2017) standards for personnel evaluations include consideration for political practicality. The following is adapted from the work of members of the Joint Committee on Standards for Educational Evaluation on personnel evaluation standards (2017, feasibility standards section, para. 3):

1. Practical procedures standards establish practical processes for "the needed information in efficient, non-disruptive ways."

2. Political viability standards establish evaluators to plan for questions from evaluatees and obtain their cooperation.

3. Fiscal viability standards establish for "adequate time and resources should be provided."

Accuracy standards guide dependability and truthfulness of the findings (Fitzpatrick, Sanders, & Worthen, 2011). In addition, personnel evaluation standards intend for the evaluation to be adequate and appropriate to the organizational context (Joint Committee on Standards for Educational Evaluation, 2017). The following is adapted from the work of members of the Joint Committee on Standards for Educational Evaluation on personnel evaluation standards (2017, accuracy standards section, para. 4):

1. Validity orientation standards establish evaluation selection, development, and implementation are "not open to misinterpretation."

2. Defined expectations standards establish that any "qualifications, role, and

performance expectations of the evaluatee should be clearly defined."

3. Analysis of context standards establish that "contextual variables that influence performance should be identified, described, and recorded."

4. Documented purposes and procedures standards establish the purpose and procedure for the evaluation be "clearly explained and justified."

5. Defensible information standards establish "that the information can be reliably and validly interpreted."

6. Reliable information standards establish "procedures should be chosen or developed and implemented to assure reliability" for consistency.

7. Systematic data control standards establish information collected, processed, and reported about evaluatees maintain "appropriate levels of confidentiality."

8. Bias identification and management standards establish for a bias-free interpretation.

9. Analysis of information standards establish "evaluations should be systematically and accurately analyzed" according to the purpose of the evaluation.

10. Justified conclusions standards establish any "conclusions about the evaluatee's performance should be explicitly justified."

11. Metaevaluation standards establish "evaluation systems should be examined periodically."

Rationale for Conducting a Program Evaluation

Program evaluation is a wide-ranging field giving program evaluators numerous possibilities for conducting an evaluation. Different evaluation models can be used as a tool for planning a program, managing a program, or documenting program issues (Frechtling, 2007). Program evaluation can be used to modify programs and inform

program improvements. In fact, the field of program evaluation acknowledges the "importance of looking at both implementation and progress" (p. 3) as increasingly valuable (Frechtling, 2007). Different evaluation models can be used as a tool for planning a program, managing a program, or documenting program issues (Frechtling, 2007). In fact, the field of program evaluation acknowledges the "importance of looking at both implementation and progress" (p. 3) as increasingly valuable (Frechtling, 2007). Fitzpatrick, Sanders, and Worthen (2011) underlined that a researcher must first identify and clarify the purpose, goals, resources, procedures, and management of the program being evaluated. The U.S. Government Accountability Office (2012) identifies the reasons for conducting evaluations for the purpose of enhancing programs. Moreover, by acquiring, evaluating, and disseminating information from a program evaluation the results can satisfy governmental reporting requirements and assist decision making (U.S. Government Accountability Office, 2012).

Program evaluation is commonly practiced throughout the public sector in regard to policy making, program management, and client advocacy. In fact, is "widely acknowledged by those in political and administrative roles in government" (Rossi, Lipsey, & Freeman, 2004, p. 12). Many federal agencies have their own evaluation units; it is common practice for federal, state, and local agencies to contract for program evaluations (Rossi, Lipsey, & Freeman, 2004). For decision makers, effective program evaluations utilizing professional evaluation standards derive useful results (Frye & Hemmer, 2012; Joint Committee on Professional Standards for Educational Evaluation, 1994). These collective points underline the rationale for this program evaluation.

Evaluation Approaches

If an evaluation's primary purpose is to provide information for program improvement, it is considered a formative evaluation (Fitzpatrick, Sanders, & Worthen, 2011, p 20). For example, a formative evaluation might include observation or collection of reactionary feedback from participants during or after the program (Fitzpatrick, Sanders, & Worthen, 2011). The typical audience for a formative evaluation is program managers and staff. A formative evaluation is also characterized by its usefulness in providing feedback for program improvement. The frequency of data collection can be copious, employing the use of small samples with a diagnostic purpose (Fitzpatrick, Sanders, & Worthen, 2011). In a summative evaluation, however, the purpose is to make a judgment such as on the program's future or adoption. According to Rossi, Lipsey, and Freeman (2004), an evaluation should fit the program's unique circumstances and interact between the conditions and the evaluator's expertise of "approaches, techniques, and concepts" (p. 32).

Effective program evaluations conduct evaluations to examine identified program components within the five areas of utility, feasibility, propriety, accuracy, and evaluation accountability (Joint Committee on Standards for Educational Evaluation, 2014) although various approaches are available. Program evaluation has no "one size fits all" approach which can be challenging for evaluators. Evaluations can be simple, or complex, however, typically evaluations are grounded in: (a) evaluation questions to be answered; (b) methods and procedures to answer the questions; and (c) nature of evaluator-stakeholder relationship (Rossi, Lipsey, & Freeman, 2004). There could be a plethora of concerns for a program, however, the central focus of a program evaluator is to specify the guiding purpose and focus the evaluation (Rossi, Lipsey, & Freeman,

2004). The evaluator should select methods that are practical and capable of "providing meaningful answers to the questions" (Rossi, Lipsey, & Freeman, 2004, p. 33). To add credibility to the findings the evaluation method should include at least one objective process, and include replicable methodological procedures (Fitzpatrick, Sanders, & Worthen, 2011). Moreover, Fitzpatrick, Sanders, and Worthen (2011) guide program evaluators to match evaluation question to the context in making the design choice. A well-designed program evaluation incorporates a plan for working with program stakeholders that clarifies issues, communicates how the evaluations will be conducted, and identifies effective use of the evaluation findings (Rossi, Lipsey, & Freeman, 2004). Fitzpatrick, Sanders, and Worthen (2011) classified different evaluation approaches into four overarching categories. A brief description of these four categories is provided in the following text.

Expertise and consumer-oriented approach. Fitzpatrick, Sanders, and Worthen (2011) categorized the expertise-oriented approach and the consumer-oriented approach as methods that focus evaluators on "comprehensive judgements of the quality of the program" (p. 123). Typically, these approaches are more formal and structures; they are some of the oldest approaches to evaluation and tend to be public (Fitzpatrick, Sanders, & Worthen, 2011). The expertise-oriented approach relies on professional expertise of the program evaluator or by subject-matter experts working as a team (Fitzpatrick, Sanders, & Worthen, 2011). However, both of the approaches establish merit or worth of the program as their primary purpose (Fitzpatrick, Sanders, & Worthen, 2011). These approaches to evaluation are not the subject of significant research studies or professional evaluation articles although commonly used in many sectors (Fitzpatrick, Sanders, & Worthen, 2011).

Program-oriented approach. The program-oriented approach is categorized for the methods that focus evaluators on the characteristics of the program (Fitzpatrick, Sanders, & Worthen, 2011). Logic models and program theory are applicable in these evaluation approaches. When evaluating programs using a logic model inputs, outputs, and short, medium, and long-term outcomes are identified (Fitzpatrick, Sanders, & Worthen, 2011). Logic models are used as a roadmap; the model gives a simplified visual illustrating "logical relationships" and "underlying rationale" of a program or project (Taylor-Powell, Jones, & Henert, 2003).

Decision-oriented approach. Fitzpatrick, Sanders, and Worthen (2011) categorized this approach as methods that focus evaluators on "decisions to be made about the program" (p. 123). Design-oriented approaches are effective in assisting managers in fostering accountability and improvement in a program through the assessment and identification of decisions related to the program (Stufflebeam & Shinkfield, 2007). A key to decision-oriented approach models is the ability to clearly identify decisions and information in advance of the evaluation and stability of the program (Fitzpatrick, Sanders, & Worthen, 2011). Models applicable to this approach include the UCLA evaluation model, the utilization-focused evaluation model, and the CIPP evaluation model.

Participant-oriented approach. The participant-oriented approach is categorized by Fitzpatrick, Sanders, and Worthen (2011) for methods that focus evaluators on the participation of program stakeholders. Any model applicable to this approach uses people or entities that have an interest in the program that could include participants, sponsors, shareholders, or program managers, or others. The models vary widely in the participation of the stakeholders from roles at the beginning and end of the evaluation to

involvement throughout the evaluation (Fitzpatrick, Sanders, & Worthen, 2011). A strength of this approach is the ability to enhance understanding and use of the program evaluation by the program stakeholders (Fitzpatrick, Sanders, & Worthen, 2011).

Evaluation Framework

According to Frye and Hemmer (2012), evaluation approaches for educational programs "is best understood as a family" (p. 292). The model, or models, used forms the process of the evaluation. Choice of an evaluation model should embrace "the complexity of the educational process," and allow the program evaluator to "examine for change" (Frye & Hemmer, 2012). The evaluation strategy was part of the design of the CCTB training program developed initially using a logic model. Logic models are a common method for objectives-oriented approach in evaluation. When developing a logic model, the program inputs, and outputs, as well as the program's short, medium, and long-term outcomes are identified (Fitzpatrick, Sanders, & Worthen, 2011). Logic models are used as a roadmap; the model gives a simplified visual illustrating "logical relationships" and "underlying rationale" of a program or project (Taylor-Powell, Jones, & Henert, 2003). The logic model presents key features of the program being evaluated which can include essential stakeholders. Due to the structure of local government, the logic model is an appropriate fit to help with accountability of the program (Taylor-Powell, Jones, & Henert, 2003), and moreover help determine the continuation of funding, or demonstrate the need to completely revamp the program (Fitzpatrick, Sanders, & Worthen, 2011). With the CCTB logic model as the foundation, this study blended the Kirkpatrick model and CIPP evaluation model as the framework for this program evaluation.

Kirkpatrick model. The four levels, and the Kirkpatrick model, were developed by Dr. Don Kirkpatrick in the 1950s as the subject of his dissertation for the University of

Wisconsin (Kirkpatrick & Kirkpatrick, 2016). "Kirkpatrick's four-level training evaluation model is the most universally known in performance evaluation" (Lin, Chen, & Chuang, 2011, p. 928). The model is widely accepted as fairly accurate, and for its simplicity of use (La Duke, 2017; Lin, Chen, & Chuang, 2011). Moreover, Wartenweiler (2018) demonstrated that the Kirkpatrick model can be used to evaluate educational programs. Reviewed studies by Throgmorton, Mitchell, Morley, and Snyder (2016) found various levels of Kirkpatrick's model were used to evaluate over 200 leadership development programs. For this program evaluation, the Kirkpatrick model and all four levels was used as the conceptual foundation and causal verification. Similarly, the Lin, Chen, and Chuang (2011) study used the four levels to explore the causal relationship between training learning and behaviors to organizational commitment. The Kirkpatrick model was designed with four levels to measure a specific element of a training program (La Duke, 2017). The levels were designed to be evaluated in order from Level 1 to Level 4. The definitions for each of the four levels have been modified by trainers and program evaluators over time. The most recent iteration of the four levels, adapted from Kirkpatrick and Kirkpatrick (2016), are defined as follows:

- Level 1: Reaction is defined as the "degree to which participants find the training favorable, engaging and relevant to their jobs."
- Level 2: Learning is defined as the "degree to which participants acquire the intended knowledge, skills, attitude, confidence and commitment based on their participation in the training."
- Level 3: Behavior is defined as the "degree to which participants apply what they learned during training when they are back on the job."

- Level 4: Results is defined as the "degree to which targeted outcomes occur as a result of the training and the support and accountability package."

In 2009, the "New World Kirkpatrick Model" upheld the four levels while recognizing a twenty-first century workplace and workforce. According to Kirkpatrick and Kirkpatrick (2016), improving the program, maximizing the transfer of learning, and demonstrating value are three reasons to evaluate a training program. According to Steensma and Groeneveld (2010), evaluations should not be limited to Level 1 reaction, although participants reactions are an important component, it is not sufficient. "To see if the training succeeds in reaching the intended goals, measures at Levels 2-4 should be studied" (Steensma & Groeneveld, 2010, p. 328). Kirkpatrick and Kirkpatrick (2016) defined effective training as training that is well-received by participants and learning that can be relevantly applied in the workplace. Moreover, a program that is well-received "are of little use unless what is learned in training is relevant and gets implemented on the job" (Kirkpatrick & Kirkpatrick, 2016, p. 6). Steensma and Groeneveld (2010) suggested, that the Kirkpatrick Model, although not the most scientifically rigorous model, enables evaluation of "good trainee-training fit" (p. 321).

CIPP evaluation model. CIPP was created by Daniel Stufflebeam in the 1970s as a response and improvement on the dominant experimental design model of that time (Stufflebeam & Shinkfield 2007). CIPP principles have remained dependable with widespread use throughout the world (Fitzpatrick, Sanders, & Worthen, 2011). The CIPP evaluation model is comprehensive and collaborative in its design to guide program decisions and enable the researcher to personally contribute to the evaluation process whether formative or summative (Stufflebeam, 2007; Stufflebeam & Shinkfield, 2007). Evaluators use the CIPP model to provide a framework for examining, revising, or

improving specific program components (Stufflebeam, 2007; Stufflebeam & Shinkfield, 2007). The CIPP evaluation model provides a framework that contributes to the development of specific questions for guiding evaluations based on four types of program decisions: (a) Context evaluation, to determine needs and define program objectives; (b) Input evaluation, to define alternative available resources and strategies; (c) Process evaluation, to ascertain the quality of implementation reviewing changes and barriers, and decide on program modifications; (d) Product evaluation, to conclude results (Fitzpatrick, Sanders, & Worthen, 2011). According to Frye and Hemmer (2012), CIPP components allow for continuous program-improvement data in an ever-changing environment. The four levels within the CIPP can be used whole or in part to seek information requested by stakeholders (Stufflebeam & Shinkfield, 2007). Moreover, CIPP is not constrained to a linear approach like the seemingly similar logic model (Frye & Hemmer, 2012).

CIPP stands for the evaluation levels of context, input, process, and product that make up the four-part framework. Context-related evaluations are used to identify the appropriate context, targeted population, problems, and needs assessment as they relate to a specific setting (Stufflebeam, 2007; Stufflebeam & Shinkfield, 2007). A context evaluation study is typically conducted during the planning stages of a program (Frye & Hemmer, 2012). Input-related evaluations focus on system capabilities for attaining program goals and objectives. An input evaluation study can be applied to a program already in place. In fact, it can help the evaluator "to assess current educational practices against other potential practices" (Frye & Hemmer, 2012, p. 297). An input study could involve methods such as reviewing literature, benchmarking similar programs, or consulting with experts (Frye & Hemmer, 2012). Process-related evaluations involve

accessing implementation of the program through monitoring to adapt and refine program activities in order to overcome barriers (Fitzpatrick, Sanders, & Worthen, 2011). Finally, product-related evaluations judge program achievements and can guide decisions on expansion or discontinuation of the program (Stufflebeam, 2007; Stufflebeam & Shinkfield, 2007).

Summary

Chapter 2 briefly reiterated the connection of global climate change and local government action. Next, the literature review identified the theory of andragogy (Knowles, 1984), the art and science of facilitating adult learning. Knowles theorized a set of assumptions about adult learners: (a) adults direct their own learning; (b) adults learn by drawing on personal experience; (c) adults are problem-centered learners; and (d) adults are motivated internally to learn (American Institute for Research, 2011). In addition, applications of best practices were examined.

Next, this chapter reviewed literature, studies, and related to climate change education, and discussed the barriers to behavior change. Resistance to change is natural although resistance may be more pronounced in public sector institutions with its hierarchical structure that can pose challenges to a learning culture. Further, the purpose of this literature review was to connect communicating climate change to professional adults when engaged in training programs.

Finally, the researcher discussed program evaluation. The researcher outlined program evaluation standards developed by the Joint Committee on Standards for Educational Evaluation (1994, 2017) and detailed the rationale for conducting this program evaluation. Different approaches for program evaluation were examined as categorized by Fitzpatrick, Sanders, and Worthen (2011), and the framework for this

investigation was described. The evaluation design will employ a case study format for the purpose of describing and understanding the effects and achievements of the CCTB training program using a blend of models. Collectively, the literature reviewed and discussed in this chapter, provided a methodological structure to conduct this program evaluation.

Research Questions

This program evaluation was guided by five research questions. This evaluation blended a decision-oriented and a program-oriented approach. Both the CIPP model and the Kirkpatrick model was used as the evaluation framework for the study. Research Question 1 addressed the input component of the CIPP evaluation model. Research Question 2 addressed the Level 1 of the Kirkpatrick model. Research Questions 3 and 4 addressed Level 2 of the Kirkpatrick model. Research Question 5 addressed Level 3 and Level 4 of the Kirkpatrick model:

1. What strategies and activities have been planned to address the needs of employees in a climate change engagement program?

2. What are the effects of instructional quality on climate literacy achievement?

3. How well did the learners master the program content?

4. How well did the training meet the development needs identified? Was learning applicable to job performance?

5. How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction?

Chapter 3: Methodology

Local government has a unique ability to respond to climate change and a duty to protect their communities. Local governments are "credible laboratories of social change with sufficient scale to bring meaningful changes" (Hoornweg, Sugar, & Lorena Trejos Gomez, 2011, p. 2). The researcher developed this study in order to evaluate a program geared toward educating employees on climate change. First, this chapter presents a description of the Climate Change Toolbox (CCTB) training program, a professional development program for local government employees. The purpose of this program evaluation was to examine whether the CCTB training program is achieving the program's stated goals and objectives at desired levels. The evaluation was requested by the Environmental Planning and Community Resilience Division in an effort to further develop, implement best practices, and evaluate the effectiveness of the CCTB training program internally. Following the program description, the researcher reviews the blended model approach that was used, and indicates the study instruments and procedures. Last, the researcher states the safeguards that were taken to meet propriety standards specific to evaluation of personnel (Joint Committee on Standards for Educational Evaluation, 2014).

Program

Broward County has a population of more than 1.9 million residents (Census Bureau, 2018) with over 6,000 employees serving the community. The CCTB is an ongoing educational program aspiring to reach at least 20% of county employees by 2020. The Environmental Planning and Community Resilience Division develops, monitors, and delivers the CCTB training program. The program was originally launched in the spring of 2016, now with more than a dozen training sessions offered at various

county facilities and training rooms. Each of the training sessions are 3.5 hours in length and divided into three modules; one module pertaining to each CCTB learning objective. An informal needs assessment was completed during an employee earth day event to assess employee climate literacy. A climate literacy quiz was collected from 122 employees that computed an average score of 79.8%. The goal of the CCTB training is to improve employee engagement on climate change using best practices to bridge the gap between climate science and action in local government. Consideration of evaluation for the CCTB training program has been deliberated since the program's initial planning phase. Steps were taken to ensure training content and activities related to current operations to increase the likelihood that learning is applied on the job. The training goals were developed to align with the organization's mission accomplishment, and learning objectives for the CCTB training program were established:

- Understand global climate change, and the local the impacts to South Florida.
- Recognize how climate change relates to your division or department.
- Discover and apply the tools and resources available in the Climate Toolbox.

Overall, the CCTB training program contributes to achieving the local climate commitment of reducing greenhouse gas emissions 80% by 2050. It was initiated as part of the implementation of the county's Climate Change Action Plan (CCAP). The CCTB training supports CCAP numbers 81 and 82 for educating and engaging the county staff on climate change (Climate Change Task Force, 2015).

The Environmental Planning and Community Resilience Division spent nearly six months developing and setting priorities for the training program. The CCTB training program was developed by county staff for county staff; an internal strategy for ensuring content was related to county operations. Climate, Energy and Sustainability program

staff reviewed climate communication research from Climate Access, George Mason University Center for Climate Change Communication, Yale Program on Climate Change Communication, Climate Nexus, National Oceanic and Atmospheric Administration (NOAA) Climate. The Climate, Energy and Sustainability program staff developed training materials which included the online Climate Toolbox for agencies. Four division staff, including three sustainability program staff, were selected by the division director to facilitate the training. The various backgrounds of the team brought a range of skills and perspective to the program. The team consisted of an environmental planner, community educator, environmental engineer, and environmental policy expert. In addition, two members of the team are trained Climate Reality Leaders, and one member is a certified Climate Change Communicator through the University of Miami and The CLEO Institute. The team members combined have over 30 years' experience in the public sector. However, not being professional development experts, the program team enlisted expertise from the agency's Leadership and Organizational Development staff to review and comment on the planned training program.

The program team was careful not to place too much importance on the training event. Training alone cannot produce targeted results, and training programs should avoid simply delivering a learning event (Office of Personnel Management, 2011). The program team is aware adult learning can take place in a variety of venues, and in following the Office of Personnel Management's (2011) guidebook, the team considered drivers for change and pre and posttraining activities as part of the engagement plan. Required drivers "are processes and systems that reinforce, monitor, encourage, and reward performance of critical behaviors on the job" (Office of Personnel Management, 2011, p. 17). Environmental Planning and Community Resilience Division leadership and

the program team concluded “encourage” is the required driver for critical behaviors that would be both manageable and effective for the CCTB training program. The required driver was discussed and approved during program planning incorporated in the program logic model (see Appendix A).

Pre training activities include providing a short video giving an overview of global climate change to introduce the topic, and a link to the online Climate Toolbox giving an opportunity for employees to familiarize themselves with the resource and bring pertinent questions, suggestions or divisional needs for discussion during the training session. Post-training activities for ongoing development include monthly updates to the Climate Toolbox, and on-the-job coaching, feedback, and mentoring offered by the program team. The following is a general overview of the information and activities in the training modules.

Module 1: Climate Considerations. The first module included a presentation with an introduction to global warming, a description of global climate indicators followed by seven anticipated impacts to South Florida. Next, participants would hear about current county programs and projects to prepare for, mitigate, and adapt to the climate crisis. Activities throughout module one included an ice-breaker mapping exercise to visualize where employees have encountered their worst natural disaster, a two-minute video to explain the difference between climate and weather, an interactive look at the entire country versus state level carbon footprints, the “climate dice” game developed by the training team, and a pop quiz for participants to recall the six local climate impacts described in the presentation.

Module 2: Agency Relevance. The second module began with a presentation establishing federal and regional alignment with relevance to county goals followed by an

activity using the CCAP to establish alignment to the specific agency or division. Next, there was a brief presentation on how the specific agency or division might be affected, discussing the vulnerable areas and services, and that each county employee plays a role in how resilient our community is. The entire second half of module two was dedicated to a scenario activity. Participants were broken into groups and given one of three scenario activities: a heat-wave event, a challenge for building energy reduction, or a flooding scenario. A report was given to the full group from each team and a facilitated discussion ensued.

Module 3: Climate Toolbox. The final module began with showing participants where and how to access the county climate toolbox online. Next, examples of tools and resources relating the specific agency or department were displayed and were followed by an activity for participants to learn to read and understand the Unified Sea Level Rise projection graph and how it is meant to be used for planning projects. Finally, trainers presented a recap of the objectives, reminded participants where the climate toolbox was located online, and communicated the opportunity for participants be involved in the internal cross-agency workgroup on climate. Participants were provided contact information and invited to call program staff for support.

County employees were the intended clients. Most important, each training session was specific to individual agencies or departments; however, any county employee could register for any of the training sessions through the internal employee learning center portal. In the learning center, each workshop was listed to represent the specific agency or department, for example, “Climate Change Toolbox Training for Aviation” or “Climate Change Toolbox Training for Human Services” for which to register. There are on average 14 employees per training program. In addition, there were

three sessions offered as "General" trainings open to all agencies. To date, 15 training sessions have been facilitated, completed by 217 county staff, representing more than 20 different agencies and divisions. The cost of developing and delivering the training program totals nearly $12,500 equating to $58 per employee participant. A feedback survey, developed by program staff, was distributed and collected at each training session.

Participants. The target population was Broward County employees (N = 6,202). The participants for this program evaluation were selected using a cluster sample (n = 217), a type of probabilistic sampling, of county employees who have completed the CCTB training. All CCTB training program participants were given the opportunity to participate in the research. This study also included convenience sampling for knowledge testing of climate literacy to a registered CCTB training group and a comparison group of employees participating in another agency's training. Although the convenience samples may not be representative of the target population, the sampling method will help answer the research questions and give insight toward the research objective.

In Broward, the government sector accounts for four percent of total local industry employment with the county as one of the largest employers (DataUSA, 2015). Broward County government has 60 agencies, 500 different job classes, and more than 6,000 employees working throughout numerous work sites (Broward County Human Resources Division, 2015). According to Broward County Human Resources Division (2016), the largest department by percentage of the total number of county employees is transportation (23%), followed by parks (14%), public works (13%), libraries (12%), administration (9%), aviation (8%), human services (8%), environmental protection (6%), and sea port (4%). The remaining agencies and divisions represent approximately

three percent of the total county workforce. In 2015, almost half of county staff participated in a "HR sourced internal training and facilitation" (p. 5). Data for this program evaluation was collected using a mixed-method approach.

Evaluation Model

"In many cases, programs already have specified objectives" (Fitzpatrick, Sanders, & Worthen, 2011, p. 154) as is the case for the CCTB training program. The purpose of this study was to evaluate the CCTB training program outcomes in regard to the program's objectives. The researcher used program documents and the reactions of program stakeholders in order to obtain information that can contribute to the improvement of the program. In following a classic public-sector approach, the evaluation plan began with the development of a logic model to provide structure and fill in gaps between the program and its objectives. "Logic Models have proven especially useful when more than one person is involved in planning, executing, and evaluating a program" (Frye & Hemmer, 2012, p. 295) to apply varied perspectives pertinent to program activities and outcomes. The initial logic model was created and approved by the program team (program team meeting, December 8, 2016). Following a review of literature and evaluation guidelines (Frye & Hemmer, 2012; U.S. Government Accountability Office Applied Research and Methods, 2012; U.S. Office of Personnel Management, 2011), the logic model was updated and approved (program team meeting, July 14, 2017). The CCTB training program logic model is available in Appendix A.

Frye and Hemmer (2012) posited program evaluators typically augment a logic model approach with additional strategies to increase the capability of a critical-goals analysis and systems-thinking approach. For this study the Kirkpatrick model, and the CIPP model were blended. The two models have similar components that when blended

can combine Kirkpatrick's goal-based approach with the CIPP model's systems approach (Adedokun-Shittu & Shittu, 2013). "A CIPP Input evaluation study formalizes a scholarly approach to program design" (Frye & Hemmer, 2012, p. 297). The input evaluation component of the CIPP model (Stufflebeam, 2003, 2010) was incorporated into this study to help evaluate current program practices against other potential practices. In addition, Kirkpatrick's Levels 1-4 (Kirkpatrick & Kirkpatrick, 2016) was the framework used for the study to evaluate how the program is being received by employees and to improve the transfer of learning behavior toward organizational goals. Reviewed literature substantiated blending these two models with studies that have employed blending of the models or recommended a blending of the models (Adedokun-Shittu & Shittu, 2013; Khalid, Abdul Rehman, & Ashraf, 2012; Lee, 2008; Owston, 2008; Wolf, Hills, & Evers, 2006).

Different types of teams can be assembled according to available resources for evaluation (U.S. Department of Health and Human Services, 2010). Program evaluations can be either "internal" or "external" distinguished by whether program employees are conducting the evaluation or if by outsiders. The CCTB training program was evaluated by internal program staff that have a role in the program as part of the program team. According to Fitzpatrick, Sanders, and Worthen (2011), benefits to an internal evaluator include familiarity with the organization and the program's history enabling them to keep the evaluation results relevant. It is the least expensive option for a program with limited resources while contributing to building staff evaluation expertise (U.S. Department of Health and Human Services, 2010). In contrast, evaluation results by an external evaluator may bring more credibility and perceived objectivity (Fitzpatrick, Sanders, & Worthen, 2011).

An internal program evaluation can be structured to improve credibility. Ensuring a successful internal evaluation needs to meet the following conditions: "(a) active support for evaluation from top administrators within the organization, and (b) clearly defined roles for internal evaluators" (Fitzpatrick, Sanders, & Worthen, 2011, p. 29-30). Internal evaluations should be prepared to enlist continuous communication and careful planning to in consideration of the above. Furthermore, internal evaluators may be "dispersed among program units" (p. 30) and mid-level within the organization to enable multi-directional communication links while still allowing for direct program improvement (Fitzpatrick, Sanders, & Worthen, 2011). To ensure compliance with public sector protocols, this study was in accordance with the U.S. Government Accountability Office Applied Research and Methods (2012) protocol and followed the U.S. Office of Personnel Management (2011) guidelines for designing evaluations.

Evaluation standards for personnel. The Joint Committee on Standards for Educational Evaluation (1994, 2017) has developed proprietary, utility, feasibility, and accuracy standards specific to personnel evaluation, in line with the general educational evaluation standards, that was used to guide this research project. Only those program team members deemed necessary by the division administration will have access to the data files. The researcher maintained anonymity of all data to "ensure that the identity of subjects cannot be ascertained during the course of the study, in study reports, or in any other way" (The Joint Committee on Standards for Educational Evaluation, 1994, p. 203). All stored data consists of non identifiable information. Data archive protocol for the county was followed.

To ensure dependability of the evaluation, diverse viewpoints were taken into account including input sought from all those involved such as program staff, client, and

employees from the various agencies. It is the intent of this evaluation to be ongoing and inform improvements and modifications for future trainings. Therefore, key stakeholders were invited to comment on the evaluation plan and instruments. In a program team meeting on December 8, 2016, team members reviewed the evaluation plan and provided input and approval of the evaluation plan prospectus. The program team was continually engaged on each step of the program evaluation process.

Researcher's role. According to Fitzpatrick, Sanders, and Worthen (2011), internal evaluators need "clearly defined roles" (p. 30) to enhance the credibility of the program evaluation. The researcher's role in the organization is as a change agent working to increase knowledge, collaboration, and action in both the community and internal county operations on climate change. The researcher acts as a change facilitator, putting in place certain processes and programs to encourage the implementation and use of climate tools and resources. For this study, the researcher acted as a change facilitator initiating the movement of climate literacy among fellow county employees with resources to use climate tools as a context for decision making on the job. The researcher took the role as an internal evaluator, working as part of the program team, collaborating in the design and facilitation of the CCTB training program which is the subject of this evaluation study.

Relevant and contextual issues. As one of sixteen communities in the nation designated as a Climate Action Champion by the White House for leadership on climate change, Broward County continues to advance the frontier of climate action through planning and to serve as a model for other communities (The White House, 2014). The Environmental Planning and Community Resilience Division, which administers the program, requested the evaluation to benefit from either positive or negative findings as

an opportunity to improve the program. There were no known political factors or forces to preclude a meaningful and fair evaluation for the CCTB training program.

Instruments

This study utilized a mixed-methods approach employing both quantitative and qualitative data. The data collection maximized the use of CCTB training program existing data and then filled the gaps with new data. The data collection process for this study included the following types of instruments: (a) questionnaires collecting both qualitative and quantitative data; (b) archival data reflecting professional development activities and exemplary program data; (c) pre and posttests to provide quantitative data (c) online surveys to assess delayed on the job feedback, which provided quantitative and qualitative data; and (d) interviews that provided qualitative data. Triangulation was incorporated within this study through the inclusion of multiple subjects and collection approaches encompassing a two-year period of time from the launch of the CCTB training program in February 2016 to the end of this research study in March 2018. Each of the data sources are described in the following text.

Investigation. An investigation into other local government employee training programs was implemented to answer one research question as the analyses for the input component of the CIPP evaluation model for this study. According to Frye and Hemmer (2012), reviewing literature, visiting exemplary programs, and consulting experts are examples of methods that can be used for an input evaluation study. The researcher explored public data through literature review, document review, program reports, data requests, and public sector environmental databases.

Archival data. According to the U.S. Department of Health and Human Services (2010), an internal evaluator should examine whether there is previously collected data

available for use in the evaluation. Archived data collected during the implementation of the CCTB training program since program inception, at the study site, from the "Module 3: End of Workshop Survey" (see Appendix B) was available to the researcher representing the 12 agency-specific, or group, training sessions. The Module 3: End of Workshop Survey was developed by the CCTB training program team as a retrospective pre- and post-assessment. The survey included seven multiple choice questions that generated categorical-ordinal data. A 5-point scale format using verbal descriptors was used for participants to indicate knowledge level with the statement rated from 1 to 4 as follows: 1 equaled "none;" 2 equaled "a little;" 3 equaled "some aspects but not all;" 4 equaled "very informed;" and 5 equaled "ready to present." The deidentified records were available in the form of Microsoft Excel spreadsheets.

Questionnaires. "Employees will not be inclined to learn new things, or to use what they have learned, if they do not like the training and the trainers" (Steensma & Groeneveld, 2010, p. 320). Therefore, the researcher developed two questionnaires in order to evaluate and triangulate employee reactions to the training. A "Participate Reaction Survey" (see Appendix H) was adapted using the Kirkpatrick Model Hybrid Evaluation Tool Template (2012) for employee's immediate reaction following a training session. The tool template includes a variety of sample questions for each dimension of Levels 1 and 2. The researcher selected questions from each dimension, and it was approved by the program team to meet CCTB training program informational needs. According to Kirkpatrick and Kirkpatrick (2016), including questions from multiple levels and dimensions within the same evaluation tool maximizes both the evaluator's and participant's time investment. The 10-point Likert-type item format with numerical descriptors was used according to the template for participants to indicate agreement with

the statement from 1 to 10 where 1 equaled "strongly disagree" and 10 equaled "strongly agree." Questions are framed positively so that a score of 1 is reliably bad and a score of 10 is reliably good (La Duke, 2017). The neutral response was omitted. Level 1 (Q1-4) measured participates immediate reaction on engagement and relevance, and Level 1 (Q9 and Q10) measured satisfaction, of the training event. Level 2 (Q5-8) measured learning through the participant's level of confidence and commitment immediately following the training event. Level 2 (Q12-15) were open-ended questions included to measure commitment for using the learned information on the job.

A second instrument, a Self-Assessment Questionnaire (see Appendix C), was used for assessing agreement pertaining to trainer effectiveness. The questionnaire was developed with 18 Likert-type items including key competencies for trainers such as subject matter expertise, cultural sensitivity, engagement through communication techniques, and respect for the group. Verbal descriptors were used for participants to indicate agreement with the statement from 1 to 5 where 1 equaled "needs improvement" and 5 equaled "competent." The self-assessment questionnaire was adapted from the "Trainers Guide to Cancer Education," National Cancer Institute (2001). The self-assessment questionnaire allowed the program trainers to personally assess their individual training skills.

Pre and posttests. Identical pre and posttests are "key to ascertaining whether the participants learned anything in the learning event" (La Duke, 2017, p. 20). A knowledge test, the "Climate Literacy Quiz" (see Appendix D), was used to triangulate findings with archival data for the participant's level of climate knowledge before and after a training session. According to La Duke (2017), questions should be shuffled for the posttest to make participants think about the information presented. Therefore, the questions on the

climate literacy pre and posttest were identical, but the question sequence was reordered for the posttest version. The Climate Literacy Quiz was adapted from the NASA Global Climate Change Education Program's Climate Literacy Assessment (2011). Questions represent the seven Climate Literacy Principles (NASA Global Climate Change Education Program, 2011) with the exception of principles three and four since those principles are not covered during the CCTB training program. In addition, three questions were added to the test that pertain to specific regional knowledge and each question relating to one of the three CCTB training program's learning objectives. Findings were compared to an average county employee climate literacy score of 78.9%.

Online surveys. "The Kirkpatrick perspective is that training professionals have to concern themselves with more than the training program" (Kirkpatrick & Kirkpatrick, 2016). Follow-up support has been built in to the CCTB training program. The program logic model (see Appendix A) identified intermediate outcomes for employee behavior on the job. Part of the CCTB training program are online resources, and program staff that are available for on-the-job coaching and assistance. Therefore, one of the critical components to evaluating the training program for the program staff, and client, was the application of knowledge and tools on the job well after the training program. The "Delayed Use Online Survey" (see Appendix E), with a total of 17 questions, was developed by the researcher, and tested by the program team. Question 1-12 of the survey were adapted from the Kirkpatrick Model Hybrid Evaluation Tool Template (2012) for delayed use after a training program. The tool template includes a variety of sample questions for each dimension of the levels that are appropriate to evaluate at some point after the training (Kirkpatrick & Kirkpatrick, 2016). Level 3 questions were selected from the template to include on-the-job and leading indicators dimensions. The 12 questions

chosen were modified and customized for the CCTB program's content, audience, culture and desired results. As the Level 3 evaluation objective was to measure employee behavior, a post training evaluation should occur at least a month after the training has occurred to determine learning attainment (La Duke, 2017). The survey was designed to be administered at least three months after the employee had completed the CCTB training. In addition, four questions were included to compare county employee responses to the national climate research from the Six Americas study of the general American public. The last question in the survey allowed employees to volunteer to be interviewed.

Interviews. Research studies often focus on whether an intervention had the intended effect rather than how much of an effect the intervention had (Valentine & Cooper, 2003). Moreover, measuring the effects of a training program for Level 4 evaluation can be quite complicated (Steensma & Groeneveld, 2010). For this study, **s**emi-structured interviews were conducted to evaluate individual differences between respondents' experiences and explore training outcomes. The Kirkpatrick Hybrid Evaluation Tool Template (2012) was adapted using the open-ended template questions relating to Level 4 behaviors as the foundation for the interview questions. Interviews that are semi-structured allow the interviewer the flexibility in question order and wording (Centers for Disease Control and Prevention, 2009). According to the Centers for Disease Control and Prevention (2009) the same questions can be asked to individual participates. For this evaluation, the same interview questions were asked to participants to reflect on the CCTB program outcomes and to discover how different individual employees are utilizing climate knowledge and tools, if barriers have been perceived or blocked, or what support could reinforce and encourage action. Interviews are typically

qualitative but also may include quantitative questions (Centers for Disease Control and Prevention, 2009). The first interview question was multiple choice using verbal descriptors, in order to gain context and insight (Centers for Disease Control and Prevention, 2009) and to gauge the extent the knowledge and tools from the training had been used by the employee (see Appendix F).

Procedures

The procedures for data collection and analysis for this study were chosen to match with the purpose of the evaluation, the evaluation questions, and the resources available. According to the Joint Committee on Standards for Educational Evaluation (1994) stakeholder engagement creates an increased chance that an evaluation will be useful. For this study, the researcher identified the key stakeholders to include the program team, employee participants, and county administration. It is particularly important to foster input and participation among those invested in the program's findings (Joint Committee on Standards for Educational Evaluation (1994). Therefore, built into the evaluation timeline of the CCTB training program was review and feedback on the data collection procedures and instruments.

Design. This program evaluation was a formative assessment, to "provide information for program improvement" (Fitzpatrick, Sanders, & Worthen, 2011, p. 20), using a blended model with a mixed-methods approach for collecting and analyzing quantitative and qualitative data. By using a mixed methods design, researchers can develop a "fuller picture of the abstract constructs we tend to design" (p. 386) allowing for a broader understanding of the different results combined across methods (Fitzpatrick, Sanders, & Worthen, 2011). Moreover, Creswell (2015) noted the mixing of quantitative and qualitative methods as a complimentary design. A mixed-methods approach and

blended model allowed for triangulation of the data which was collected from multiple sources in order to connect and relate information to expand the knowledge for program improvement. According to Creswell (2015), relating data through triangulation broadens the understanding gained from a study.

Data collection procedures. Over 200 county employees (n = 217) have completed a CCTB training session. The data collection methods are summarized and aligned with the research questions and evaluation model levels in a chart format (see Appendix G). This study acquired data from three sources: data collected from external agencies, data collected from county employees that have completed the CCTB training program, and data collected from county employees that have not completed the CCTB training program. The third data source was solely for assessing agreement of the findings. The data collection process is detailed in the below text, arranged by the pertaining research question.

Research question 1. What strategies and activities have been planned to address the needs of employees in a climate change engagement program? The researcher drafted a list of data points typical for local government programming that could be useful in benchmarking the program. The final list of benchmarks were approved: (a) population; (b) number of employees; (c) target audience; (d) number of employees trained; (e) length of training; (f) learning objectives; (g) internally or externally developed; (h) training budget; (i) needs-assessment, (j) collection of feedback; and (k) ongoing engagement. The researcher used climate and sustainability networks and associations to collect the data. A discussion thread was posted on the Urban Sustainability Directors Network (USDN), available to this researcher through county membership, requesting contacts and information for cities or counties that have or are educating their employees

on climate change through a formal training program. The researcher e-mailed data requests for training program information to sustainability contacts for the cities of Miami Beach and Fort Lauderdale through the Florida Sustainability Directors Network, and the city of Baltimore through USDN. The cities of Miami Beach and Fort Lauderdale supplied data in the form of public presentation slides, reports and other published data. In addition, sustainability staff noted availability for further comment or clarification over the phone. The researcher scheduled a brief phone call with each city contact. The collection of data during the phone calls was recorded through typed notes in Microsoft Word by the researcher. To confirm accuracy, the researcher sent the drafted text to the sustainability staff contact for their review and approval. The city of Baltimore was unresponsive to requests therefore publicly available data were collected for that city along with other government climate training programs through internet searches and sustainability networks online document databases.

Research question 2. What are the effects of instructional quality on climate literacy achievement? Level 1 reaction criteria data were collected through two instruments developed by the researcher. Collected first, was the Participant Reaction Survey (see Appendix H). The survey was collected from a small convenience sample immediately following one of the 15 training sessions. The survey was distributed at the end of a "General" training in lieu of the Module 3: End of Workshop Survey that is typically collected from participants. CCTB trainers placed the survey at each seat during the program break similar to other training sessions. With five to ten minutes of the training session remaining, the program trainers asked participants to fill out the feedback survey and place it in a pile in the center of the table before leaving. Participants have the choice to complete the survey or not. The collection of participant feedback is normal

protocol for the county's training programs. Identifiable information was not requested on the survey. As program trainers cleaned up the training space, reusable materials and completed surveys were collected from the tables. Completed surveys were placed in a blue-labeled "Survey" folder that is part of the CCTB training materials bin. Once back at the office, the researcher was able to transfer the completed surveys from the folder to the CCTB evaluation folder in a locked file cabinet where the evaluation data is stored.

For Research Question 2, a second instrument was used. A Self-Assessment Questionnaire (see Appendix C) was collected from the four program trainers. Prior to collection, the researcher visited each program team member detailing how and when the self-assessment questionnaire would be circulated. The CCTB program team members work in the same office, in relatively close proximity, therefore communication with and between the program team is unproblematic. To collect the questionnaire, the researcher prepared a large manila envelop that sealed with a clasp and made four copies of the questionnaire. Using a black sharpie, the envelope was titled CCTB Program Evaluation. Directions were written on the outside of the envelope to "Initial next to your name once you've completed the assessment and give to the next team member on the list." Each name was written on the outside of the envelope with a blank line adjacent, and listed in an order so that the researcher would receive the envelope last. A large yellow Post-it note was attached to the top blank assessment with a list of reminders:

> Please fill out the self-assessment completely and honestly and place your completed assessment in the envelope then seal shut. There are two sides of the assessment to complete. Initial once completed and give the envelope to the next team member listed.

The blank copies were attached to the envelope with a binder clip. The researcher gave

the envelope to the first team member on the list. The use of this method of collection allowed for complete anonymity and unconstrained time for each member to self-reflect based on their own schedule. The envelope was returned to the researcher after two eight-hour work days. The researcher confirmed there were four assessments in the envelope and that both sides had been completed. The researcher resealed the envelope and placed it in the CCTB evaluation file in the locked office cabinet.

Research question 3. How well did the learners master the program content? Level 2 learning data were collected in order to detail participant knowledge acquired from the training program. Two data collection instruments were used to assess the level of understanding on global climate change and local impacts. The Module 3: End of Workshop Survey (see Appendix B, Q1-4) was used as the primary analysis. The Climate Literacy Quiz (see Appendix D) pre and posttest was collected to assess agreement to the retrospective survey data. A limited amount of training time may preclude use of traditional, pretest and posttest approach, and utilization should only occur "if there is a specific use for the data" (Kirkpatrick & Kirkpatrick, 2016). Therefore, the pre and posttest was collected from one of the three "General" training sessions as a convenience sample for comparison. To distribute and collect the Climate Literacy Quiz, the researcher made double-sided copies: one side was the pretest and the other side had the posttest with the question order scrambled. A quiz was placed at each seat in the training room. Quizzes were printed on blue paper so that participants could be easily directed to it among the program materials on the tables. The use of colored paper also made it visually simple for the program trainers to collect and keep the quizzes separate from other program materials. As participants entered and signed in the trainers were able to direct participants to fill out the pretest while waiting for the training session to begin. Pre

and post knowledge tests are a typical tool utilized in the county's training programs. With five to ten minutes left in the training session, participants were instructed to flip over the pretest (blue sheet of paper), and complete the posttest. Before the quizzes were collected, the participants requested the facilitators go over the test questions and answers. Therefore, the program trainers had the participants grade their own quiz prior to collecting them. This was not part of the original plan, but the participants seemed genuinely interested in how they scored. Program trainers went through the questions and answers, and then quizzes were collected by the program trainers and placed in the blue-labeled "Survey" folder that is part of the CCTB training materials bin. Once back at the office, the researcher was able to transfer the completed surveys from the folder to the CCTB evaluation folder in a locked file cabinet where the data is stored.

Research question 4. How well did the training meet the development needs identified? Was learning applicable to job performance? Level 2 learning data were collected in order to detail participant confidence and commitment to the information, and relevance to their job. Data from two instruments previously collected was used for this analysis. This is a blended technique in using one instrument as the basis for data collection on multiple levels. This technique uses training time effectively and reduces survey fatigue (Kirkpatrick & Kirkpatrick, 2016). To assess participant confidence and commitment, qualitative and quantitative data from the Module 3: End of Workshop Survey (Questions B and C) was used, in conjunction with quantitative data from the Participate Reaction Survey (Q5-Q8) to assess congruence of the results. To assess relevance, Module 3: End of Workshop Survey (Q5-Q6, and D) was analyzed.

Research question 5. How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction? Level 3 behavior

and Level 4 results data were collected to assess whether participants were using the knowledge and tools on the job. Surveys and interviews were the two instruments used on employees that had completed the CCTB training program and had been able to utilize training knowledge on the job for more than three months. First, the researcher distributed the Delayed-Response Online Survey (see Appendix E) through e-mail to county employees who had previously completed the CCTB training program. The survey was created using the online Survey Monkey (2017) application. The researcher drafted the questions based on the Kirkpatrick Model Hybrid L3/L4 Survey (2016) with input from the client. The use of an online survey was intended for the convenience of the participants and intended to produce a high rate of response. The researcher sent an e-mail using Microsoft Outlook with the survey link embedded to all employees who had completed the CCTB program as of December 2017. The list of e-mails was accessible to the researcher through the county's Pathlore training platform. Only county employees that have been designated by the agency and have received training on its use have access to Pathlore software. The researcher was able to run a query and filter employees designated as "Finished" to export e-mail addresses into Microsoft Outlook. The survey link was active for a period of two weeks to ensure ample opportunity for participation. A reminder e-mail was sent to the same list of employees three days in advance to the close of the survey. The researcher exported the survey results into Microsoft Excel and Microsoft PowerPoint and saved the files on a USB that was placed in the CCTB evaluation folder in a locked file cabinet where the evaluation data is stored.

Next, qualitative interviews were conducted to provide an understanding of the outcomes as related to Level 4 results. Through the use of a semi-structured interview, this study further evaluated relevance of the training program by linking on-the-job use.

Question 17 of the Delayed-Response Online Survey allowed participants to self-elect to provide their contact information to be interviewed. The interviews were scheduled and conducted with four employees, selected from six employees who had volunteered, to secure representation from a broad range of county agencies. A list of available dates and times were e-mailed to the four employees. Within one week, all employees had responded with their first and second choice. The interviews were scheduled using Microsoft Outlook to send a calendar invite detailing the date, time, and location to each participant to block the 30 minutes on their calendar. The researcher scheduled a conference room at each work site using Microsoft Outlook room scheduling feature through the organization's network. Interviews were held in person at the participant's work site. The collection of data during the interviews was recorded through handwritten notes documented by the researcher. All gathered data subsequently were stored in a locked, secure file cabinet in the researcher's office. The researcher was the only individual with access to the data.

Data analysis. The procedures of this program evaluation included analyzing data from three distinct sources: (a) governmental data for comparison; (b) traditional and online survey responses, pre and posttest results, and interview responses from county employees who had completed the CCTB training program; and (c) self-assessment responses an pre and posttest scores from county employees who had not completed the CCTB training program. Prior to analyzing the data, an evaluator should consider how to report the data to program stakeholders especially when evaluating for program improvement or effectiveness (Centers for Disease Control and Prevention, 2013). Therefore, reporting the data according to stakeholder needs, the evaluation purpose, and target audience were considered in the development of the data analysis. Descriptive

statistics methods were used to compare, analyze, and present the findings without concern for drawing conclusions or inferences about a larger set of data. Standard statistical software (SPSS 22) and traditional software programs (Microsoft Office) were used to present findings according to stakeholder preference of nontechnical government staff. Each method is detailed in the text below, organized by the research question to which the source pertains.

Research question 1. This research question pertained to the CIPP Input component of the evaluation model. Findings from the investigation were reviewed, and data were condensed and presented in text form. For simplicity, comparable data points were input into a chart using Microsoft Word for a visual description of benchmarks to describe results to the client.

Research question 2. This research question pertained to Level 1 Reaction of the evaluation model. Employee reaction to training environment, content, and facilitators was analyzed through congruence and triangulation of the Participant Reaction Survey (see Appendix H, Q1-4, and 9-10) immediately following a training session, and the Self-Assessment Questionnaire (see Appendix C, Items 1-18) completed by the program trainers. Descriptive statistics were presented in a means and frequencies table that included the median as the measure of central tendency for the participant survey. For comparison, the trainer self-assessment results were categorized and then analyzed the median score of the grouped trainer's skills and the dispersion of the scores between the four trainers using the Inter-Quartile Range as an indicator.

Research question 3. This research question pertained to Level 2 Knowledge of the evaluation model. Responses from the retrospective before and after Module 3: End of Workshop Survey (see Appendix B, Q1-4) were analyzed and then triangulated with

the pre and posttest Climate Literacy Quiz (see Appendix D) scores. Paired Samples *t*-Tests were used to compare the means of two variables; variable one was pre-training, and variable two was post training, for each group. The data were normalized against the county's employee climate literacy score average (79.8) from an informal needs assessment for the CCTB training program.

Research question 4. This research question pertained to Level 2 Learning of the evaluation model. Analysis was subdivided to measure the employee's confidence and commitment to the training knowledge, relevance of the training to the employee's work, and potential interaction between knowledge and relevance with the employee's likelihood to act. The Module 3: End of Workshop Survey (see Appendix B) provided quantitative data (Q5-6, and B) and qualitative data (Questions C and D) for analysis. Transcription of participant written responses were analyzed and coded for common themes using Microsoft Excel. Questions B and C were triangulated with responses from the Participant Reaction Survey (see Appendix H, Q5-8) provided for analysis of employee perceptions on their level of confidence and capability of training knowledge. Paired Sample t-Tests were used to analyze the Module 3: End of Workshop Survey (Q5-6) to analyze level of knowledge on climate impacts to the agency and job before and after the training. Question D written responses were used to discover if there were common needs for tools and resources across the agencies.

Module 3: End of Workshop Survey Questions 1-7 were used to further analyze whether or not an interaction is preferentially present between the training groups. A factorial ANOVA analysis was used to investigate any potential relationship between the pre-training mean score and post-training mean score to determine if the absolute value

of change (Q1-6) influences how likely the participant was to act on their knowledge (Q7). SPSS 22 was used to run the analysis.

Research question 5. This research question pertained to both Level 3 Behavior and Level 4 Results in the evaluation model. A survey instrument collected both quantitative and qualitative data more than three months after the employee had completed the training to analyze on-the-job behavior. Delayed Response Online Survey (see Appendix E, Q1-16) data were exported from the Survey Monkey application into Microsoft Excel to analyze responses, and Microsoft PowerPoint was used to illustrate responses in chart form.

Employee responses to semi-structured interview questions (see Appendix F) were transcribed into text format using Microsoft Excel. The data obtained during the interviews involved functional details and perceptions from supervisory and nonsupervisory employees representing different county agencies related to Level 4 evaluation model results. The data obtained was inductively analyzed as suggested by Creswell (2015) using process, activity and strategy coding for causal links between the training program and the desired outcomes (Steensma & Groeneveld, 2010). The researcher interpreted the data based on current literature in an effort to answer the research question.

Chapter 4: Results

The purpose of this study was to conduct a formal evaluation to examine whether the CCTB training program is achieving the program's stated goals and objectives at desired levels. The evaluation was requested by the Environmental Planning and Community Resilience Division in an effort to further develop, implement best practices, and evaluate the effectiveness of the CCTB training program. This program evaluation was guided by the Kirkpatrick Four Levels (Kirkpatrick & Kirkpatrick, 2016) model blended with the input component of the CIPP model (Stufflebeam, 2003, 2010). The mixed methods design used quantitative and qualitative instruments collected in multiple phases to triangulate the research questions. This evaluation was guided by five research questions:

1. What strategies and activities have been planned to address the needs of employees in a climate change engagement program?
2. What are the effects of instructional quality on climate literacy achievement?
3. How well did the learners master the content?
4. How well did the training meet the development needs identified? Was learning applicable to job performance?
5. How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction?

Each research question addressed a specific evaluation model level and was analyzed with a combination of data collection instruments (see Table 1). This chapter presents the evaluation results derived from the data collection and subsequent analysis of the CCTB training program. Research question results are presented sequentially,

arranged by evaluation model level. The CIPP Input component is presented first followed by the Kirkpatrick Levels in order: Reaction, Learning, Behavior, and Results.

Table 1
Summary of Research Questions, Evaluation Model, and Research Instruments

Research Question	CIPP/Kirkpatrick Level	Instrument
1. What strategies and activities have been planned to address the needs of employees in a climate change engagement program?	Input: Structuring decisions, how should we do it?	Investigation – Collected and reviewed data on other local government employee climate training programs.
2. What are the effects of instructional quality on climate literacy achievement?	Level 1: Reaction, is the training engaging?	Questionnaires – Participant Reaction Survey (Q1-4, and Q9-10), and Self-Assessment Questionnaire for program trainers.
3. How well did the learners master the content? *(CCTB Learning Objective 1)*	Level 2: Learning, are the participants acquiring the intended knowledge?	Pre and Posttest and Archival Data – Climate Literacy Quiz, Module 3: End of Workshop Survey (Q1-Q4).
4. How well did the training meet the development needs identified? Was learning applicable to job performance? *(CCTB Learning Objective 2)*	Level 2: Learning, are the participants acquiring intended confidence and commitment? Was the training relevant?	Archival Data and Questionnaire – Module 3: End of Workshop Survey (B, C and D, and Q5-6), and Participate Reaction Survey (Q5-8).
5. How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction? *(CCTB Learning Objective 3)*	Level 3: Behavior, are the participants using what they learned on the job?	Online Survey – Delayed Response Survey (Q1-16).
	Level 4: Results, do targeted outcomes occur as a result of the training?	Interviews – Qualitative semi-structured interviews.

Note. CIPP = context, input, process, product (Stufflebeam 2003, 2010). CCTB = Climate Change Toolbox (training program). Q = question number.

CIPP Input Component

Results for Research Question 1. Research Question 1 was as follows: What strategies and activities have been planned to address the needs of employees in a climate change engagement program? To evaluate the input component of this program, the researcher utilized data collected from Southeast Florida regional government climate training programs to benchmark with the CCTB training program and researched what other governmental programs existed. Data were condensed to a list of key benchmarks: (a) population; (b) number of employees; (c) target audience; (d) number of employees trained; (e) length of training; (f) learning objectives; (g) internally or externally developed; (h) training budget; (i) needs assessment, (j) collection of feedback; and (k) ongoing engagement. Data were collected through website searches, e-mail record requests to environmental departments, and messages posted on the Urban Sustainability Directors Network (USDN) and Florida Sustainability Directors Network (FSDN) online member community boards. Results are presented separately in text for each program by government entity. Benchmark data were compiled into a summary comparison table that includes the CCTB training program (see Table H1 in Appendix H).

Miami Beach, Florida. The City of Miami Beach has a population close to 92,000 residents (Census Bureau, 2018) with nearly 2,100 municipal employees serving their community. Initially, the Miami Beach training was targeted to department heads in October 2015, followed by training opportunities for additional employees in February 2016. A total of 168 city employees completed the training provided at two different sessions from “directors, staff appointed by directors, and interested employees” (F. Tonioli, personal communication, March 21, 2018). The training program was three hours in length. The learning objectives of the training were for employees to leave with

an understanding of the science of climate change, and "build momentum for the city's climate resilience and sustainability initiatives" (C. Lewis, personal communication, January 14, 2018). Miami Beach worked with an external, and local, agency, The CLEO Institute, to develop and provide the "Climate 101" training program. A 30-minute presentation on the current sustainability, climate mitigation and adaptation efforts was incorporated into the training program. The sustainability staff also participated as trainees. There was no needs-assessment data collected from employees prior to the development of the training program. The cost of the training was $4,200; that is, $25 per participant. At the end of the training sessions a survey was distributed and collected from 125 attendees and was summarized in a report sent to the city. Participants used a 5-point Likert scale consisting of the following responses: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). Results indicated a strong level of agreement that participant's awareness of climate issues increased after the training at the rate of 70% strongly agreed, 29% agreed, and 1% neutral. Similarly, participants elected 55% strongly agreed, 43% agreed, and 2% neutral that they can now better support climate resilience efforts locally and regionally.

Miami Beach plans to continue offering the Climate 101 training program but is looking into the possibility of making an online version (personal communication, Miami Beach sustainability staff, December 19, 2017). Moreover, the city has many ongoing engagement opportunities for employees such as resiliency workshops, an annual environmental permitting and regulation workshop, and seven monthly lunch and learns that include hands-on environmental activities. Also, the city works with a local nonprofit partner, Dream In Green, to present their "WE-LAB" educational workshops to employees on water and energy conservation. In addition, Miami Beach encourages

employees to acquire their Leadership in Energy and Environmental Design (LEED) accreditation by offering LEED educational courses, and the possible incentive of having the exam fee covered by their department. Recently, the city provided trainings specific to parking staff on "Park Smart" the LEED equivalent for parking garages. Flavia Tonioli is the Sustainability Manager for the City of Miami Beach, she remarked on the importance when working with an external facilitator to maintain a portion of the training that is dedicated to city efforts presented city staff:

> We found it very valuable to present on city initiatives for the last half hour of the training. It enabled sustainability staff to connect with and ignite employee champions. Now we have people very passionate about sustainability infiltrated into different departments. It is not just the training alone but coupled with ongoing engagement, and incentives, we've seen more ideas implemented from the different departments. (F. Tonioli, personal communication, March 21, 2018)

Fort Lauderdale, Florida. The City of Fort Lauderdale has a population of nearly 179,000 residents (Census Bureau, 2018) or "neighbors" as they are called by the city. Fort Lauderdale has 2,500 employees. The "Climate Change and Sustainability-Science, Seriousness, Solutions Training" program was a mandatory training "to engage ALL employees in the City's Vision Plan related to adaptation and mitigation" (Gassman, 2016). Thirty-two training sessions were offered between May and June, and each session was 2.5 hours in length. Nearly 2,300 employees completed the training: "1,649 in person and 644 watched video" G. Hadwen, personal communication, March 22, 2018). Although there were no formal learning objectives, the overall goal of the training was "to give context and build momentum for the city's ambitious sustainability initiatives" (The CLEO Institute, 2015, p. 14). Fort Lauderdale commissioned an

external, and local, agency The CLEO Institute, to develop and facilitate the training program. The cost of the program was $16.77 per employee (Gassman, 2016); the per capita cost excludes staff time to prepare and participate in training. City sustainability staff developed a component of the training dedicated to city-specific resources and initiatives that took 30 minutes of the training and was delivered at each session by city sustainability staff. There was no needs-assessment data collected from employees prior to the development of the training program; however, the idea of citywide training was initiated from the "Climate Ambassadors" employee group (Gassman, 2016). A survey, developed by The CLEO Institute, was collected at the end of each session. Participants used a 5-point Likert scale consisting of the following responses: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). Survey results indicated 24% strongly agreed and 45% agreed that the information learned in the training could be used in their everyday work activities. Twenty-three percent of employees were neutral on the use of the information, and 4% for both disagree and strongly disagree responses.

For Fort Lauderdale, the enormous effort undertaken for the climate training was a one-time occurrence. However, the city continues to offer ongoing education and engagement initiatives on climate and sustainability just not on the scale of the Climate Change and Sustainability-Science, Seriousness, Solutions Training. The city continues to offer external training opportunities for city staff on climate through partnerships such as ACCO, Institute for Sustainable Communities, Southeast Florida Regional Climate Change Compact, and Broward County (Gassman, 2016). Moreover, the city has an internal action-based "Green Team" with the goal of engaging more employees. The Green Team has developed and coordinated three citywide competitions that tie back to the message from the climate training "Flip the Switch" to encourage energy

conservation, “Kick the Can” to increase recycling, and the most recent a “Paper Wise” challenge to reduce the amount of printing. In addition, the Green Team is promoting a “Green Our Meetings” campaign for city conference and meeting rooms. Glen Hadwen is the Sustainability Manager for the City of Fort Lauderdale, he stated as the city moves forward with major initiatives there are some unexpected results where employees have displayed self-motivation on the issue:

> I think we have made some real progress on employee engagement but there is still a way to go. One neat thing is we have seen results that we did not expect. For example, the city’s Human Resources Department hosts a monthly lunch and learn, and recently without guidance from sustainability staff they stopped serving bottled water. Employees are more conscious and thinking about this beyond what we [sustainability staff] are working on. (G. Hadwen, personal communication, February 23, 2018)

Other government programs. The researcher discovered several alternative types of employee climate change development programs and approaches worth discussion for ongoing engagement activities: (a) National Parks Service creates climate educational content for their bimonthly newsletters, (b) U.S. Forest Service deploys video tutorials, (c) City of Baltimore gamifies resilience training, and (d) City of Fort Collins offers incentives and educational field trip opportunities. The following details summary results from the researcher’s web investigation although there may be other employee training programs that incorporate climate change in some way or are dedicated to climate change, but information was not conveniently accessible on public websites.

National Parks Service. The National Parks Service (NPS) is an arm of the U.S. Department of the Interior. NPS has a Climate Change Response Program to

communicate and educate NPS employees and visitors. High priorities of the program include embracing climate education, implementing employee training on climate change, and sharing best practices across the 39 national parks (Richman, & Welling, 2011). NPS has a website dedicated to climate change (www.nps.gov/climatechange) featuring climate web-based seminars from climate experts on relevant topics to the parks system. NPS practices ongoing engagement on the topic through bimonthly newsletters (Richman, & Welling, 2011).

Forest Service Alaska Region. The United States Department of Agriculture is addressing climate change working with the Forest Service Alaska Region to provide climate change education to Tongass employees. Training and educational information packets were distributed to all employees in the region (Darr, 2017). Educational information included reports specific to the area, a forest climate change scorecard report, and other climate change information (Darr, 2017). In addition, a training document was distributed with linked climate education tools that included brief "Tongass NF Sustainable Operations" video tutorial (Darr, 2017).

Baltimore, Maryland. The City of Baltimore has a population close to 615,000 residents (Census Bureau, 2018). The city employs 13,483 part-time and full-time staff which includes police and fire departments (Open Baltimore, 2017). The training is aimed at staff in such as public works, transportation, utilities, sustainability, planning, and parks that deal with physical assets primarily in the right of way like storm water systems and roadways. The training is approximately 3.5 hours in length. The learning objective for the training is to equip city staff with the knowledge and resources to "mainstream" or "operationalize" climate change preparedness and resilience into planning, engineering, operations, and maintenance activities. The training was

developed as part of a grant through the Urban Sustainability Directors Network, led by the City of Baltimore, to develop a climate training toolkit that any local government can readily modified for local context, and use to facilitate trainings of staff. The training is grounded around the use of an interactive "Resiliency Game" where employees work in teams of 4-8 with one facilitator per group.

Fort Collins, Colorado. The City of Fort Collins, with a population of 164, 207 (Census Bureau, 2018), launched the "One Planet" program is 2010. One Planet is an experiential education program that offers tours of City services and projects to foster cross department collaboration and awareness (Roberts, 2017). The program was developed internally by an employee volunteer team that set the initial series of field trips. Each tour ranges from one to four hours in length. The program budget is $15,000 which used to come from the administrative fund but now is a shared cost by multiple departments (Roberts, 2017). Nearly two-thirds of the budget went to purchasing gift cards which are used as monetary incentives for employees to get involved and take action to move up different levels. In 2016, a climate action plan track as part of One Planet was piloted to 50 city employees. Surveys are collected before, during, and after the program to provide feedback.

Level 1: Reaction

Results for Research Question 2. Research Question 2 was as follows: What are the effects of instructional quality on climate literacy achievement? This question pertained to Level 1 by examining employee's personal reactions to learning engagement, training activities, and presenting styles of the trainers. This question was answered using a reaction survey immediately following a training class with questions to assess employees' level of engagement with the training. For congruence, program trainers

completed a self-assessment to rate their skills as training facilitators. It should be noted that the initial evaluation plan had also intended to include an observation of a training session by a team of expert training facilitators. However, due to timing of the research approval, and the experts' schedule conflicts this did not occur but could be scheduled for a future training to triangulate results.

The Participant Reaction Survey (see Appendix G) Questions 1-4, and 9-10 were used to analyze the employee's (n = 12) level of engagement with the training. For this small convenience sample there was broad representation of county agencies from public works to environmental protection, county administration, parks, and libraries in attendance. Descriptive statistics were calculated including the median (see Table H2 in Appendix G); according to Mills, the median is an appropriate descriptive statistical measure for ordinal data (D. Mills, personal communication, May 23, 2015). In addition, a means and frequencies table was calculated for each survey question to illustrate how responses were distributed (see Table H3 in Appendix H). Descriptive statistics revealed a high level of engagement immediately following the training session. Employee responses when asked to rate whether they were engaged with what was going on during the program (M = 9.25, Mdn = 10.00, SD = 1.06) indicated a strong majority were engaged (75%). Employee responses when asked to rate whether the activities and exercises aided their learning (M = 9.58, Mdn = 10.00, SD = .79) indicated a strong majority "Strongly Agree" (75%). Employee responses when asked to rate whether they were given adequate opportunity to practice what they learned (M = 8.45, Mdn = 9.00, SD = 1.73) indicated "Mildly Agree" (33%) and "Agree" or "Strongly Agree" (58%). Employee responses when asked to rate whether they understood how to use the Unified Sea Level Rise Projection tool (M = 8.75, Mdn = 9.00, SD = 1.54) indicated "Strongly

Agree" or "Agree" (67%), "Moderately Agree" (17%), "Mildly Agree" (8%), and "Neither Agree or Disagree" (8%). Employee responses when asked to rate whether the presentation style of the instructors contributed to learning (M = 9.25, Mdn = 10.00, SD = 1.54) indicated a strong majority "Strongly Agree" (75%). Employee responses when asked to rate whether they would recommend this program to co-workers (M = 9.08, Mdn = 10.00, SD = 1.78) indicated most (75%) would recommend the course.

The Self-Assessment Questionnaire (see Appendix C) was analyzed for a numerical summation of the CCTB training team's (n = 4) overall positive or negative orientation to their skills as a trainer. No reverse coding was necessary as all the 18 Likert-type items were positively phrased. For increased confidence the results were merged (Valentine & Cooper, 2003) into four overarching attributes as follows: confidence (Items 1 and 2), sensitivity (Items 3-7), communications (Items 8-11), and team approach (Items 13-18). According to Mills (D. Mills, personal communication, May 23, 2015), no single measure of central tendency works best for all circumstances, however the median is the appropriate descriptive statistical measure for ordinal data. Therefore, the median was calculated as a measure of central tendency in addition to the Inter-Quartile Range (IQR) as a measure of dispersion amongst the categories. The findings were broadly consistent, and low IQR's showed the responses are clustered together (see Table H4 in Appendix H):

1. Confidence: most respondents indicated agreement with the idea that they are competent in their own self-knowledge and the subject matter (Mdn=4.25, IQR=1.25).

2. Sensitivity: most respondents indicated agreement with the idea that they are competent at being inclusive, culturally aware, and non-judgmental (Mdn=4.00, IQR=0).

Results indicted full agreement across the training team that they are "Competent" in this category.

3. Communications: most respondents indicated agreement with the idea that they are competent communicators which includes using illustrations, presenting clear ideas, varying pitch and tone, and reinforcing the message with body language (Mdn=4.00, IQR=.75).

4. Team Approach: most respondents indicated agreement with the idea that they are average in their understanding group dynamics, conflict resolution, and ability for openness, flexibility, and feedback (Mdn=3.5, IQR=.75). The team assessed themselves the lowest in understanding group stages and dynamics (Item 13, $M = 2.50$, $SD = .577$) and in comfort with conflict resolution (Item 14, $M = 2.25$, $SD = .5$) indicating as "Needs Some Improvement."

Level 2: Learning

Results for Research Question 3. Research Question 3 was as follows: How well did the learners master the content? This question pertained to Level 2 by measuring employee's increase in knowledge before and after the training. Knowledge was measured relative to the CCTB Module 1, Learning Objective 1, on global climate change and the local impacts to the region. This question was answered using the Module 3: End of Workshop Survey (see Appendix B). Survey responses were triangulated with the Climate Literacy Quiz (see Appendix D) pre and posttest scores from a small convenience sample (n = 12) of training participant's knowledge before and after a training session. In addition, the posttest literacy mean scores were used to test the difference between the sample of participants (n = 12) and the county employee population sample (n = 122) average literacy score. Data were calculated with SPSS 22.

Prior to calculating the *t*-tests, the Module 3: End of Workshop Survey (Q1-4) overcame the failed assumption that the dependent variable was approximately normally distributed. To test (Q1-4) distribution, the researcher conducted a Shapiro-Wilk Normality Test; assumptions tests provide assurance that the statistical procedures reported are appropriate for the data (Morgan, Reichert, & Harrison, 2002). The Shapiro-Wilk Normality test revealed a highly significant normal distribution ($p < .001$) meaning that it is very unlikely to have occurred by chance. As a result, paired samples *t*-tests were carried out to compare how climate literate were the participants before and after the training using the retrospective Module 3: End of Workshop Survey (Q1-4). Employees were asked to rate their level of knowledge on global climate change and the local impacts using a scale of one "none" to five "ready to present" prior to the training and after the training. Findings showed that on average the employee's (n = 167) report being more knowledgeable after the training (see Table H5 in Appendix H). In each case, the test statistic was significant, $p < 0.001$. To triangulate the results, scores from the Climate Literacy Quiz (n = 12) were computed. A paired samples t-test revealed that employees did not score significantly higher on the posttest ($M = 87.50$, $SD = 8.66$) than they did on the pretest ($M = 85.83$, $SD = 9.96$), $t\ (11) = -.518$, $p > .05$. Consequently, there was no difference in employees' performance between the pretest and the posttest (see Table H6 in Appendix H). In furtherance, the data were normalized against the county employee population (n = 122) climate literacy score average (79.59). A one sample *t*-test was used since the standard deviation of the population mean (n= 122) was unknown. A one sample *t*-test revealed that the average climate literacy posttest score ($M = 87.50$, $SD = 8.66$) differed statistically significant from 79.59, $t\ (11) = 3.164$, $p = .009$. A paired samples t-test revealed that employees did not score significantly higher on the

posttest, therefore, the researcher also analyzed if there was a significant difference of the pretest scores (n= 12) and the population mean. A one sample *t*-test revealed that the average climate literacy pretest score ($M = 85.83$, $SD = 9.962$) was not statistically significant from 79.59, t (11) = 2.171, $p = .053$.

Results for Research Question 4. Research Question 4 was as follows: How well did the training meet the development needs identified? Was learning applicable to job performance? This question pertained to Level 2 by measuring employee's learning confidence, and capability of using the knowledge on the job. Capability was measured relative to the CCTB Module 2, Learning Objective 2, on relevance to the employee's agency. Specifically, the program team developed the training to be applicable to the employee's agency so that the capability of using the knowledge on the job would be increased. To answer the question the Module 3: End of Workshop Survey (see Appendix B) Questions 5-6, and qualitative Questions B and C responses were used. Module 3:End of Workshop Survey (Q5-6) overcame the failed assumption that the dependent variable was approximately normally distributed using a Shapiro-Wilk Normality Test; the test revealed a highly significant normal distribution ($p < .001$). For congruence, the Participant Reaction Survey (see Appendix G) Questions 5-8 were analyzed (n = 12). Further analysis was evaluated exploring the Module 3: End of Workshop Survey results for any differences in training results between the training groups and likelihood to act (see Table H7 in Appendix H). Quantitative data were calculated and reported using SPSS 22. Qualitative data were coded in Microsoft Excel.

Measuring confidence and capability. Module 3: End of Workshop Survey Question B asked employees (n = 167) to rate the likelihood of acting on the information received from the training by circling from a list of word choices. Responses showed

employees were “Very” likely to act (63%), “Somewhat” likely to act (28%), and a limited number of employees were “Not Sure Yet” (9%). In furtherance, Module 3: End of Workshop Survey Question C was an open-ended question asking employees: In what ways might you incorporate this information into your daily or long-term work? The handwritten responses were transcribed into Microsoft Excel and coded to count the number of action phrases. Of the 102 written responses, 69 related to actions employees could integrate into their jobs. Next, action phrases were color-coded and then categorized under labels: (a) conserve, (b) consider climate impacts, (c) encourage others, (d) reduce personal emissions, (e) reduce work-related emissions, and (f) share knowledge. There were nine individual responses that did not fit into any of the categories and were left as separate phrases. An online word analysis tool (www.tagcrowd.com) was utilized to visually summarize the responses. This approach provided a simple way to present the data to the client, as action phrases with greater frequency in the responses were represented as a larger word in a word cloud as visualized (see Figure 1). Two overarching themes emerged from the data indicating employees would take actions toward conservation of resources and educating their co-workers. The conserve category responses included repeated employee actions from “power down computers” and “shut off lights” for energy conservation, to “going paperless,” “recycling,” and “biking to work.” The share knowledge category responses expressed action through informing co-workers of the local impacts, climate tools, and spreading general climate awareness. Similar to the overall statements made in response to Question C, one participant stated, “I could inform the other staff at the County Auditor’s office of the impacts of climate change.”

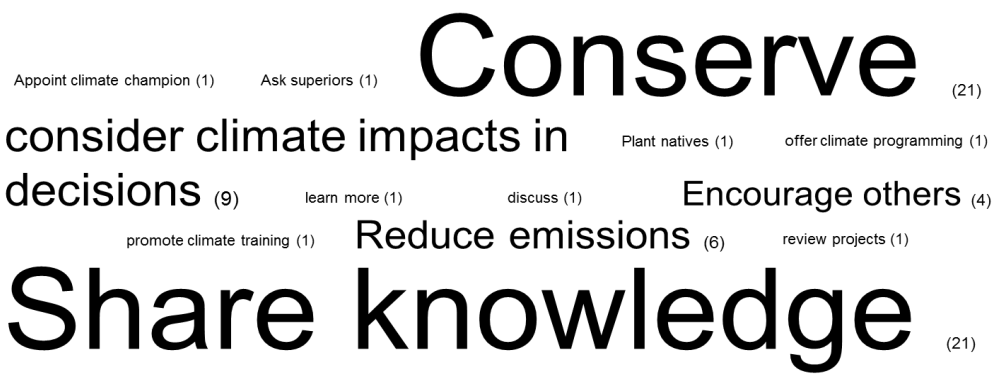

Figure 1. How employees will incorporate training knowledge in their work: a word cloud.

The Participant Reaction Survey (see Appendix G) Questions 5-8 were used for triangulation of the employee's (n = 12) level of confidence and commitment to using knowledge from the training (see Table H8 in Appendix H). Employee responses when asked whether they understood how climate change impacts their division (M = 9.08, Mdn = 9.50, SD = 1.16) indicated "Strongly Agree" or "Agree" (75%), "Moderately Agree" (8%), and "Mildly Agree" (17%). Employee responses when asked whether the information was applicable to their work (M = 8.83, Mdn = 9.00, SD = 1.40) indicated "Strongly Agree" or "Agree" (75%), "Mildly Agree" (25%), and "Slightly Agree" (8%). Employee responses when asked whether they were confident that they would be able to apply what they learned on the job (M = 8.64, Mdn = 9.00, SD = 1.36) indicated "Strongly Agree" or "Agree" (50%), "Moderately Agree" (25%), "Mildly Agree" (17%), and "Slightly Agree" (8%).

Measuring relevance of the training. Research Question 4 included a supporting question as follows: Was learning applicable to job performance? Module 3: End of Workshop Survey (see Appendix B) Questions 5 and 6 were used to answer the question. Employees were asked to rate their level of knowledge climate change impacts to their division and their job responsibilities using a scale of one "none" to five "ready to present" prior to the training and after the training. Paired Samples t-Tests were carried

out to compare how informed were the participants before and after the training. Findings showed that on average the employee's (n = 167) report being more knowledgeable after the training (see Table H5 in Appendix H). In each case, the test statistic is significant ($p < 0.01$).

Module 3: End of Workshop Survey Question D was an open-ended question asking employees to detail: What next steps or information do you need from us? The researcher decided responses might help gauge relevance of the knowledge by being able to articulate needs. Moreover, the purpose of the evaluation is to improve the CCTB program it may be of interest to determine if there are any common needs across the training groups. The handwritten responses were transcribed into Microsoft Excel, and then analyzed coding the content for common themes. The 62 written responses revealed three overarching needs that were labeled: communication, tools, and additional training. Regarding communication needs, one participant noted, "Continue to keep us informed on new policies and actions are developed. Also keep us informed on progress being made." For tools, *how to's* such as "How to budget projects to allow for changes" and "How to incorporate into our division's strategic planning process" were noted by employees' as needs. In Table 2, a summary of data collected by theme is presented.

Table 2
Synthesis of Employee Needs for Climate Action Post Training

Communication 39%	Tools 31%	Additional Training 28%
More marketing of the training program	Sharable presentation slides	More training, and classes should be offered and more frequently
Informing on how to get involved, and new policies	Simplified explanations of information	Presentations at divisional staff meetings
Detailing how our office can help	Maps and GIS layers	"Part 2 of this workshop"
Promoting a "green tip of the month"	Carbon calculators	
	"How to's"	

Note. Data reflect employee written responses for Question D from the Module 3: End of Workshop Survey. GIS = geographic information systems.

Exploring differences across training groups. Each training session was marketed to and related to a specific county agency or department. Module 3: End of Workshop Survey (see Appendix B) responses (n = 167) were explored further to test for differences between the training groups and employees' likelihood to act. A factorial ANOVA was used to compare if each survey question result (Questions 1-6) and likelihood to act (Question B) depends on which training group (1-12) the employee was in. The results are summarized in tables and profile plots to visualize the difference in means before and after the training for each group (see Table H7 in Appendix H). The findings were broadly consistent across all the different training groups indicating that the employee's felt the training was relevant with over 60% indicating they were "Very" likely to act to conserve resources and share their knowledge with coworkers as a result of the training. In general, two groups, the Port and Aviation agencies, seemed to improve the most on knowledge before and after the training out of all the groups.

Question 1 results showed that only group has a significant on training effectiveness. An increase was noticed across each group but for some, like group 11 (Aviation), the increase was much larger how greenhouse gases affect the climate before and after the training. For Question 2, findings indicate that the importance of group dwindles, having a p-value exactly at the level of importance ($p = 0.05$). Some differences are notable and seems that less performing groups have the largest benefit. Findings for Question 3 reveal the group no longer is significant. Therefore, in the case of Question 3 all groups perform the same on average. Regarding Question 4, group is significant. Regarding Question 5, all groups have performed the same on average, and no significant differences were present. For Question 6, how climate change impacts job responsibilities for each training group before and after the training, again group is significant. Findings indicate that groups 6 (Port) and 10 (Environmental Protection) improved significantly greater compared to the other groups.

Level 3: Behavior

Results for Research Question 5. Research Question 5 was as follows: How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction? This question looked at whether participants that had completed the CCTB training program are using what they learned on the job. This question is related to the third learning objective of the CCTB training program. Data were collected though an electronic survey (see Appendix E) sent to all the 217 employees that had completed the training program since December 2017. The raw data were analyzed in Microsoft Excel and summary graphics were created in Microsoft PowerPoint through the Survey Monkey application export feature. There were 16 employees who had completed the CCTB training that were no longer with the

organization. Survey responses were collected from 50 employees, for a 25% participation rate. The following text details the responses received for each survey question.

Survey Questions 1-4 collected employee demographic data. The responses indicated that over 60% of participants have worked for the county more than 10 years. Of the 50 participants, 46% were non-supervisory staff, 42% were supervisory or management level staff, 10% were senior management or administration level staff, and 2% were interns. It has been a year or longer since the training for over half of participants (53%), six months to a year for about a third of participants (28%), and between three to six months for 19% of participants. Respondents represented various county agencies, with the environmental department with the highest rate of response.

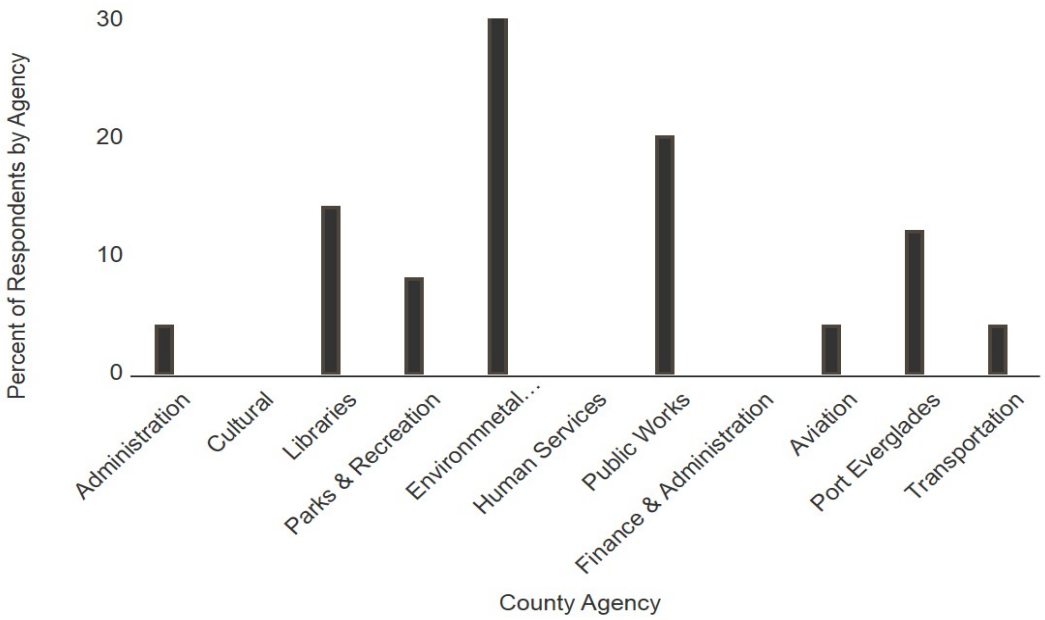

Figure 2. Percent of county agencies represented in the online delayed survey responses.

Survey Questions 5-10 explored the application or non application of the knowledge and tools on the job. Question 5 asked for a response to the statement: After completing the Climate Change Toolbox Training, I applied what I learned to my work.

Out of 47 responses, 3 skipped this question, 53% applied what they had learned within three months after the training, 32% "have not applied it, but plan to in the future," and 15% "have not applied it, and do not plan to apply it in the future" (see Table H9 in Appendix H). The question logic function in Survey Monkey was utilized to allow employee's answering in the affirmative on Question 5 to skip the next question. The 22 employees who stated they had not applied the knowledge were given the opportunity to respond to the statement in Question 6: If you have not applied what you learned, please indicate the reasons. Question 6 allowed individuals to select multiple responses. Twenty-one employees responded indicating 52% lacked resources and support, 19% have other priorities, 19% lack clear understanding of what is expected, and 14% lack necessary skills. A third of the responses marked "Other" (33%) specifying the training was not applicable to their work (see Table H10 in Appendix H). One employee described,

> From my recollection, the class was about the future impact on our local communities due to climate change, including increased flooding and beach erosion. I feel more knowledgeable about the subject, and I have recommended the training, but other than creating a materials display about climate and weather, I'm not sure how I could apply the training to my work.

Question 7 asked for a response to the statement: I have used resources and/or tools from the online Climate Toolbox. Again, individuals were able to check multiple responses. Five employees skipped this question, and 45 answered it. Of those, the 26 employees who have used the Climate Toolbox responses indicated the following tools have been used: Unified Sea Level Rise Projection (29%), links to best practice initiatives (24%), Climate Change Action Plan (22%), Green Infrastructure Maps (18%), Priority

Planning Area Map (11%), Future Groundwater Table Map (16%), energy plans (9%), and Seal of Sustainability application (7%). Out of the 45 employee respondents, 40% had not used the Climate Toolbox (see Table H11 in Appendix H).

Question 8 was as follows: What additional tools or resources could EPCRD provide to help you implement and plan for climate change impacts in your on-the-job decisions? Five employees skipped this question. Of the 45 employees, 24% responded, "None at this time." Question 8 allowed employees to select multiple answers; the range of responses are visualized (see Figure). Three employees specified other: (a) "Implementation from the top down, not bottom up. Accountability of implementation by management staff;" (b) "How about focusing on 1 issue at a time. Personally, when so many issues were thrown out there...very few stuck with me;" and (c) Visual aids, "For example: Before and after effects of climate change to various metropolitan areas during a span of 50 to 100 years into the future."

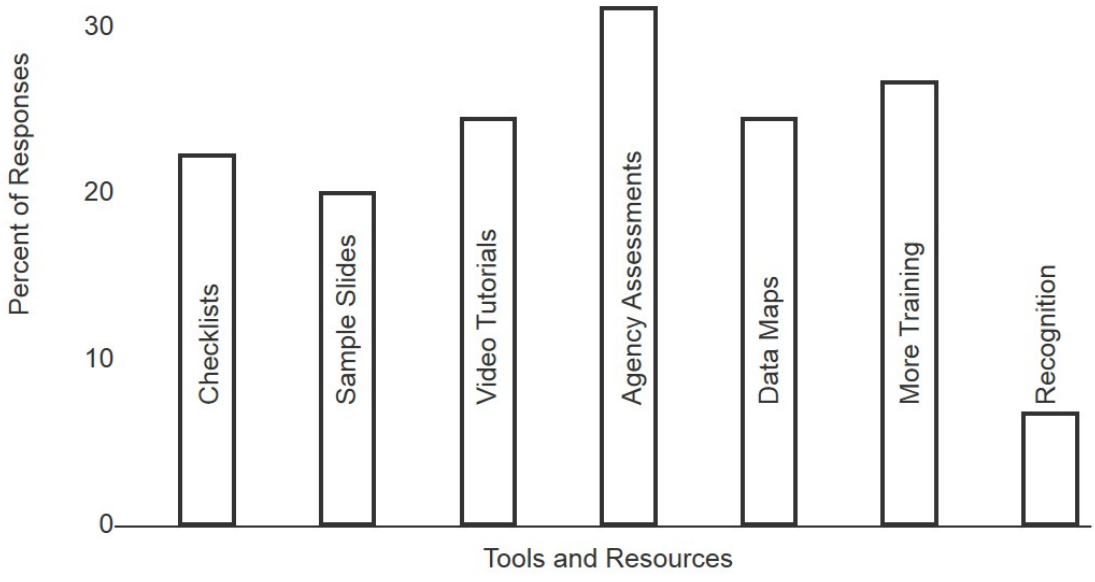

Figure 3. List of tools and resources that could help employees with implementing climate change impacts into their decision making.

Question 9 was an open-ended question requested specifically by the client: Is there a particular climate change issue that would be useful to have data evaluated for your agency? Examples were listed to clarify the question: corrosion of pipes, increased refugee population, inaccessibility of a particular building. The question's purpose was to obtain specific examples of agency impact assessments that would be valuable to employees. Fifteen detailed responses were listed (see Table H12 in Appendix H).

Question 10 was as follows: What are the reason(s) you have not used the Climate Toolbox tools and/or resources? The question logic function in Survey Monkey was utilized to allow employee's answering in the affirmative on Question 7 to skip this question. A third of surveyed employees (n = 50) answered they had not used the Climate Toolbox and were asked Question 10. All of those 18 employees selected at least one response (see Table H13 in Appendix H). At least 22% indicated they did not know where to find the Climate Toolbox. Over half of the 18 employees responded "Other" (56%). Five of the 18 employees who responded "Other" specified their reasons for not using the Climate Toolbox. One employee responded, "No opportunities to use with my current responsibilities." Another employee responded, "I am addressing other resiliency issues and have not yet had an opportunity to use it." Similarly, another employee responded, "I have other priorities. I was not entirely sure how to apply it to my current job duties." One employee responded, "I also do not know if anything will be effective because there is no way to keep myself accountable or measure the impacts." There was one employee that responded, "Forgot it was there."

Question 11 asked employees to respond to the statement: Rate the level each of the following local impacts from climate change will affect your department's or agency's business operations. Survey responses revealed employees broadly related the

impacts of climate change to their operations (see Table H14 in Appendix H). Results showed a strong majority of employees rated Rainfall Patterns (79%), as "High" or "Medium" impact to operations, followed by Increased Storm Intensity (75%), Sea Level Rise, Tidal Flooding & Salt Water Intrusion (74%), Temperature Changes (74%), Increased Storm Intensity (75%), and Vector-borne Illness (61%). At the other end of the scale, results indicated that over half of the employees rated Habitat Changes (52%) as "Not At All" or "Low" impact, and half of the employees rated Ocean Acidification (50%) as "Not At All" or "Low" impact to operations.

Norming data to climate research. Research from Yale Climate Connections identified six distinct audiences, the so-called "Six Americas," representing the American general public. The Six Americas study postulated levels in how the America public responds to the issue of climate change, and they are distinct in their belief, concern, and engagement on the issue, and each level was given a label: (a) Alarmed, (b) Concerned, (c) Cautious, (d) Disengaged, (e) Doubtful, and (f) Dismissive (Leiserowitz & Smith, 2010; Leiserowitz, Maibach, Roser-Renouf, & Feinberg, 2013). The Delayed Response Online Survey (see Appendix E) used Questions 12-16 to compare employee responses to the climate research from the Six Americas study. A total of 44 out of the 50 employees responded to this series of questions (Q12-16). Survey responses were exported from Survey Monkey in chart form, and results are presented separately for each question.

Question 12 asked employees to rate how sure they were that climate change was occurring, and employees responded they are "Extremely sure" or "Very sure" (77%), and "Somewhat sure" (11%). Research by Leiserowitz et al. (2017) revealed that "seven in ten Americans (70%) think global warming is happening" (p. 3). The findings from the survey indicate CCTB participants to be above the national average in agreement that

climate change is happening. Survey results would label a majority of employees that have completed the CCTB training to be in the "Alarmed" category.

Question 13 was as follows: How important is the issue of climate change to you personally? Employees responded, "Extremely important" or "Very important" (80%), and "Somewhat important (14%). One employee rated it "Not important at all." Leiserowitz et al. (2017) revealed the national average rated climate change to be extremely or very important to them personally at 27%. CCTB training program results indicate a significantly higher rate, 80% rate the issues as extremely or very personally important, compared to the national average. Moreover, 39% of Americans on average say climate is either "not to" or "not at all" important to them personally (Leiserowitz et al., 2017) whereas less than 7% of CCTB participants rate the issue as not personally important.

Question 14 was as follows: How much had you thought about climate change before attending the Climate Change Toolbox Training program? Employees responded they had thought about climate change "A lot" (46%), "Some" (46%), "A little" (7%), and "Not at all" (2%) prior to the training. The survey results show 9 out of 10 employees thought about climate change prior to the training. Whereas, Leiserowitz et al. (2017) revealed, 4 out of 10 Americans say they have thought about climate change.

Question 15 asked employees to rate how worried they are about climate change, and employees responded they are at least "Somewhat" to "Very Worried" (82%), "Not very worried" (14%), or "Not at all worried (5%). The number of the American public saying they are at least "somewhat worried" (61%) has been increasing since 2015 (Leiserowitz et al., 2017). The CCTB program employees, again rate higher compared to the national average with a strong majority of trainees feeling at least somewhat worried.

Results indicated CCTB participants are "Very Worried" (39%) more than double the rate compared to the average American (19%).

Question 16 asked their level of agreement with the statement: I have personally experienced effects from climate change. Results indicated employees have personally experienced effects (82%) or have not personally experienced effects (18%). According to Leiserowitz et al. (2017), the American public generally thinks climate change is a distant threat impacting future generations and are less likely to think it will impact them. In fact, a third of Americans (36%) say they have personally experienced effects from climate change, and a majority (67%) says they have not (Leiserowitz et al., 2017). Survey results indicate CCTB training participants have experienced climate impacts personally, which is more than double the national average.

Level 4: Results

Results for Research Question 5. Research Question 5 was as follows: How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction? This question pertained to Level 4 Results by exploring employee's perceptions if targeted outcomes occurred as a result of the training. This question was answered through the analysis of employee interview responses using a semi-structured interview instrument (see Appendix F). The goal of the qualitative data was to explain specific causal factors and to link these with the CCTB training program outcomes.

The last question in the online survey asked employees to volunteer to be interviewed. Nine employees selected "yes" and submitted an e-mail contact (4 Environmental, 1 Port, 2 Public Works, and 2 Libraries). Two of the four environmental employees have close work ties to the researcher and therefore were omitted. Four out of

the nine, to represent different agencies and staff levels, were selected and contacted to schedule an interview. The researcher interviewed one managerial employee, one supervisory employee, and two nonsupervisory employees working across four county agencies: Port, Public Works, Environmental Protection, and Libraries. The interview responses from the researcher's notes were transcribed in to Microsoft Word. The transcripts were coded to label relevance to applying climate knowledge and tools on the job, and then were categorized by differences between the agencies. Results are presented separately for each question.

Question 1 of the interview was as follows: To what extent have you applied what you learned in class? Employees were given a choice of never, rarely, don't know, occasionally, or regularly. Employees from working in the Environmental department and Port responded with "regularly." The employee from Libraries responded with "occasionally," and the employee from Public Works responded with "rarely."

Question 2 of the interview was as follows: Describe your experience in attempting to apply what you learned in training back on-the-job? Employee's responses varied regarding use of the knowledge and tools in their job, however, each was able to describe at least one example of application in their work over the past year. Two of the employees, from the Libraries and Environmental agencies, reported they have shared climate knowledge with other employees and the public. In response to the question, the Libraries employee replied:

> We had a grant for "Explore Earth" and is was about climate change, so we had an educational climate exhibit in the Libraries last year. We used toolbox resources to enhance the exhibit. We used the slides and used contacts from training for learning about the resources EPCRD had. We are planning for summer learning

> 2018 because it was so successful, but since we do not have the grant funding it will be something smaller scale.

In response to the question, the Environmental employee replied:

> A lot of the training because of the work I do, I was able to internalize the information. I can tell you in addition to the training, and the fact that I attend different meetings in the county that that information has been internalized to the point that every time I have a conversation on the future of an area, I'm thinking about what are going to be the climate change impacts and what do we need to do to respond to those impacts. Sometimes it relates to when I am talking to a colleague working on another project and I ask them, “Have you taken climate change into account?”

In response to the question, the Public Works employee replied:

> I remember the Seal of Sustainability-the green footprint. I was excited to have a project certified. I don't remember any of the other tools. I remember a lot of what we talked about in the training, but I could not connect further application to any of my work projects.

In response to the question, the Port employee replied:

> The environment is always on my mind. I'm very much aware. I found that the training program reinforced my understanding of climate change. We received recognition [for a project] with the Seal of Sustainability.

Question 3 of the interview was as follows: Have you struggled with application? If so, to what do you attribute your difficulty? Three of the four agencies reported that they do not struggle with applying the knowledge or tools in their work. The Libraries employee acknowledged, “We know where to find climate information from NSF, Solar

Space Institute, American Libraries Association plus internal EPCRD resources. It's pretty much user-friendly." The Port employee expressed a high level of support, "Everybody at the Port is very supportive of green initiatives. Safety is really the only barrier." The Environmental employee stated, "A difficulty could be other people's level of literacy on climate change, or how the impacts intersect." In contrast to the other responses, the Public Works employee provided the employee's perspective in struggling to apply the knowledge and tools on the job. Regarding the tools, the Public Works employee struggled in attempting to use the Seal of Sustainability. The employee stated, "There was lack of interest in the whole subject from management." Although successful in certifying one project, the employee further commented, "We could have applied for other projects, but at this point I do not think there is a point." In addition, the employee struggled in attempting to apply the knowledge to increase the environmental impact of the work projects. The Public Works employee further detailed the problem using an example:

> There used to be green requirements in contract forms, but it has been removed for some reason. I tried to get language in a recent contract about sustainability, but concern is that the overall cost of the project would go up, so language failed to be added. The contractors themselves will use recycled materials anyway when it is a savings to them, but it would be better for the county to put in sustainability requirements to begin with. Anything coming from the bottom up though, I just don't see it working here.

Question 4 of the interview was as follows: What steps do you plan to take in the future to continue your progress? Each of the agency representatives showed interest in continued progress. The Public Works employee and the Libraries employee both noted

training as a next step. The Libraries employee stated, “I would like to attend more training available to the county if there is more enhanced climate training available.” The Public Works employee specified, “I would like to get better information on how the tools can apply to my projects.” The Environmental employee and Port employee indicated progress from their perspective would be involvement to enhance climate knowledge and resources for others in the county. The Environmental employee responded to the question of progress:

> It’s reminding myself that people need to be educated on the subject and it doesn't hurt to be repetitive about it. I will engage with whoever wants to listen.

The Port employee responded to the question of progress:

> Everything is layers. To ask our employees to do something and not give them the tools is a disservice. Let them know there is a support system and that we can make this work. We'd be willing to be part of agency education by participating in webinars or workshops. For example we could detail our agency's process for becoming a certified NWF Wildlife Habitat to help other agencies do the same.

Question 5 of the interview was as follows: What additional training and/or support do you need to increase your effectiveness? In response to this question, the answers varied from tools employees could use with their stakeholders to additional training and federal support. The Public Works employee described the support they believed needs to be effective as the following:

> If it becomes written policy or part of our standard agreement requirements from administration, that’s the only thing that will help. Then, some kind of checklist or justification on what needs to be done. Many agency projects follow federal specifications. I reached out to a state agency to see what they do for their projects

> regarding sustainability or climate change, but I could not find any requirements, so I could not get any help from the state level because they are not doing much either. If there was language in the contract and purchasing specifications, then those state requirements would likely apply to us too.

The Libraries employee described support they believed needs to be effective as the following:

> I like the face-to-face interaction of the training. More face-to-face opportunities made more in-depth with homework assignments or individual or group project requirements then I think we would get more out of it as students. Also, I like the toolbox. If it could be not just county-related but include resources for educating the general public, for example public awareness materials that we could use in our libraries.

To support further implementation, the Environmental employee recommended, "Make it part of Employee Essentials," which is the county's training required for new employees, and to "have a refresher every two years, otherwise, we forget." The Environmental employee further described support they felt they need to be effective as the following:

> I know that the Climate Change Compact has the Resilient ReDesign workshop and I think those are really useful, but I think we need to start a forum of planners, landscapers, and architects with a discussion about how we are going to redevelop our community after a disaster. I don't think we are at the level yet where we are ready to bounce back from a major event yet. So whatever we can do to move that conversation forward, I think would be extremely helpful.

The Port employee described support they believed needs to be effective as the following:

> The only contact we used to have with the environmental department was when we had a spill. We need to continue to bridge communication between the agencies, so that there can be coordination of activities. For example, we were landscaping and putting in plants - we didn't know which plants were invasive species. The training gave us connections and from that we were able to get support from EPCRD with the plant choices.

Question 6 of the interview was as follows: What kind of support have you received that has helped you to implement what you learned (if any)? Each of the employees articulated at least some level of support. The Public Works employee only referenced support from outside their agency, by receiving "support through the Seal of Sustainability" mentioning that "EPCRD staff and came and met with our group." In contrast, the other employee responses identified both internal and external agency support in detail. A noticeable trend emerged as the employees with agency leadership support were also able to connect to the county's commitment and support for climate change awareness and action. The Libraries staff noted, "Our administration is committed, the climate toolbox was rolled out two years ago and county administration made training a requirement." In furtherance, the employee detailed support from county commission by visiting and commenting on their climate exhibit. The Port employee commented on support received from the Environmental Protection department in the form of employee-expert guidance on projects, and recognition for efforts through the Seal of Sustainability. The Port employee detailed an example of a recent partnership opportunity with the U.S. Environmental Protection Agency for an air quality analysis that there was "there was no hesitation from the Port Director," while other ports declined to participate. The Port employee further elaborated on a number of environmental

projects that have been implemented as a result of support from agency leadership. The Port employee stated, “Really, at the Port there is top down support, anything any of us come up with is not rejected.” Similarly, the Environmental employee noted, “Definitely, there is support.” The Environmental employee identified support throughout the county starting at the highest levels of the Board of County Commissioners and county administration that has led to “buy in” from staff, and provided an ability to work across departments “especially with those that took the training.” The Environmental employee elaborated:

> Knowing there are county boards and organizations addressing it, seeing the media writes about it, and there are some excellent resources out there, so I can point to examples, data, and what's being done throughout the county and in different places.

Last, the Environmental employee noted that Broward County has an official Climate Resilience Officer position “linking us to the issues nationwide, and internationally” as an endorsement for support.

The data obtained during the qualitative portion of the study involved functional details and perceptions of employees, both supervisors and non-supervisors from various agencies, regarding the implementation of the CCTB on the job. All four interviewed participants had attempted to use, had used, or were currently using the climate knowledge and tools in their work. This fact was an implication of a positive impact of employee reaction, learning, and behavior effectiveness of the CCTB training program. Interview results revealed an overarching need for ongoing engagement and enhanced resources that was substantiated in the employee feedback from Levels 2 and 3. In addition, first impressions of the indexed interview data possibly infer that the extent to

use of knowledge and tools on the job and relevance to employee's work depend on the contextual factor of direct leadership support. Divisions where leadership is supportive (Environmental Protection, Port, Libraries) could indicate higher county-level priorities and support and could connect the knowledge and tools in their daily work functions. Whereas, those struggling (Public Works) could not seem to overcome the barrier of lack of divisional leadership support. The researcher linked current and relevant research for further discussion of the results in Chapter 5.

Chapter 5: Discussion

This concluding chapter begins with an overview of the evaluation involving the Climate Change Toolbox (CCTB) training program developed for Broward County government employees. An elaboration and interpretation of results are then presented. Next, conclusions are drawn from the analysis of the results to discuss implications and link the evaluation findings to current research. Limitations of the study are identified, and then the researcher presents recommendations for program improvement for the consideration of the program team, client, and County Administration. Finally, this chapter concludes with recommendations for future research.

Overview of the Study and Key Findings

This study was an evaluation of the CCTB training program. The evaluation was requested by the Environmental Planning and Community Resilience Division in an effort to further develop, implement best practices, and evaluate the effectiveness of the program. The purpose of this program evaluation was to examine whether the CCTB training program is achieving the program's stated goals and objectives at desired levels. To gain an in-depth understanding of employee perceptions, learning, and experiences with the training program, a mixed-methods study was employed in order to gather multiple sources of information. In accordance with the Joint Committee on Standards for Educational Evaluation (1994) and public sector protocols this study complied with the U.S. Government Accountability Office Applied Research and Methods (2012) protocol and followed the U.S. Office of Personnel Management (2011) guidelines for designing evaluations. This program evaluation blended the input component of Stufflebeam's (2003; 2010) CIPP model with Kirkpatrick's Four Levels (2016) model using a mixed-methods approach. The addition of the CIPP Input component allowed the researcher to

benchmark other employee climate training programs in local government to determine if amendments were needed to the CCTB program structure. The evaluation examined all four of the Kirkpatrick Levels that included reaction, learning, behavior and results. The researcher intended the evaluation instruments to be utilized to answer multiple research questions (Kirkpatrick & Kirkpatrick, 2016), and to gain a higher level of confidence in results by including triangulation as part of the design (Creswell, 2015).

Research Question 1 addressed the CIPP Input component of the evaluation: What strategies and activities have been planned to address the needs of employees in a climate change engagement program? Research Question 2 addressed Kirkpatrick Level 1 to evaluate employee reaction to the training: What are the effects of instructional quality on climate literacy achievement? Research Question 3 addressed Kirkpatrick Level 2 to evaluate employee learning in relation to climate knowledge: How well did the learners master the content? Research Question 4 also addressed Kirkpatrick Level 2 to evaluate employee learning but in relation to the employees' level of confidence and commitment: How well did the training meet the development needs identified? Was learning applicable to job performance? Research Question 5 addressed Kirkpatrick Levels 3 and 4 to evaluate behavior and results on the job: How well did the learning transfer into the participant's work setting? If not well, what do they feel are the barriers of inaction? Overall, the evaluation of the CCTB program resulted in a positive appraisal from the employees that completed the training. The CCTB training is effective in meeting the learning objectives of the program. However, analysis of employee responses also indicated a need for ongoing engagement via regular communications, enhancing tools and resources such as additional training opportunities, and supporting action from agency-level leadership.

Elaboration and Interpretation of the Results

The findings of this program evaluation do not build a clear path for climate action at the local government level. Even at the broadest levels, climate action varies between regions and depends on the community's culture, economy, and structure. It has been stated throughout this paper and established by relevant literature that climate change is a wicked problem. There is not one easy solution to solving the climate crisis. Climate science and knowledge is constantly changing and growing, and climate educational practices have to be supported as well as the practices in professional learning. This study evaluated the CCTB training program as one localized approach to closing the gap between climate commitments and action through employee learning. In general, the CCTB training program appears to be an effective employee development program for use in Broward County government. The study findings verified four essential components for professional development guided by adult learning theory and climate communication research: (a) employees are likely to act when the climate message is framed relevant to their jobs; (b) ongoing engagement with consistent messaging and information is needed; (c) employees need tools and resources to enable them act on climate in their work; and (d) build capacity for climate action the by ensuring that agency-level leadership emulates the actions employees should take.

Frame the learning so that it is relevant to the employee's work. Results from the CIPP Input and Kirkpatrick Levels 1-4 aligned to confirm that effective professional development should personalize the learning experience and meet participants where they are. Level 1 findings revealed employee reaction to the content, activities, and instructors all strongly aided employees' learning. These findings verified climate communication research (Corner, 2015; Kahan, 2015; Leiserowitz, & Smith, 2010) that the messenger is

a factor and supported adult learning literature (Arms, 2012) that positive impact from training occurs when the training instructors are passionate about the topic. The findings supported the adult learning best practice of ensuring content is relevant (Jones, 2015; Terehoff, 2002) by indicating a high likelihood to act, specifically by conserving resources and sharing their knowledge with coworkers, was significantly related to the employee's perceived relevance of the training information.

The findings raised a new question surrounding who might be the "right" messenger for communicating climate change content (Kahan, 2015; Leiserowitz, & Smith, 2010). Across the three climate training programs the findings revealed a strong positive employee perception of the training content to work relevance regardless if the program was developed internally and presented by fellow coworkers or developed externally by environmental education experts: (a) Miami Beach employees "Agree" that the training "helped me understand impacts climate might have on my job" (100%); (b) Fort Lauderdale employees "Agree" that the training "I can now use the information learned during my everyday activities at work" (69%); and (c) Broward County employees were "Very Informed" that the training "impacts your own job responsibilities" (74%). The benchmark data also indicated that the externally developed programs are more cost effective per employee. These findings could impact the practice and structure of the CCTB training program if the program team considers pursuing external facilitators. An additional benefit of external facilitators could allow the program team more time toward development of ongoing engagement activities and enhancing tools available to employees.

Practice ongoing engagement to continue employee learning on the job. The findings verified adult learning best practices (Henderson et al., 2010) and climate

communications research (Garfin et al., 2011) that a training program cannot be limited to a one-time learning intervention. This was corroborated throughout the program evaluation from the CIPP Input component to Levels 2-4 where employee responses detailed a need for regular communications, additional training, and recognition as opportunities for continual engagement. The CIPP Input component revealed that both Miami Beach and Fort Lauderdale climate training programs consider ongoing engagement as an essential practice for continued learning and application leading to climate action at the local government level. This is further supported through other governmental training programs that use ongoing engagement strategies such as bimonthly newsletter distribution to National Parks Service employees, video tutorials available to U.S. Forest Service employees, and educational field trips and incentives offered by the City of Fort Collins.

Support employees with localized tools and resources. Research shows a locally framed message for a specific audience (Climate Solutions for a Stronger America, 2014; ecoAmerica 2016; Moser, 2010; Scannell & Gifford, 2013) particularly for government employees (Garfin et al., 2011) is an effective climate communication strategy and is supported by the results of this study. In addition, the findings raised a new perspective that locally framed tools are needed to support employees' use of knowledge on the job. The findings of Level 3 and Level 4 were generally reflective of a statement by an employee during the qualitative interviews:

> To ask our employees to do something and not give them the tools is a disservice. Let them know there is a support system and that we can make this work.

Level 3 findings revealed a split between the employees with just over half (53%) the employees using the knowledge and tools on the job within 12 weeks of completing the

program, and under half (47%) not applying them on the job. When asked to elaborate on why the knowledge and tools had not been used the employees indicated that support resources were lacking. Moreover, the findings are in line with increasing engagement using local visualization tools (Moser, Daniels, Pike, & Huva, 2017) in particular employees indicated sample presentation slides, carbon calculators, video tutorials, maps, and agency assessments would be useful tools.

Ensure agency-level leaders act on climate to support employee action. Level 4 qualitative interviews revealed an interesting component that was not reviewed in the literature prior to the training development. The interviews revealed an overarching theme for a need of climate leadership at the agency level. Before behaviors can be altered barriers must be evaluated and removed (Gifford, 2012). Therefore, providing training and resources does not always lead to action. The findings verified there were certain employees that did not change as a result certain personal or structural barriers (Gifford, 2012; McElliot et al., 2012; Stokes et al., 2012). Moreover, program evaluation enhanced the findings of Gifford (2012) by adding to the list of potential barriers the agency-level leaders to employee action in local government. The findings supported that whoever has control over the decisions must be considered (Moser, 2006) in local government and discovered new context that relevant support and communications must be practiced (Moser, 2010) in local government at the agency-director level in order to translate climate knowledge into climate action. The CCTB training program was initially abbreviated and presented to county agency directors in order to garner support for employees using work time to attend the half day training session. With the top-level support from county administrators and commissioners for climate action the program

team did not fathom that agency director action or non action on climate was such an essential component to action by the employees.

Conclusions

Local governments are taking the lead in the effort to entrench sustainability into operations and throughout communities. Broward County government was an early adopter. Since 2008, significant milestones have been achieved toward the sustainability: a climate action plan was approved, a greenhouse gas inventory was taken, and a climate change element was added as part of the comprehensive plan. In 2014, Broward County was recognized as a national leader in sustainability achieving a 4-STAR community rating. However, despite these local efforts the county as a whole is not meeting its sustainable development goals. In a study of local government planning directors, Tang, Wei, Quinn, and Zhao (2012) found a high awareness of climate change in the local jurisdictions that responded to their survey however the responses also revealed "a very low level of actions" (p. 89). According to Velazquez et al. (2011) local and global efforts being only minimal "because learning enough to make this concept operational has not been possible (p.36). There is no globally relevant set of guidelines for communities and organizations to follow. Due to the complexities of worldwide climate change and legal factors, the majority of adaptation efforts are transpiring at more regional and local levels (*Highlights of Climate Change Impacts in the United States*, 2014). Even though climate change is a global problem, not every region is affected the same way. Therefore sustainability plans, policies and even knowledge needs continue to be localized. Organizations concerned with climate adaptation, and increasing their governance capacity to adapt, should dedicate resources toward developing knowledge and enhancing collaboration (Meijerink & Stiller, 2013). This study was an initial attempt

within the research setting to assess the CCTB training program, but continued evaluation to improve the effectiveness of employee climate training and education within local governments is warranted.

Communicating climate change for professional development. Climate communication researchers and communication practitioners, in a meeting hosted by the American Association for the Advancement of Science, reached consensus on the need to empower people with solutions and engage people through their peer networks to establish social norms (Bowman, 2016). One peer network that is overlooked in climate communications research is the role of an organization, and employee training in particular as a way to empower employees with solutions, knowledge, and establish organizational norms that make climate change part of everyday decision-making. A learning organization is defined as an organization which "learns effectively and collectively and continually transforms itself" (Marquardt, 2011, p. 247). The transformation occurs through knowledge transfer, better management and empowerment of employees, and use of technology (Marquardt, 2011). "Learning organizations can have the capability to respond to the changing environment" (Velazquez, Esquer, Munguía, & Moure-Eraso, 2011, p.37). According to Marquardt (2011), "a learning culture does not fear constant change and chaos" (p. 69). Moreover, continuous learning must occur in every level of the organization engaging all employees (Marquardt, 2011). Understanding global trends and local impacts of climate change is valuable to business operations particularly of natural disasters and resources. Velazqez et al. (2011), define a sustainable learning organization to be "considered as a role model to prevent, eliminate and/or reduce the environmental and occupational risks associated with its operations" (p. 36) using sustainability knowledge while continuing to be profitable. Institutionalizing

sustainability and climate action into operations, as with a learning organization, will take a systems thinking approach. Systems thinking "was derived from systems theory and is the basis for the learning organization" (Chun, Sohn, Arling, Granados, & Nelson, 2009, p. 47). At the local government level, systems thinking for climate change adaptation means taking advantage of increasing community resilience while at the same time reducing negative impacts, and understanding how those two concepts interact and collaborate (Maani, 2013).

Organizations are unique in their norms and values which will guide policies and protocols. One thing that is consistent is that "people are the main strategic resource of any organization" (Livitchi, Hacina, & Baran, p. 156, 2015). According to Arms (2012) an effective learning and development program is central as a way to "future proof" (p.17) the workforce. Training programs are widely recognized are important components for employee development (Hallová, Polakovič, & Slováková, 2017; Rahman, 2014; Ricketts, 2015). Employee learning in local government typically occurs through professional development (PD) programs. Effective PD programs ideally offer collaborative training and support in order to conquer challenges collectively (Beavers, 2009). In developing employee PD programs a key factor to consider is that adult learner's process new information differently than children (Beavers, 2009). There is a significant amount of research regarding pedagogy, pioneered by Dewey in the 1930's. Parallel to Dewey's work, however, is the work of Malcolm Knowles, known widely as the pioneer of adult education and for his description of andragogy. According to Jones (2015) reiterated key to adult learning is the immediacy and relevancy of the content. In furtherance Beavers (2009) explained if there is conflict between the learner and the content adult learners will resist learning. Moreover, alighting the content with learner's

expectations and values aids in the effectiveness of a PD program (Arms, 2012). Therefore, the PD trainer's role should be seen as more facilitative versus instructional for adult education.

Developing a learning intervention using the theory of andragogy, research has shown that adults learn when (a) the new knowledge meets a personal need or benefit; (b) the learning intervention validated their expertise or allows them to share and build on their knowledge; (c) they have a degree of control over what they are learning; (d) there is practicality in the information and ability to use it immediately; and (e) the training take different approaches to allow for multiple styles of learning. Building an employee training program on the foundation of the theory of andragogy requires blending time for learner self-reflection and group learning as part of the program. According to Ricketts (2015), storytelling is a key technique that can be use in training programs following best practices for stories: (a) balance with facts; (b) appropriate for the audience and relevant to the training purpose, (c) showcase a cause and effect relationship; (d) connect the audience to at least one main character; (e) emphasize solutions or prevention; (f) "have an element of suspense" (p. 55); (g) allow learners to imagine alternative outcomes; (h) be relatable yet surprising; and (i) clarify the message with illustrations. In furtherance, key findings from the Garfin et al. (2011) study, of climate change training in the National Parks Service offered, training materials need to be credible, connect to regional impacts, relevant to the employee's job duties, and communicated consistently.

Relating global climate to local government operations. Today, nearly 40 million residents in coastal communities worldwide are exposed to the probability of a 100-year flood event occurring in their community (Obeysekera & Park, 2013). In the United States, coastal areas are a significant source of the country's economy (Klein and

Osleeb, 2010). Fewer than four feet above sea level sits property values in the hundreds of billions along America's coastlines (*Highlights of Climate Change Impacts in the United States*, 2014). According to Clayton (2009), research conducted of a worst-case situation which included significant land loss from sea level rise, damage to coastal communities, and collapse of food systems recorded a potential loss of 20 percent aggregate economic output. With significant number of people living and infrastructure along coastlines, increases in economic losses from hurricanes and floods is on the rise (Wilby & Keenan, 2012). Moreover, according to Wilby and Keenan (2012) flooding is currently the most widespread natural disaster and the third most destructive, and is being exacerbated along the coast due to sea level rise.

The impact of sea level rise is not limited to flooding, additional impacts include coastal ecosystem damage, beach erosion, and the loss of water and salinity control structures (Obeysekera & Park, 2013). Altogether sea level rise impacts will disturb both socio-cultural factors such as basic physiological and safety needs, and economic factors such as tourism and marine transportation industries. Beaches are key economic drivers used for recreation, disaster prevention, and ecosystem preservation (Yoshida et al., 2014). Ecosystem preservation is vital in protecting sea turtles and enhancing native vegetation, and recreational uses for tourism are invaluable to some economies (Yoshida et al., 2014). Beach quality is imperative for travel based economies. In some areas of the world coastal habitats could become unrecognizable as sea level rise changes the seascapes, and some flora and fauna to go extinct (*Highlights of Climate Change Impacts in the United States*, 2014).

Infrastructure such as roads and buildings, and industries like port facilities will see an increasing risk of damage from rising seas as development continues along the

coast (*Highlights of Climate Change Impacts in the United States*, 2014). Ports facilities and infrastructure are significant to local and global economies, but additionally vital in the preservation and protection of surrounding estuaries. Furthermore, Becker et al (2012) reasons ports being located along waterways make them the most exposed economic infrastructure vulnerable to sea level rise. Ports are crucial to economies, facilitating import and export markets for 90% of goods worldwide (Becker et al., 2012). New regulations for building codes, updates to land-use plans, and infrastructure and habitat fortifications are some of the adaptation techniques being used currently by local governments throughout the United States toward climate change (*Highlights of Climate Change Impacts in the United States*, 2014). For example, a regional effort is the Broward, Miami-Dade, Palm Beach, and Monroe counties regional commitment for climate action which includes regulations discouraging land development in areas vulnerable to climate change consequences like sea level rise (*Highlights of Climate Change Impacts in the United States*, 2014).

Developing ongoing engagement opportunities. Training programs need to be pushed to the next level to be respectful of employees' time, understand attention spans are short, and leverage collective brain power (Attebury, 2015). In the Garfin et al. (2011) study, employees identified inadequacies of the climate education program: information was not being disseminated clearly, convincingly, or consistently; funding was not being allocated for climate initiatives; and actions and policies were missing clear guidance. As the city of Fort Lauderdale has tried different mechanisms for embedding sustainability via policies and procedures, Glen Hadwen, Sustainability Manager, also acknowledged "another component is continual engagement of city staff to have awareness of things they can do in their day to day work activities" (G. Hadwen, personal

communication, March 22, 2018). National Parks Service staff recommended webinars, newsletters, and briefings as opportunities for follow-up engagement to the climate training program (Garfin et al., 2011). Solutions could be communicated and showcased such as when new buildings achieve LEED certification, or supplemental budgets are approved for renewable energy projects.

Enhancing local tools and resources. Effective adult learning interventions need instructors and materials that are reflective of the audience (Arms, 2012). In their climate change engagement study, Scannell and Gifford (2013) discovered increased engagement on climate change when their participants had received a localized message. This study corroborated the findings that when the message is localized the employees not only could connect the relevance of the information but that broadly increased from before and after the training program, and likelihood of participants to take action was high. Moreover, Scannell and Gifford (2013) also found a strategy for communicating climate change to directly address the barriers to action for the target audience. Programs educating employees on climate utilize testimonials, videos, and images to assist employees in increasing the effectiveness of using the tools and resources on the job. Framing the issues locally improves the communication particularly for the negative impacts associated with climate change (Scannell & Gifford, 2013). To continue forward momentum, the CCTB training program's local approach with localized messaging is indeed an impactful method toward climate action. In addition, Garfin et al. (2011) observed the need for structuring and organizing climate information by how the information relates to employees job duties.

Building capacity at the leadership level. One particular strategy enacted for a particular period of time will not be enough to meet local climate commitments. Tang,

Wei, Quinn, and Zhao (2012) findings indicated a strong correlation of political will and institutional capacity to climate action from local government directors. Institutional capacity included the variables of interagency leadership, and technical abilities. Although climate change was accepted in concept by the directors, any climate action policies that had been implemented remained medium to low-level strategies and were not mandated at the jurisdiction level (Tang, Wei, Quinn, and Zhao, 2012). Merely committing an organization to act on climate is insufficient when successful results depend on employee behaviors (Robertson & Barling, 2013). Research points to leaders playing a significant role in whether or not employees actively engage in pro-environmental behaviors (Kim, Youngsang, Han, Jackson, Ployhart, 2014; Robertson, & Barling, 2013). Through the Garfin et al. (2011) evaluation study, employees suggested the National Parks Service climate training be completed by upper management including interpreters and facilities management staff. In furtherance, the study identified a key component to the program's success was employee buy-in, and a key challenge was convincing internal climate skeptics (Garfin et al., 2011).

Kim, Youngsang, Han, Jackson, Ployhart (2014) studied three private firms with a sample of 325 employees to uncover why employees voluntarily employ pro-environmental behaviors in the workplace. The Kim et al. (2014) study built on the organizational citizenship behavior theory as the foundation for voluntary pro-environmental actions by employees wherein employee involvement was predicated on reflecting "personal underlying motives to fulfill psychological needs" (p. 2). The study found that employees whose leaders engage in pro-environmental behaviors is a key factor in employees' willingness to act, and that pro-environmental behaviors can then be supported by coworkers' actions. Kahan (2012) study showed the link of one's belief on

climate change to one's personal groups. This influence is corroborated by Kim et al. (2014) showing out of a desire to fit in employees observing pro-environmental behaviors are "likely to engage in such behaviors" (p. 7) as an indirect influence. In contrast, a leader's role was posited to directly influence employee environmental behavior (Kim et al., 2014). Moreover, Robertson and Barling (2013) study supported the positive active association between leaders' actions and employees' actions specific to engaging the employee in pro-environmental behaviors. This program evaluation study compliments the findings of Robertson and Barling (2013) and Kim et al. (2014) although less conclusively, and further connected employees that have perceived support from their own agency's leadership can associate that support to the highest level of the organization's commitment. Towler, Watson, and Surface (2014) studied military personnel and posited an important link between trainees and their leaders in affecting how the employee prioritizes the training knowledge into their work activities. The study found supervisory attitudes and behaviors influenced the employees' actions, therefore can be a predictor of training outcomes (Towler, Watson, and Surface, 2014). According to Stewart (2014), to shift employees from professional development toward professional learning, for example using the data through experience and reflection, the trainees need active reinforcement back on the job.

According to Daniel Kreeger, Executive Director, ACCO is working with the Maryland Department of Natural Resources to develop a strategic employee development plan for climate literacy. Development steps include an analysis of what the priorities of each business unit are and an analysis for what skills the employees need, so that a learning progression can be developed. A good way to start the analysis is to "look at job descriptions and highlight where job duties intersect with climate change" (D. Kreeger,

personal communication, August 25, 2017). The analysis of skills can be determined by interviewing department heads, and as a best practice, before finalizing the training the department heads should have the opportunity to review the training material for buy in. ACCO's training plan will start with foundational knowledge. There will be a pre-assessment that employees take, and if they pass the quiz there will be no need for the mandatory training. If time and budget are an issue, the foundational knowledge training could be created as an online course. Daniel Kreeger emphasized the importance of partnering with the organization's human resources leadership to build climate literacy into standardized training and hiring processes:

> Employees don't stay in a position for 30 years anymore, so what local government needs to move toward is a long-term strategy for capacity building within the organization embedding climate change into decision making, but this is new territory for professional development. Job descriptions should include climate literacy. New employees should have to take internal training within three months of employment if they do not have foundational knowledge when hired. The goal is to get to where we are raising the bar and not always teaching foundational knowledge" (D. Kreeger, personal communication, August 25, 2017)

Employee interviews revealed support from division directors may be a contextual factor in the extent to which climate knowledge and tools are used on the job. If barriers are not addressed engagement on change is relatively pointless (McKenzie-Mohr & Shultz, 2014). The "political will variables" and "socioeconomic context variables" and "institutional capacity variables" (Tang, Wei, Quinn, & Zhao, 2012, .p. 85) are present in Broward County and therefore should work to positively reinforce actions for climate change. Broward County has incorporated climate action into its

vision, values, and goals. There are numerous high-level policies however the majority of climate action is remains voluntary action by agencies. From the researched reviewed for this study, and evaluation of the CCTB training program, leadership at the agency level is a key factor for climate change solutions the organization. In Broward County there are approximately 120 agency leaders, directors and assistant directors that need to not only be aware and understand climate change but to also actively engage in climate action to reinforce employee support across the organization. Implications for County administration include guidance for recruiting and selecting agency leadership positions that have at an acceptable level of climate literacy. An online climate literacy quiz could be part of the supplemental requirements for job applicants. The County could enact a cross-divisional resilience group of directors that meet regularly to discuss climate initiatives. In order for efficient dialogue, the interaction must be based on trust, cooperation, and respect for each other (Wals & Schwarzin, 2012) and the leadership position each holds in the organization.

Limitations

Three limitations may have affected either the validity or trustworthiness of findings derived from the program evaluation, although the researcher attempted to minimize the limitations. First, it is necessary for the researcher to address a certain bias that is associated with personal beliefs and experiences related to climate change. The researcher has a deep connection grounded in environmental advocacy and advocates for climate literacy and action in the community. Second, it is important to acknowledge the study was limited by the voluntary population of county employees electing to attend the training program, perhaps indicating that participants already had an interest in learning about climate change. Third, the CCTB training program was custom designed for the

issues and needs of this organization's values and location. Any change in employee perception of knowledge, confidence, and adequacy of training may not be applicable to other institutions due to the uniqueness of an organization's climate action plans and climate impact preparedness issues.

Recommendations for Policy, Practice, and Future Research

For its contribution to research, this study helped in understanding local climate actions by evaluating a specific case of an employee climate training program in a local county government. Based on findings of this program evaluation, the CCTB training program appears to be an effective employee development program for use in Broward County government. However, climate challenges are not routine and cannot be solved by a routine approach. Therefore, the evaluation of the CCTB training should regularly assess employee needs and evaluate whether the program continues to meet its learning objectives. In addition, the findings connected adult learning practices and climate communications research into four essential components with implications to policy and practice to improve the CCTB training program and for future research: (a) employees are likely to act when the learning program is perceived as relevant to their work; (b) effective training programs incorporate ongoing engagement post training; (c) employees need localized tools and resources to enable them act on climate in their work; and (d) agency-level leadership plays an essential support role for an employee's ability to act on climate.

Recommendations for practice. Based on the findings from this study, the following practices are recommended to further improve the effectiveness of the CCTB training program:

- The program team should evaluate reducing sections of Module 1: Climate

Considerations on global climate in order to allow for more training time that focuses on the local impacts and relevance to agency operations.

- The program team should get a cost estimate from a local climate education partner to evaluate whether a more externally developed training would reduce the cost of the program but yet remain at its current level positive participant reaction. An external facilitator could allow the program team to dedicate more time toward ongoing development and enhancing the tools and resources available to employees.
- The program team should develop ongoing engagement opportunities starting with automatically subscribing CCTB training participants to the climate resilience newsletter which is currently provides regular communications and updates on the County's climate initiatives.
- The program team should use internal county marketing tools available the divisions through the Office of Public Communications to promote the climate coaching services available to employees from the program team and market the availability of the program team to make presentations at agency staff meetings.
- The program team should make additional training opportunities available which could be in the form of short video tutorials, live and recorded webinars, or more substantial experimental learning opportunities such scheduling environmental field trips and facilitating the resilience game available through the Urban Sustainability Directors Network.
- The program team should develop a checklist for considering climate impacts when making local projects decisions in relation to County values.

Recommendations for policy. Based on the findings from this study regarding a need for capacity building at the agency-leadership level the recommendation for policy

begins by collecting performance measures for each agency to evaluate for overlap of County values and Climate Change Action Plan strategies. In policy, making some level of climate knowledge mandatory could help ensure a minimum level of understanding throughout local government. It is yet to be determined if mandatory training leads to more climate action. However, if a level of climate literacy is mandated this would allow for the assessment of climate knowledge at the agency-directors level and the potential development of human resources hiring policy to include climate literacy as a supplemental question for all employee job candidates.

Recommendations for future research. A recommendation for future research includes conducting additional case studies at the local government level to improve understanding on variations in regional approaches and actions. Moreover, this study evaluated training reactions, training learning, training behavior, and training outcomes for a particular program; the study lacked evaluation of the reasons why the training had positive effects and why some employees act on the knowledge more than others. Future research could lend knowledge to the professional development field in order to better connect employee characteristics, learning interventions, and organizational context to changed behaviors.

This program evaluation complemented the understanding that agency-level leaders develop a supportive infrastructure for advancing climate action by their employees in a local government. Caution must be taken to confirm a direct link of agency leader's role to employee action countywide as this study included a limited sample. However, the notion of the critical factor mid-level leaders to support employee action on climate in local government could be further studied. Case studies should be undertaken to review local jurisdictions with strong climate action to strengthen the

understanding of the possible direct connection to agency-level leadership and action. In addition, more research is needed to conclude to what extent the contextual factors of pro-environmental leadership behaviors and coworker advocacy effect public sector employee behavior.

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Appendix A

Climate Change Toolbox Training Program Logic Model

Appendix A

Climate Change Toolbox Training Program Logic Model

Agency Goal: Implement an employee engagement program to build capabilities on climate change at all managerial levels

LOGIC MODEL: Business Objective: Build capability within the leadership pipeline for sustained organizational success toward climate commitments					Target Population: Employees, Supervisors, Managers, Executives		
Inputs	Activities	Short-term Outcomes	Intermediate Outcomes	Long term Outcomes	Outputs	Evaluation Methods	Evaluation Tools
Program budget Facilities 4 full time staff Office Supplies Technology Other: Climate toolbox online portal and resource database Professional development credit, certificate External Factors: Political environment and perception on climate change Assumption that local government maintains environmental priority for climate commitments	Research Establish leadership commitment Provide Training to Supervisors, Managers & employees Develop an Action Plan Develop an agency-wide engagement strategy Other: Government Operations Workgroup meetings Climate Change Task Force meetings	Changes in Learning: New knowledge Increased skill Increased awareness Increased commitment Increased confidence Changed attitudes, opinions or values Changed motivation or aspiration Changed perspective	Critical Behaviors: Increased collaboration/sharing of best practices within and across agencies Increased employee advocacy Changed practices and use of tools and resources Required Driver: Encourage Climate Change Toolbox Program Team members provide on-the-job coaching, feedback, and mentoring	Changed Conditions: Organization reduction of greenhouse gas emissions and increased community resilience Other: Regionally-shared toolkit for local governments for training employees on climate change	# of participants who completed training % increase of pre-and post-self-assessment of knowledge % participant satisfaction Other: # visits to the Climate Toolbox # of environmental initiatives and policies	Literature review, case studies, exemplary program visits Take pulse checks during the program Conduct confidence and commitment assessment Survey participants 1, 3 and 12 months after the program Other: Monitor number of initiatives	Checklist Third-party observation Archival data and Hybrid evaluation form Hybrid L3/L4 survey And/or focus group interviews Other: Tracking sheet

Appendix B

Module 3: End of Workshop Survey

Appendix B

Module 3: End of Workshop Survey

A. Please rate your knowledge level before and after the training on these aspects of climate change:

1= none
2= a little
3 = some aspects but not all
4 = very informed
5 = ready to present

(Circle 1 for each)	Prior to the training	After the training
How greenhouse gases affect the climate (global warming)	1 2 3 4 5	1 2 3 4 5
Global and local predictions for sea level rise	1 2 3 4 5	1 2 3 4 5
Other climate impacts expected and/or being observed	1 2 3 4 5	1 2 3 4 5
What Broward County is doing to mitigate and plan for the impacts of climate change	1 2 3 4 5	1 2 3 4 5
How climate change impacts your department/division	1 2 3 4 5	1 2 3 4 5
How climate change impacts your own job responsibilities	1 2 3 4 5	1 2 3 4 5

B. How likely are you to act on the information you received today?

Very Somewhat Not sure yet

C. In what ways might you incorporate this information into your daily or long term work?

D. What next steps or information do you need from us?

Appendix C

Self-Assessment Questionnaire

Appendix C

Self-Assessment Questionnaire

Directions: Think about your own skills as a trainer then read through the following statements.

Rate your skills based on the following scale:

Needs Improvement	Needs Some Improvement	Average	Competent	Very Competent
1	2	3	4	5

You know yourself. You are confident and fully prepared. You are just nervous enough to keep alert.	1	2	3	4	5
You know your subject matter. You have studied your topic and have experienced the events about which you speak.	1	2	3	4	5
You know your audience. You respect and listen to the participants. You call them by name, if possible.	1	2	3	4	5
You are neutral and non-judgmental. You validate everyone's experience and their right to individual perspectives. You respect differences of opinion and lifestyle.	1	2	3	4	5
You are culturally sensitive. You are aware that your own views and beliefs are shaped by your cultural background just as your participants' cultures shapes their perspectives.	1	2	3	4	5
You are self-aware. You recognize your own biases and "hot-buttons" and act in a professional manner when your "hot-buttons" are pushed.	1	2	3	4	5
You are inclusive. You encourage all participants to share their experiences and contribute to the group learning process.	1	2	3	4	5
You are lively, enthusiastic, and original. You use humor, contrasts, metaphors, and suspense. You keep your listeners interested and challenge their thinking.	1	2	3	4	5

You use a variety of vocal qualities. You vary your pitch, speaking rate, and volume. You avoid monotones.	1	2	3	4	5
You use your body well. Your body posture, gestures, and facial expressions are natural and meaningful, reinforcing your subject matter.	1	2	3	4	5
You make your remarks clear and easy to remember. You present one idea at a time and show relationships between ideas. You summarize when necessary.	1	2	3	4	5
You enhance with illustrations. You use examples, charts, visuals, and audio aids to illustrate your subject matter.	1	2	3	4	5
You understand group dynamics, and the stages all groups go through.	1	2	3	4	5
You are comfortable with conflict resolution.	1	2	3	4	5
You are flexible. You read and interpret your participants' responses— verbal and nonverbal—and adapt your plans to meet their needs. You are in charge without being overly controlling.	1	2	3	4	5
You are open to new ideas and perspectives. You are aware that you don't know all the answers. You recognize that you can learn from participants as well as offer them new knowledge or perspectives.	1	2	3	4	5
You are compassionate. You understand that some of the material may have an emotional impact on the participants. You are empathetic and understanding about participants' emotional reactions.	1	2	3	4	5
You are interested in evaluating your work. You encourage co-trainers and participants to give feedback.	1	2	3	4	5

Appendix D

Climate Literacy Quiz

Appendix D

Climate Literacy Quiz

Directions: In the blank write *T* for True statements or *F* for False statements.

1. Human beings are the only force, or cause for climate change. _____
   Climate Literacy Principle 1

2. Climatologists and meteorologists use the same data to predict future atmospheric conditions. _____
   Climate Literacy Principle 5

3. Scientists and economists predict that there will be both positive and negative impacts from global climate change. _____
   Climate Literacy Principle 6

4. Freshwater is not threatened by climate change. _____
   Climate Literacy Principle 7

5. Incidents of extreme weather are increasing. _____
   Climate Literacy Principle 7

6. The chemistry, acidity, or pH of the ocean water is changed by absorption of carbon dioxide from the atmosphere. _____
   Climate Literacy Principle 7

Directions: Circle the best answer option.

7. Carbon in the atmosphere is reduced naturally through:
   Climate Literacy Principle 2
   a. Animals
   b. Plants
   c. Deforestation

8. The effects of sea level rise will be felt in Broward County in our:
   a. coastal communities
   b. inland communities
   c. both

9. The Southeast Florida Regional Climate Compact members include:
   a. Broward and Miami Dade counties
   b. Broward, Miami Dade, Palm Beach, and Monroe counties
   c. Broward, Miami Dade, and Palm Beach counties

10. Broward County Board of County Commissioners has committed to generate _____ of county operations electricity from renewable energy sources (ex. solar energy):
    a. 20%
    b. 50%
    c. 100%

Appendix E

Delayed Response Online Survey

Appendix E

Delayed Response Online Survey

1. How long have you worked at Broward County?
2. What department/agency do you work in?
3. What is your job role?
4. When did you complete the Climate Change Toolbox Training?
5. After completing of the Climate Change Toolbox Training, I applied what I learned to my work:
    a. Within a week
    b. Within 2-4 weeks
    c. Within 5-12 weeks
    d. I have not applied it, but plan to in the future.
    e. I have not applied it, and do not expect to apply it in the future.
6. If you have not applied what you learned, please indicate the reasons (check all that apply):
    a. I do not have the necessary knowledge and skills.
    b. I do not have a clear picture of what is expected of me.
    c. I have other, higher priorities.
    d. I do not have the necessary resources to apply what I've learned.
    e. I do not have the human support to apply what I've learned.
    f. The training didn't give me the confidence to apply what I learned.
    g. I don't think what I learned will work.
    h. There is not an adequate system of accountability to ensure the application of what I learned.
    i. Other (please explain):

    _____
7. I have used resources and/or tools from the online Climate Toolbox (check all that apply):
    a. Unified Sea Level Rise Scenario.
    b. Seal of Sustainability Application.
    c. Climate Change Action Plan.
    d. Community Energy Strategic Plan/Renewable Energy Action Plan.
    e. Green Infrastructure Maps.

f. Links to Best Practice initiatives.
g. There were no resources listed for my department or agency.
h. I have not utilized the Climate Toolbox.
i. Other (please explain):
_____

8. What additional tools or resources could EPCRD provide to help you implement and plan for climate change into your on-the-job decisions?

9. Is there a particular climate change issue that would be useful to have data evaluated for your agency? (for example, corrosion of pipes, increased refugee population, inaccessibility of a particular building).

10. What are the reason(s) you have not used the Climate Toolbox tools and/or resources (check all that apply):
    a. I do not know where to find the Climate Toolbox online.
    b. The resources and tools are not helpful to me.
    c. There were no resources listed for my department or agency.
    d. The training didn't give me the confidence to apply what I learned.
    e. Other (please explain):
    _____

11. Rate the level each of the following local climate change impacts will affect your department's or agency's business operations:

Not at all	Low	Medium	High	Sea Level Rise, Tidal Flooding & Salt Water Intrusion (of our drinking water supply)
Not at all	Low	Medium	High	Rainfall Patterns (longer time between rain events, increased downpours, increased and prolonged drought)
Not at all	Low	Medium	High	Temperature Changes (increased heat, more days that will reach above 95 degrees)
Not at all	Low	Medium	High	Increased Storm Intensity (including increasing storm surge and beach erosion)

Not at all	Low	Medium	High	Ocean Acidification (impact on our coral reef system and fisheries)
Not at all	Low	Medium	High	Habitat Changes (changes in wildlife patterns, plant hardiness zones)
Not at all	Low	Medium	High	Vector borne Illness (increase in insect and rodent spread diseases, i.e. Zika)

12. Do you think climate change is happening? How sure are you that climate change is/is not happening?

13. How important is the issue of climate change to you personally?

14. How much had you thought about climate change before attending the Climate Change Toolbox Training program?

15. How worried are you about climate change?

16. I have personally experienced effects from climate change.

17. I am willing to take part in an interview on my application (or non application) of Climate Toolbox resources, and what I learned or barriers to implementing what I learned in the Climate Change Toolbox Training?

18. If yes, please insert your e-mail.

Appendix F

Qualitative Interview Questions

Appendix F

Qualitative Interview Questions

1. To what extent have you applied what you learned in class?

   Never Rarely Don't Know Occasionally Regularly

2. Describe your experience in attempting to apply what you learned in training back on the job.
3. Have you struggled with application? If so, to what do you attribute your difficulty?
4. What steps do you plan to take in the future to continue your progress?
5. What additional training or support do you need to increase your effectiveness?
6. What kind of support have you received that has helped you to implement what you learned?

Appendix G

Participant Reaction Survey

Appendix G

Participant Reaction Survey

A. How many years have you worked for Broward County? _____

B. In your current roll, are you a supervisor? *(Circle one)* Yes or No

Instructions: Thinking about the course you just completed, please indicate by circling a number to what degree you agree with each statement using this rating scale:

1 = Strongly Disagree 2 3 4 5 6 7 8 9 10 = Strongly Agree

I was engaged with what was going on during the program.	1	2	3	4	5	6	7	8	9	10
The activities and exercises aided in my learning.	1	2	3	4	5	6	7	8	9	10
I was given adequate opportunity to practice what I was learning.	1	2	3	4	5	6	7	8	9	10
I understand how to use the Unified Sea Level Rise Projection tool.	1	2	3	4	5	6	7	8	9	10
I understand how climate change impacts my division/department.	1	2	3	4	5	6	7	8	9	10
The information in this program is relevant and applicable to my work.	1	2	3	4	5	6	7	8	9	10
I am confident that I will be able to successfully apply what I learned on the job.	1	2	3	4	5	6	7	8	9	10
I am committed to applying what I learned in my work.	1	2	3	4	5	6	7	8	9	10
The presentation style of the instructors contributed to my learning experience.	1	2	3	4	5	6	7	8	9	10
I would recommend this program to my co-workers.	1	2	3	4	5	6	7	8	9	10

Please answer the following open-ended questions. Feedback will be use to update and improve the program:

How could this program be improved?

Which modules did you find to be the most relevant to your job?

Which modules did you find to be the least relevant to your job?

In what ways might you incorporate this information into your daily or long-term work?

What next steps or information do you need from us?

What next steps or information do you need from us?

Other comments?

Appendix H

Results

Appendix H

Results

Table H1
South Florida Region Employee Climate Training Benchmarks Summary Comparison

	Miami Beach	Fort Lauderdale	Broward County
Number of employees	2,100	2,500	6,202
Number of trained employees	168	2,293	217
Percent of workforce trained	8%	92%	4%
Cost of training program per employee *(Rounded to the nearest dollar)*	$25	$17	$58
Developed internally or externally	Externally	Externally, with city sustainability staff input	Internally
Length of training *(Hours)*	3	2.5	3.5
Employee response to climate information regarding relevance to work	100% Agree *understand impacts to my job*	69% Agree *can use in my work*	74% Very Informed *impacts to my work*

Note. CIPP Input component (Stufflebeam 2003, 2007) benchmark comparisons for climate training program structure.
[a] Cost of training per employee for City of Fort Lauderdale did not include sustainability program staff hourly salaries.

Table H2
Descriptive Statistics Report for the Participant Reaction Survey

Survey Question	*M*	*SD*	*Median*
I was engaged with what was going on during the program.	9.25	1.055	10.00
The activities and exercises aided in my learning.	9.58	.793	10.00
I was given adequate opportunity to practice what I was learning.	8.42	1.730	9.00
I understand how to use the Unified Sea Level Rise Projection tool.	8.75	1.545	9.00
I understand how climate change impacts my division/department.	9.08	1.165	9.50
The information in this program is relevant and applicable to my work.	8.83	1.404	9.00
I am confident that I will be able to successfully apply what I learned on the job.	8.64	1.362	9.00
I am committed to applying what I learned in my work.	9.09	1.446	10.00
The presentation style of the instructors contributed to my learning experience.	9.25	1.545	10.00
I would recommend this program to my co-workers.	9.08	1.782	10.00

Note. Level of engagement centered upon the Climate Change Toolbox training program to meet Level 1 reaction in the Kirkpatrick evaluation model. *M* = Mean. *SD* = Standard Deviation.
[a] $n = 12$

Table H3
Means and frequencies table for the Participant Reaction Survey

Survey Question	Response	Frequency	Percent
Q1. I was engaged with what was going on during the program.	Neither Agree or Disagree	-	-
	Mildly Agree	1	8.3
	Moderately Agree	2	16.7
	Agree	2	16.7
	Strongly Agree	7	53.3
Q2. The activities and exercises aided in my learning.	Neither Agree or Disagree	-	-
	Mildly Agree	-	-
	Moderately Agree	2	16.7
	Agree	1	8.3
	Strongly Agree	9	75.0
Q3. I was given adequate opportunity to practice what I was learning.	Neither Agree or Disagree	1	8.3
	Mildly Agree	4	33.3
	Moderately Agree	-	-
	Agree	2	25.0
	Strongly Agree	5	41.7
Q4. I understand how to use the Unified Sea Level Rise Projection tool.	Neither Agree or Disagree	1	8.3
	Mildly Agree	1	8.3
	Moderately Agree	2	16.7
	Agree	3	25.0
	Strongly Agree	5	41.7
Q9. The presentation style of the instructors contributed to my learning experience.	Neither Agree or Disagree	1	8.3
	Mildly Agree	-	-
	Moderately Agree	2	16.7
	Agree	-	-
	Strongly Agree	9	75.0
Q10. I would recommend this program to my co-workers.	Neither Agree or Disagree	1	8.3
	Mildly Agree	1	8.3
	Moderately Agree	1	8.3
	Agree	-	-
	Strongly Agree	9	75.0

Note. Level of engagement centered upon the Climate Change Toolbox training program to meet Level 1 reaction in the Kirkpatrick evaluation model.
[a] $n = 12$

Table H4
Descriptive Statistics for the Self-Assessment Questionnaire (Items 1-18)

Trainer Skill	Min	Max	*M*	*SD*
You know yourself.	4.00	5.00	4.2500	.50000
You know your subject matter.	3.00	5.00	4.2500	.95743
You know your audience.	3.00	4.00	3.7500	.50000
You are neutral and non-judgmental.	3.00	5.00	4.2500	.95743
You are culturally sensitive.	3.00	5.00	4.2500	.95743
You are self-aware.	2.00	4.00	3.5000	1.00000
You are inclusive.	4.00	5.00	4.2500	.50000
You are lively, enthusiastic, and original.	2.00	5.00	4.2500	1.50000
You use a variety of vocal qualities.	4.00	5.00	4.2500	.50000
You use your body well.	4.00	4.00	4.0000	.00000
You make your remarks clear and easy to remember.	3.00	4.00	3.2500	.50000
You enhance with illustrations.	4.00	5.00	4.5000	.57735
You understand group dynamics, and the stages all groups go through.	2.00	3.00	2.5000	.57735
You are comfortable with conflict resolution.	2.00	3.00	2.2500	.50000
You are flexible.	3.00	4.00	3.2500	.50000
You are open to new ideas and perspectives.	4.00	5.00	4.2500	.50000
You are compassionate.	4.00	5.00	4.2500	.50000
You are interested in evaluating your work.	4.00	5.00	4.5000	.57735

Note. Trainer self-evaluation of training competencies checklist (National Cancer Institute 2001). *M* = Mean. *SD* = Standard Deviation.

Table H5
Summary Table of Paired Sample t-Tests

Element	Statistic	Result	Mean Difference	Interpretation
1. How greenhouse gases affect the climate.	-13.721	Very Significant Difference	-1.06	More Informed After Training
2. Global and local predictions for sea level rise.	-18.262	Very Significant Difference	-1.33	More Informed After Training
3. Other climate impacts expected and/or being observed.	-18.019	Very Significant Difference	-1.33	More Informed After Training
4. What Broward County is doing to mitigate and plan for climate change.	-21.526	Very Significant Difference	-1.70	More Informed After Training
5. How climate change impacts your department/division.	-13.99	Very Significant Difference	-1.12	More Informed After Training
6. How climate change impacts your own job responsibilities.	-13.929	Very Significant Difference	-1.08	More Informed After Training

Note. Test used archived data from the retrospective Module 3: End of Workshop Survey.
*Very significant difference due to $p < .001$.

Table H6
Results of Paired Sample Test

Paired Differences							
			95% Confidence Interval of the Difference				
Mean	Standard Deviation	Standard Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
-1.667	11.146	3.218	-8.749	5.415	-.518	11	.615

Note. Test compares the Climate Literacy Quiz pre and posttest scores. t = t-score. df = degrees of freedom.
[a] $n = 12$. [b] Pretest Score ($M = 85.83$, $SD = 9.962$). [c] Posttest Score ($M = 87.50$, $SD = 8.660$).

Table H7
Results of Factorial ANOVA

	Type III Sum of Squares	df	Mean Square	F	Sig.
Q1.					
Intercept	1935.019	1	1935.019	1739.406	.000
Group	38.892	11	3.536	3.178	.001
LikelytoAct	2.845	2	1.423	1.279	.282
Group * LikelytoAct	16.006	17	.942	.846	.637
Q2.	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1784.051	1	1784.051	1893.319	.000
Group	19.263	11	1.751	1.858	.050
LikelytoAct	4.133	2	2.066	2.193	.116
Group * LikelytoAct	14.668	17	.863	.916	.557
Q3.	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1859.298	1	1859.298	1971.011	.000
Group	13.557	11	1.232	1.306	.227
LikelytoAct	.043	2	.021	.023	.978
Group * LikelytoAct	14.681	17	.864	.915	.557
Q4.	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1577.397	1	1577.397	1487.971	.000
Group	23.712	11	2.156	2.033	.030
LikelytoAct	.809	2	.404	.381	.684
Group * LikelytoAct	28.202	17	1.659	1.565	.082
Q5.	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1637.771	1	1637.771	1167.617	.000
Group	27.356	11	2.487	1.773	.064
LikelytoAct	2.320	2	1.160	.827	.440
Group * LikelytoAct	27.076	17	1.593	1.135	.327
Q6.	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1644.351	1	1644.351	1054.982	.000
Group	35.239	11	3.204	2.055	.028
LikelytoAct	1.541	2	.770	.494	.611
Group * LikelytoAct	37.908	17	2.230	1.431	.131

Note. Level of knowledge and relevance centered upon the Climate Change Toolbox training program to meet Level 2 learning in the Kirkpatrick evaluation model. Test of Between-Subject Effects using the Module 3: End of Workshop Survey (Q1-6) to Link Likelihood to Act (Question B).

Table H8
Means and frequencies table for the Participant Reaction Survey

Question	Response	Frequency	Percent
Q5. I understand how climate change impacts my division/department.	Neither Agree or Disagree	-	-
	Mildly Agree	2	16.7
	Moderately Agree	1	8.3
	Agree	3	25.0
	Strongly Agree	6	50.0
Q6. The information in this program is relevant and applicable to my work.	Neither Agree or Disagree	-	-
	Mildly Agree	3	25.0
	Moderately Agree	-	-
	Agree	4	33.3
	Strongly Agree	5	41.7
Q7. I am confident that I will be able to successfully apply what I learned on the job.	Neither Agree or Disagree	-	-
	Mildly Agree	2	16.7
	Moderately Agree	3	25.0
	Agree	2	16.7
	Strongly Agree	4	33.3

Note. Level of commitment and confidence centered upon the Climate Change Toolbox training program to meet Level 2 learning in the Kirkpatrick evaluation model.

Table H9
Delayed Online Response Survey (Question 5)

Question	Answer Choices	Responses Percent	Responses Number
After completing the Climate Change Toolbox Training, I applied what I learned to my work.	Within 1 week	21.28	10
	Within 2-4 weeks	19.15	9
	Within 5-12 weeks	12.77	6
	I have not applied it, but plan to in the future.	31.91	15
	I have not applied it, and do not expect to apply it in the future.	14.89	7

Note. Answered: 47, Skipped: 3.

Table H10
Delayed Online Response Survey (Question 6)

Question	Answer Choices	Responses Percent	Responses Number
If you have not applied what you learned, please indicate the reasons (check all that apply).	I do not have the necessary knowledge and skills.	14.29	3
	I do not have a clear picture of what is expected of me.	19.05	4
	I have other, higher priorities.	19.05	4
	I do not have the necessary resources to apply what I've learned.	33.33	7
	I do not have the human support to apply what I've learned.	19.05	4
	The training didn't give me the confidence to apply what I learned.	0.00	0
	I don't think what I learned will work.	4.76	1
	There is not an adequate system of accountability to ensure the application of what I learned.	9.52	2
	Other (please specify)	33.33	7

Note. Answered: 21, Skipped: 29.

Table H11
Delayed Online Response Survey (Question 7)

Question	Answer Choices	Responses Percent	Responses Number
I have used resources and/or tools from the online Climate Toolbox (check all that apply).	Unified Sea Level Rise Projection	28.89	13
	Seal of Sustainability Application	6.67	3
	Climate Change Action Plan	22.22	10
	Community Energy Strategic Plan/Renewable Energy Action Plan	8.89	4
	Green Infrastructure Maps (count visualization of solar installation, certified wildlife habitats, tree canopy, etc.)	17.78	8
	Priority Planning Area Map	11.11	5
	Future Groundwater Table Map	15.56	7
	Links to best practice initiatives by agency	24.44	11
	I have not used the Climate Toolbox	40.00	18
	Other (please specify)	4.44	2

Note. Answered: 45, Skipped: 5.

Table H12
Employee Comments Online Delatyed Response Survey (Question 11)

	Employee Comment
1	Impact by climate change on homeless in libraries and parks
2	Drainage outfall
3	Improved Air Quality at Governmental Center - may apply to all county facilities.
4	Recycled/sustainable project material
5	Impacts of salt water intrusion and infiltration/inflow on existing sewer conveyance systems.
6	Maps of impacted areas
7	Clogging and corrosion of the drainage pipes and boxes
8	Increased flooding
9	Cost/benefit ratio data for cities with >2 years of recycled water.
10	Sea rising conditions.
11	Water pollution
12	Energy consumption and usage of devices (computers, printers, copiers, etc.)
13	Sea level rise; storm water management
14	Cost benefit associations of adaptation measures
15	Flooding data near county libraries. And info that would let us know if there certain libraries that won't be as affected by flood so we could have a stand-by list for our customers.

Table H13
Delayed Online Response Survey (Question 10)

Question	Answer Choices	Responses Percent	Responses Number
What are the reason(s) you have not used the Climate Toolbox tools and/or resources (check all that apply).	I do not know where ot find the Climate Toolbox Online.	22.22	4
	The resources and tools are not useful to me.	11.11	2
	There were no resources listed for my department or agency.	5.56	1
	The training didn't give me the confidence to apply what I learned.	5.56	1
	Other (please specify)	55.56	10

Note. Answered: 18, Skipped: 32.

Table H14
Online Delayed Survey (Question 11)

Element	Not At All	Low	Medium	High	Total
Sea Level Rise, Tidal Flooding & Salt Water Intrusion (of our drinking water supply)	7	4	5	27	43
Rainfall Patterns (longer time between rain events, increased downpours, increased and prolonged drought)	4	5	14	20	43
Temperature Changes (increased heat, more days that will reach above 95 degrees)	5	6	17	15	43
Increased Storm Intensity (including increasing storm surge and beach erosion)	6	5	9	24	44
Ocean Acidification (impact on our coral reef system and fisheries)	15	6	9	12	42
Habitat Changes (changes in wildlife patterns, plant hardiness zones)	11	11	10	10	42
Vector borne Illness (increase in rodent and insect spread diseases, i.e. Zika)	6	11	11	16	44

Note. Question asked employees to rate the level each of the listed local impacts from climate change will affect their department's or agency's business operations. 44 employees answered, 5 skipped this question.