

Climate Change Adaptation Strategies in Coastal United States:

Barriers and Bridges for Monitoring and Evaluation

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Abstract

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Monitoring and Evaluation

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As the impacts of climate change begin to surface in all regions of the world, it has become clear that mitigation cannot stand alone in addressing this issue. Adaptation to current and projected climate change impacts is imperative and as a result, adaptation has received increased attention in recent years. As these strategies become more prevalent, monitoring and evaluation for adaptation effectiveness must be employed, especially in vulnerable coastal regions. Due to the characteristics of climate change, developing and implementing these plans is especially challenging. Following the logic of a rapid appraisal, semi-structured interviews were conducted with individuals in six coastal areas in the United States. Interviews focused on better understanding the barriers and bridges to monitoring and evaluation of climate adaptation. This study found that monitoring and evaluation is being discussed and considered in four out of the six areas reviewed with a variety of barriers and bridges reported.

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1 Introduction

In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) stated that the impacts of climate change to date are both “widespread and consequential,” affect natural and human systems, and have been felt in all areas of the world (Stoker et al. 2013). It was reported with very high confidence that some ecosystems and many human systems are susceptible to the impacts of climate variability, detailing that coastal areas are especially at risk due to impacts such as sea level changes, ocean temperature changes, and ocean acidification (Beck et al. 2012; Stoker et al. 2013). Many statistics are reported to accentuate the finding that we have begun to feel the impacts of the Earth’s changing climate; from 2002-2011, more than one million people were victims of natural disasters and the economic cost of these disasters totaled to at least \$1.195 billion (Beck et al. 2012). Coastal urban areas are of exceptional importance as they are expected to face “widespread negative risks” from impacts such as sea level rise and storm surges, which threaten not only human livelihoods and ecosystems, but also assets and economies (Beck et al. 2012; Stoker et al. 2013). While developed countries are often thought of as having considerable adaptive capacity, they are also threatened by the perception of low vulnerability, especially in the United States, as well as the assumption that adaptive capacity directly translates to successful adaptation actions (Repetto 2008). While cities within the United States lag behind the rest of the world in climate adaptation planning (Carmin, Nadkarni, and Rhie 2012), planning for climate change adaptation has begun across the country; yet the impacts of these strategies on adaptation remains unclear (Hansen et al. 2013).

Recent weather events such as Hurricanes Katrina and Sandy highlight the need for coastal cities to adequately prepare for the predicted impacts of the Earth’s changing climate. As these areas begin to implement adaptation strategies, it is essential to understand their effectiveness and contribution to adaptation (Morgan et al. 2008). While techniques for evaluating greenhouse gas

mitigation strategies are widely accepted and used, evaluation of adaptation strategies is extremely limited and it is unclear to what extent monitoring and evaluation of these efforts is taking place in the United States (Berrang-Ford, Ford, and Paterson 2011; Hansen et al. 2013). This study aims to better understand the degree to which monitoring and evaluation (M&E) of climate change adaptation is occurring in coastal urban areas throughout the U.S. through a series of interviews with climate adaptation planners and practitioners. This study is a rapid systematic appraisal of adaptation in seven coastal areas (Beebe 1995); its utility is the empirical information gathered from a representative sample of coastal locations, which can help to inform other cities when addressing the issue of adaptation evaluation. The aim of this work is to share information on the barriers and bridges to planning for and implementing such evaluative measures in an effort to encourage dialog on how to foster adaptation evaluation in the U.S. Bridges can be defined as “factors that facilitated (i.e., bridges) or inhibited (i.e., barriers)” movement forward with M&E of adaptation strategies (Engle 2012).

The following paper begins with a review of the importance of adaptation as a complimentary strategy to mitigation and reviews the role of M&E in the adaptive management cycle. The unique challenges that planners face when developing M&E strategies for adaptation are highlighted, with an overview of the need for M&E as demonstrated by different organizations internationally. Justification for the focus on the coastal United States is provided along with a description of methods used in the interview process, including a presentation of the study questions, an overview of the systematic rapid appraisal process, selection of areas of focus, structure of interviews, and results of the process. The paper concludes with a discussion of findings.

2 Background

While there are multiple strategies to address climate change, mitigation and adaptation have emerged as the two dominant responses (Dang et al. 2003; Joyce et al. 2013); other responses include coping, which is the ability of a system to regain basic functions after a disturbance, and transformation, which is the need for structural changes when climate change impacts surpass the ability of a system to adapt (Joyce et al. 2013; Beck et al. 2012; Qin et al. 2013). Mitigation has long been the dominant strategy for addressing climate change, defined as the reduction of human sources of greenhouse gasses that cause changes to the Earth's climate through alterations in human practices (Michaelowa 2001; Joyce et al. 2013; Stoker et al. 2013). Adaptation is relatively new when compared to mitigation, but is an increasingly accepted way to address the impacts of climate change (Hansen et al. 2013; Stoker et al. 2013). As the field of climate change adaptation has emerged, the concept has been subject to varying interpretations over the past several years (Bours, McGinn, and Pringle 2013). According to the IPCC, climate change adaptation is “the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities” (Field et al. 2012). Adaptation goals are also intricately linked to reductions in vulnerability, or the “propensity or predisposition to be adversely affected” by climate change impacts (Field et al. 2012). As the understanding of climate change impacts has increased, the ability to adapt is now regarded as an essential aspect of the climate change planning process (Berrang-Ford, Ford, and Paterson 2011; Stafford Smith et al. 2011; Pielke et al. 2007; Lenton et al. 2008).

The benefits of mitigation are often seen as global and long term, though some strategies can have local air quality benefits; in contrast, adaptation benefits can be considered shorter term and more local in nature (Dang et al. 2003). While these two strategies differ in their methodology and scale of results, they are both efforts to advance the concept of sustainability (Dang et al. 2003;

Dolšák 2009). It has become evident that both strategies are needed; even if aggressive mitigation plans are immediately implemented, impacts of past emissions levels will be felt in the future, as greenhouse gas emissions will not be stabilized through mitigation in the short term (Wigley 1998; Bernstein et al. 2007). Therefore, as future impacts are addressed through mitigation, the consequences of passed emission levels must be offset by adaptation measures. The intersection between adaptation, mitigation, and sustainability is a growing area of interest that is demonstrated by not only governments but also private sector literature (Stoker et al. 2013). New York City provides an excellent example of this intersection through documents such as the American Institute of Architects New York Committee on the Environment's white paper "Where Mitigation Meets Adaptation: An Integrated Approach to Addressing Climate Change in New York City" (Sapinsley et al. 2013). While it is important to acknowledge that these strategies are intricately linked, addressing adaptation separately from mitigation is important in order to adequately consider the characteristics of adaptation that make it more complicated to track and evaluate than mitigation.

Adaptation strategies can take different forms. Technical adaptation is broadly defined as "equipment, techniques, practical knowledge, or skills for performing a particular activity" whereas adaptation that is social in nature is a "policy process that involves making decisions and applying technologies" (Michaelowa 2001; Sovacool et al. 2012). Technical adaptation involves efforts such as the construction of sea walls and shoreline armoring to protect coasts from sea level rise, whereas societal adaptation could be seen as changes to land uses patterns such that policy limits development in close proximity to the shore (Michaelowa 2001). Mitigation strategies, in addressing the sources of greenhouse gasses, can be seen as short-term efforts that feed into longer-term climate stabilization goals (IPCC 2007). For example, a mitigation strategy could focus on

reducing emissions from a fleet of public busses that are contributing to increased levels of greenhouse gasses in the atmosphere, which drives melting of ice that contributes to sea level rise.

While adaptation impacts are shorter-term than the results of mitigations strategies, adaptation is a longer-term strategy than that of coping, a reactive measure that aims to use existing resources to regain basic functions immediately after a disturbance (Bernstein et al. 2007). In contrast to coping, adaptation includes a focus on societal change in order to lessen the negative impacts of climate change in the future (Beck et al. 2012). While each of these strategies work in tandem to lessen the negative impacts of climate change for both natural and human systems, adaptation is receiving increased attention (Stoker et al. 2013). However, engaging in adaptation is not straightforward; the process is seen as having number of concerns, including the scale of climate change and the complexity of its impacts; the lack of alignment between adaptive capacity and adaptive action taking; the threat of maladaptation; and limited transferability of metrics across projects (Adger and Barnett 2009; Barnett and O'Neill 2010; Neil Adger, Arnell, and Tompkins 2005).

2.1 The role of monitoring and evaluation in adaptive management effectiveness

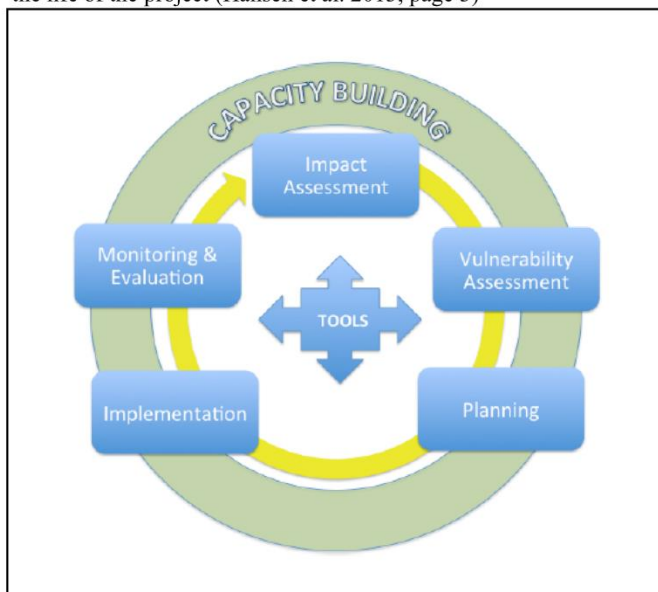
Strategies such as adaptation fall under the concept of adaptive management. Cyclical in nature and iterative, adaptive management is the “integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn” (Salafsky, Margoluis, and Redford 2001) and is rooted in strategic project management. The theoretical climate change adaptation cycle consists of an impact assessment, vulnerability assessment, planning,

implementation, and monitoring and evaluation; the process then leads back into the impact assessment phase, with capacity building occurring throughout each cycle (Hansen et al. 2013). Essentially, the process of adaptive monitoring is about making improvements to the current strategy based on monitoring and its inclusion in the cycle means that project management does not end with implementation (Stem et al. 2005; Salafsky, Margoluis, and Redford 2001). “Key to completing the adaptive management cycle” (Hansen et al. 2013), monitoring and evaluation is most simply defined as the process of “testing what works and what doesn’t” (Salafsky, Margoluis, and Redford 2001). A graphical example of the adaptive management process can be seen in Figure 1 (Hansen et al. 2013). Strategic monitoring and evaluation is recognized as an important and necessary aspect of effective project management (Stem et al. 2005). For the purposes of this study, it is important to differentiate between monitoring implementation of adaptation plans and monitoring their effectiveness; the latter is how monitoring and evaluation is defined in this review, i.e., monitoring and evaluating the effectiveness of adaptation plans.

Despite its importance in the management cycle, monitoring and evaluation of adaptation interventions has seen limited attention and it is often the case that “evaluation approaches implicitly assume that once appropriate measures are identified and projects implemented, this will protect communities against climate impacts” (Villanueva 2010). In 2012, the

Figure 1: The Theoretical Adaptation Cycle

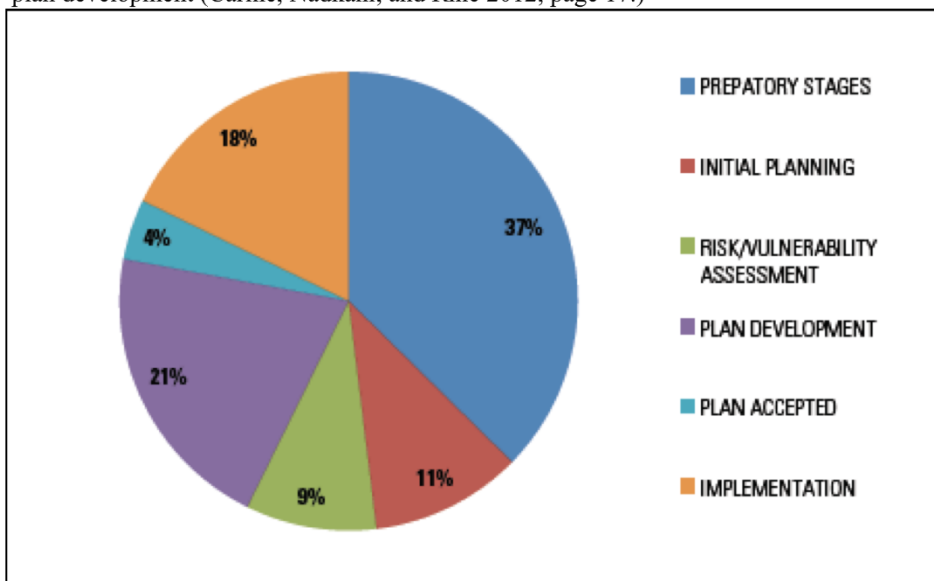
EcoAdapt's visual representation of the theoretical adaptation cycle shows an iterative process, with continued learning taking place over the life of the project (Hansen et al. 2013, page 3)



Massachusetts Institute of Technology (MIT) released a global study on adaptation planning progress. In this study, MIT surveyed 468 cities worldwide that are members of ICLEI-Local Governments for Sustainability (Carmin, Nadkarni, and Rhie 2012). Cities were asked to report on their adaptation planning status, broken down into the following categories: preparatory stages, initial planning, risk/vulnerability assessment, plan development, plan acceptance, and plan implementation (Carmin, Nadkarni, and Rhie 2012). See Figure 2, taken from MIT's 2012 study (Carmin, Nadkarni, and Rhie 2012). Monitoring and evaluation was not even included as a category when reporting on the status of adaptation. This same issue is reflected in tracking carried out by Center for Climate and Energy Solutions (C2ES), which tracks the status of adaptation plans in U.S. cities under the following four categories: adaptation actions but no formal plan, adaptation planning recommended in general plans, adaptation planning in progress, and adaptation plan completed. Based on this tracking, the maximum planning level that can be achieved is that an adaptation plan has been completed.

Figure 2: Status of adaptation planning in select cities worldwide

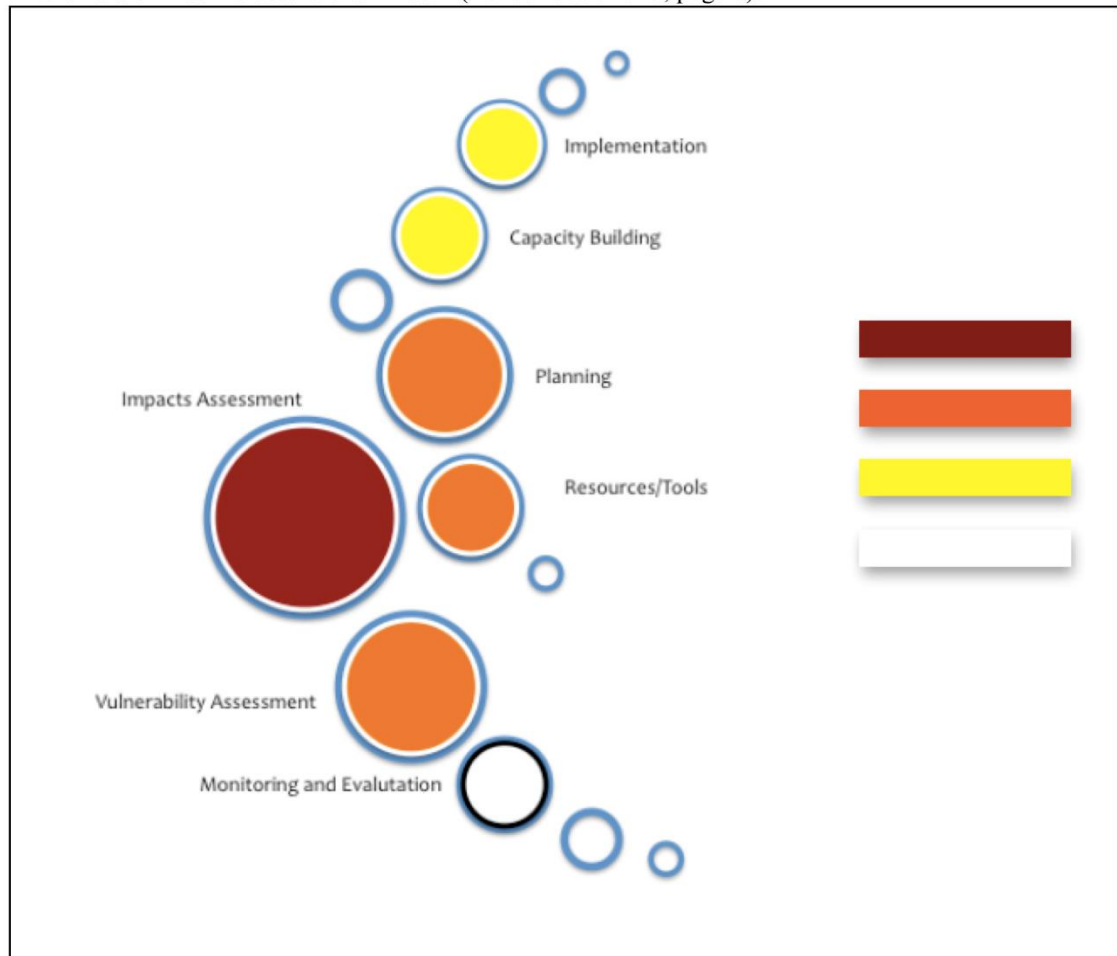
MIT's study on adaptation planning consists of six possible stages of adaptation plan development (Carine, Nadkani, and Rhie 2012, page 17.)



In a 2013 review of adaptation progress in the United States, the climate planning and management organization EcoAdapt found that the field of M&E for climate change adaptation was extremely limited; this was described not only as “bad form”, but also seen as part of a larger issue regarding a lack of information on whether or not existing adaptation strategies are working (Hansen et al. 2013). This is especially troublesome when considering the potential for maladaptation, which is defined as ineffective adaptation planning that actually results in reduced adaptation and increased vulnerability to climate change impacts (Villanueva 2010; Hedger et al. 2008). This concept is represented graphically in Figure 3, which is taken from EcoAdapt’s 2013 report “State of Adaptation in the United States: An Overview” (Hansen et al. 2013).

Figure 3: Status of adaptation planning in the United States

EcoAdapt's visual representation of adaptation planning in the United States indicates that progress in the field of M&E is absent or unknown (Hansen et al. 2013, page 8).



Cities often have limited budgets to spend on mitigation, adaptation, or a combination of both; justifying spending on adaptation can be difficult without measures in place to determine effectiveness (Michaelowa 2001). Still, huge investments are being made in adaptation throughout the United State and abroad. For example, the Australian Government invested \$129 million in its 2007-2013 National Climate Change Adaptation Program; the Louisiana State Government is expected to spend \$650 million on an elevated highway system to ensure evacuation routes are secure; and multi-million dollar investments have been made in saltwater marshes for coastal protection in the United Kingdom, Virginia, and Florida (NY Rising Communities 2013). As these

initiatives become more prevalent, there is a need to address the concern that just “doing good may not be enough to make a lasting adaptation difference” (Bours, McGinn, and Pringle 2013). Most climate change adaptation strategies implemented thus far have taken the form of no-regrets policy that looks for win-win situations; however, it is becoming clear that “transformative change” may be needed if society is to adequately prepare for the impacts of climate change (Noble et al. 2013). If this need is recognized, it may be reflected by strategies that appear to lose money until gains can be effectively demonstrated.

2.2 Barriers to effective monitoring and evaluation of adaptation effectiveness

While adaptive management professionals consider M&E an integral part of the adaptation process (Ford et al. 2013), creating and implementing these plans is not without significant challenges; hurdles to M&E exist in all types of adaptive management, not just those that specifically focused on climate change. Cost, for example, is often seen as a significant barrier to effective monitoring, especially in the context of coastal ecosystems because of the number of data points needed to understand the state of the ecosystem as a whole (Walters 1997). There also seems to be a repetitive effort to build M&E systems from scratch without effectively using past lessons learned, signifying that sharing of best practices has been a challenge (Stem et al. 2005). M&E for climate change adaptation is subject to these challenges, yet certain characteristics of climate change lead to additional barriers that make this type of evaluation difficult. While literature on the topic is limited (Berrang-Ford, Ford, and Paterson 2011; Ford et al. 2013), challenges of M&E expressed to date include:

- Changes to the Earth’s climate may have been gradual, but linear change is not guaranteed and therefore the timeframe in which adaptation can take place might be significantly shorter than assumed (Adger and Barnett 2009; Lenton et al. 2008).

- Maladaptation is a considerable threat, especially when adaptation strategies are not viewed in the long term, as is the case with many water use practices (Adger and Barnett 2009; Barnett and O'Neill 2010).
- Past data cannot be used as a baseline for adaptation progress, as disturbances in the future under climate change will be more extreme than represented in historical trends (Millar, Stephenson, and Stephens 2007).
- Sharing lessons across adaptation initiatives is especially hard, as metrics used for one project may only be well understood in the context of that specific initiative (Adger and Barnett 2009).

In 2013, Sea Change, an Asia-based organization that promotes a community of practice for M&E of climate change initiatives, in collaboration with the United Kingdom's Climate Impacts Programme (UKCIP), summarized a number of challenges to M&E for climate change adaptation as recognized by adaptation practitioners. Issues highlighted include that planning for climate change requires considerations to be made on an "unprecedented scale and scope" which does not align with traditional programmatic boundaries and timeframes (Bours, McGinn, and Pringle 2013). The organizations reviewed a number of M&E frameworks and tools released from 2007 to 2013 and found seven challenges to effective M&E that must be considered in the development of evaluation strategies. The challenges identified in this document are listed below.

1. Climate change impacts occur on long timeframes. Because climate change is a long-term process, its impacts may not be realized for an extended period of time; it is incredibly challenging to quantify adaptation on a timescales that far exceed the scope of traditional planning processes if the most significant impacts of climate change will not be evident during a project cycle (Bours, McGinn, and Pringle 2013).

2. Uncertainty exists regarding how and when climate change impacts will be realized.

Despite widely accepted evidence that the Earth's changing climate will lead to severe disturbances and events, uncertainty remains as to how and when these events will unfold. In addition, it is uncertain what the subsequent reactions will be and how those reactions will further impact natural and human systems (Bours, McGinn, and Pringle 2013).

3. Baseline data may be less useful due to the unpredictable and taxing nature of climate change on local ecosystems. As contexts shift due to climate change, the use of baseline data may be compromised. In traditional program evaluation, baselines data is collected and progress is tracked against these data, but under the guise of climate change, these baselines may not be acceptable comparative data sources (Bours, McGinn, and Pringle 2013).

4. Measuring non-events. The full impact of climate change-driven weather events may not occur within any one cycle of a particular adaptation intervention. Determining success may then focus on climate change preparedness and adaptation strategies will not fully be tested if a weather event does not occur. Similarly, maintaining current states rather than improving them may be considered progress in the face of increased pressures, which can be a challenge to communicate as a success (Bours, McGinn, and Pringle 2013). Proxy indicators can be used, but it should be noted that assessing proxy indicators (such as those relating to capacity building) is inherently different than assessing adaptation success.

5. Universal indicators are not applicable to local adaptation interventions. Climate change impacts are local and therefore the measures to determine success must also be created in a local context, often including qualitative indicators. This means that it is especially

challenging to share lessons learned, as transferability of recommendations and results may not be possible (Bours, McGinn, and Pringle 2013; Olivier, Leiter, and Linke 2012).

6. The ability to determine attribution is unlikely. Traditional M&E activities are focused on the impact that a specific action or set of actions has on a stated objective. Because of the complexity of climate change however, determining impact is not as straightforward as in the traditional sense. Instead of focusing on attribution, the focus should be on degree to which any one action contributes to overall adaptation, which in many cases is heavily dependent on external factors outside of the control of managers (Bours, McGinn, and Pringle 2013).
7. Key climate change terms may be interpreted differently among practitioners and stakeholders. Concepts such as adaptation, adaptive capacity, resilience, and vulnerability have been subject to varying interpretations as the field has developed. Furthermore, certain terms are used in reports and documents that may only be understood in the context of a specific intervention, making the sharing of information across projects less useful (Bours, McGinn, and Pringle 2013).

It is evident from the work of UKCIP and the practitioners cited that climate change adaptation planners looking to evaluate their work face considerable barriers stemming directly from the complex nature of climate change. The seven challenges listed above would exist even if other barriers such as funding and capacity were nonexistent, therefore creating effective M&E plans for adaptation requires special care and attention. A number of organizations have attempted to address these challenges through the creation of various tools and guidance materials, as noted throughout the previous section. Even though adaptation M&E must be tailored to a specific intervention, these tools provide a bridge for climate adaptation planners looking to develop and

implement such M&E plans, as they include guidelines for developing plans, questions practitioners can ask themselves as they think through this process, suggested indicators, and suggestions for developing project-specific indicators.

2.3 Bridges to monitoring and evaluation across sectors: the state of the field

As adaptation has increased in prevalence, a variety of purposes for M&E have been indicated across sectors currently engaged in climate change adaptation. While literature supports the need for M&E (Berrang-Ford, Ford, and Paterson 2011; Morgan et al. 2008; Ford et al. 2013), so too do working documents and toolkits. Reports, tools, guidance, and other resources discuss some needs that M&E can fill, such as providing accountability, demonstrating effectiveness, and improving learning. Clearly identifying the need for M&E represents continued dialogue on the issue and increases its exposure. Accountability is driven by the need to demonstrate a return on a specific investment in adaptation and effectiveness is the achievement of stated adaptation objectives and goals (Villanueva 2010). Learning is the process of improving adaptation efforts (Bours, McGinn, and Pringle 2013). Table 1 provides examples of the need for M&E under the three umbrella “types of needs”. While this is not an exhaustive review of available material, it provides some insight into the ways in which effective M&E could be used across sectors.

Table 1: Need for monitoring and evaluation of climate change adaptation

	Need for monitoring and evaluation	Citation
Accountability: demonstrate a return on investment in adaptation	Attribute results to actions	Michaelowa 200; Olivier, Leiter, and Linke 2012; United Nations Development Programme 2007; United Nations Development Programme
	Compare success across investments	Lamhauge, Lanzi and Arawala 2012; Brooks et al. 2013; Pringle 2011; United Nations Development Programme 2007
	Demonstrate the return on development investments in adaptation	Brooks et al. 2013; DERFA 2010; Sanahuja 2011
	Determine and/or justify funding allocations	Harley and van Minnen 2009; Michaelowa 2001; DEFRA 2010; Hedger et al. 2008; UNFCCC 2010
	Foster confidence in government decisions	DEFRA 2010
	Justify spending on adaptation over mitigation	Michaelowa 2001
	Provide accountability	Pringle 2011
	Support equity of funding decisions	Hedger et al. 2008
Effectiveness: achieve stated adaptation objectives	Avoid maladaptation	Pringle 2011; United Nations Development Programme 2013
	Assess impact / determine effectiveness	Olivier, Leiter, and Linke 2012; Brooks et al. 2013; Harley and van Minnen 2009; Pringle 2011; United Nations Development Programme 2007; Global Environment Facility 2013; Mullan et al. 2013; UNFCCC 2010
	Evaluate adaptation, not just adaptive capacity	Natural England 2010
	Generate political momentum	Hedger et al. 2008
	Improve efficiency	Pringle 2011
	Leverage funding and support for climate change adaptation	Hedger et al. 2008; Mullan et al. 2013
	Reduce disaster risk	Bernstein 2007, Villanueva 2010
Learning: improve the practice of adaptation	Address issues of equity	DEFRA 2010
	Adjust targets based on results in light of uncertainty	Sanahuja 2011
	Better future interventions, share lessons learned, and develop best practices	Bours, McGinn, and Pringle 2013; Pringle 2011; Hedger et al. 2008
	Improve communication	Harley and van Minnen 2009
	Inform decision makers	Pringle 2011; DERFA 2010; Harley and van Minnen 2009
	Mainstream adaptation	Harley and van Minnen 2009
	Simplify information	Harley and van Minnen 2009
	Understand adaptation from the viewpoint of different	Pringle 2011

Table 1 contains a variety of needs as demonstrated across a number of documents from varying sectors around the world (Michaelowa 2001; Olivier, Leiter, and Linke 2012; UNDP 2007; Lamhauge, Lanzi, and Agrawala 2012; Brooks et al. 2013; Pringle 2011; DEFRA 2010; Sanahuja 2011; Harley and van Minnen 2009; Hedger et al. 2008; United Nations Development Programme 2013; Global Environment Facility 2013; Mullan et al. 2013; Natural_England 2010; Bernstein et al. 2007; Villanueva 2010; Bours, McGinn, and Pringle 2013).

3 Monitoring and Evaluation of Adaptation Strategies in Coastal U.S. Cities

The following section makes the case as to why it is important to discuss monitoring and evaluation of climate change adaptation strategies specifically in the coastal United States.

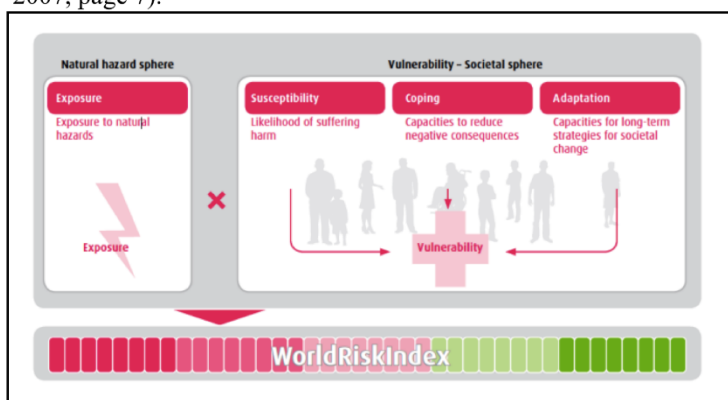
3.1 Adaptive capacity versus adaptive action

Literature on the need for increased adaptation seems to focus on developing countries, as the vulnerability to climate change associated with these areas is often high and developed countries are seen as having the resources to reduce the negative impact of the hazards they face (Beck et al. 2012; Berrang-Ford, Ford, and Paterson 2011). The 2012 World Risk Report, for example, used vulnerability in the social sphere to offset (or exacerbate) risk of exposure. To calculate risk, the following equation was used, as demonstrated in Figure 4, which is taken directly from the World Risk Report: Risk = Exposure x [Susceptibility + Coping + Adaptation]. According to this

equation, the United States is at considerably low risk when it comes to the impact of climate change; the US was 127 on the list of 173 countries, placing the country's overall score (3.99%) in the light green part of the scale used in Figure 4 (Beck et al. 2012). The resulting vulnerability reported for the United States is actually considered to be in the light green region. However, the factors coping and adaptation used in this equation are based on capacity, not action. Coping is defined as “capacities to reduce negative consequences” and adaptation is defined as “capacities for long-term strategies for societal change” (Beck et al. 2012). If the United States is not acting on their perceived ability to cope and adapt, the country's risk of exposure is not actually as offset as the equation would suggest. When looking at exposure alone, the United States actually falls in the light pink section of the spectrum at 12.25% (Beck et al. 2012).

Figure 4: The components of the 2012 Work Risk Index

The equation for the Risk Index developed in the 2012 World Risk Report includes natural hazard exposure and vulnerability in the social sphere. This includes definitions of coping and adaptation that stem from capacity to engage in said strategies (Beck et al. 2007, page 7).



This is an example of what has become known as the “adaptation myth” (Repetto 2008). This concept means that “simply stating that the U.S. can adapt, does not imply that it U.S. will adapt” (Repetto 2008). Often, adaptation success is tracked in relation to adaptation capacity but in a country such as the U.S. where perceived risk of climate change is low (Repetto 2008), it may

be likely that adaptation action is sufficiently lower than adaptive capacity might suggest it would be. Developed countries such as the United States are thought of as having a considerable ability to adapt to climate change, however there are a number of areas of concern regarding this expectation, including that (a) developed countries may be able to engage in vulnerability assessments, yet there is still an information gap when it comes to how to carry out adaptation in response to vulnerability; (b) information is not well shared between the different scales of developed governments and across jurisdictions; (c) technological advances may assist in adaption, but can also lead to additional vulnerabilities; and (d) political support is weak because adaptation initiatives may be costly without strong short-term benefits (Berrang-Ford, Ford, and Paterson 2011). For these reasons, it is important to understand the degree to which the adaptation strategies that are employed are effective rather than assuming relatively high capacity is leading to results.

3.2 Coastal county population trends

Exposure risks are especially high coastal areas (Beck et al. 2012). These areas are largely considered the most “dynamic natural environments on Earth” due to the unique intersection of the land and sea; they are also seen as some of the most productive, attracting considerable human development despite risks such as storms and erosion (Klein et al. 2014). Expected future climate impacts suggest that coastal areas are especially in need of adaptation policies (Beck et al. 2012). As the U.S. National Oceanic and Atmospheric Administration (NOAA) puts it, “this situation presents coastal managers with the challenge of protecting both coastal ecosystem from a growing population and protecting a growing population from coastal hazards” (NOAA 2013a). Interest in the concentration of the human population living in coastal areas has been a source of concern for at least a decade. As of 2001, it was estimated that 20.6 percent of the population lived within 30

kilometers of the coast and that the percentage increased to 37 percent when expanding the distance from the coast to 200 kilometers (Klein et al. 2014). Ten years later, the United Nations made a similar point from a different approach, stating that 13 percent of the global population was living on land that was less than ten meters above sea level (UN Habitat 2011). Whether based on distance from the coast or distance above sea level, each of these statistics was reported as a cause for concern.

Within the United States, recent estimations of coastal populations can be determined using data published by the U.S. Census Bureau collected in 2010; this information has since been used to project a continual increase in the number of people living in coastal areas for the next decade. NOAA cites the Census Bureau's findings in its State of the Coast project. This project is a resource created to communicate with the public about the fragility and importance of healthy coastal ecosystems, highlighting the need to "better understand, manage, and protect our nation's coastal resources" because they are intricately linked to the health of the economy as well as the safety and sustainability of life on the coast (NOAA 2013b). Through this project, NOAA reported that 39 percent of the total population was living in coastal counties in 2010. Yet coastal U.S. counties represent just ten percent of the total area of the U.S., excluding Alaska (NOAA 2013a). From 1970 to 2010, there was a 39 percent increase in the percentage of the population living in these counties and NOAA projects that these areas will increase in population by 37 persons for each square mile (excluding Alaska) by 2020 (NOAA 2013a). This increase is considerable in comparison to an 11 person per square mile increase projected for the U.S. overall in the same time period (NOAA 2013a). These projections are concerning considering the susceptibility of coastal regions to the impacts of climate change and the uncertainty of adaptation effectiveness.

U.S. cities and urban areas provide a focusing lens from which to view climate change adaption planning. Urban cities in general have recently come into focus as important players in the field of climate change response (UN Habitat 2011; The World Bank 2010). While cities may be playing a more important role globally, U.S cities are behind the rest of world when it comes to climate change adaptation strategies. In the 2012 MIT study previously mentioned, it was found that 68 percent of surveyed report that they are engaging in adaptation planning, but the U.S. reports a rate of only 59 percent; this is the lowest rate reported regionally (Carmin, Nadkarni, and Rhie 2012). This lag in activity exists despite the fact that U.S. cities are also reporting increased climate change impacts (Carmin, Nadkarni, and Rhie 2012). However, adaptation received a major jump in attention from the U.S. public around 2006, as evident in news media trends in the country; research on this topic suggests that an important swing has occurred in the U.S. climate change conversation from a focus on the drives of climate change to the question of how to adapt to expected changes at the local level (Berrang-Ford, Ford, and Paterson 2011; Moser 2009). As this attention increases, it is expected that adaptation planning will become more prevalent and in turn, it will become more important to demonstrate success.

3.3 Climate change risk in the coastal United States

Within the sphere of U.S. urban areas, coastal regions were the focus of this study because of the increased vulnerability and the similar risks that each area faces compared to one another, such as those associated with sea level rise and coastal weather events. This study takes the approach that it is more useful to compare coastal cities of different sizes than it is to compare cities of the same size that are not all on the coast; in the latter situation, the cities are susceptible to different climate change impacts. The U.S. is considered to have high capacity to adapt to climate change, but also faces considerable risk of exposure, especially in these coastal areas (Beck

et al. 2012). Of the adaptation initiatives that do exist in the States, the status of M&E of these plans is unclear and it does not appear as though a comprehensive study on evaluations of M&E within the United States has taken place. As evident in Section 1.4, the issue is being considered in sectors outside of the States, meaning there are resources that U.S. adaptation planners can draw upon as they look toward further developing plans and subsequent monitoring schemes. Yet, it remains unclear whether or not these tools are being utilized or if M&E is even being considered by those cities already engaged in adaptation planning.

While the relative overall vulnerability to climate change of these areas has not been evaluated across all impacts, the 2014 U.S. National Climate Assessment summarizes current and projected impacts by region, as detailed in Table 2. According to this report, the regions containing coastal counties are susceptible to varying sources of risk. The Northeast Region's main sources of climate change vulnerability are heat waves and coastal and river flooding. The Southeast and Caribbean Region is susceptible to sea level rise as well as increased temperatures combined with increasingly significant extreme heat events. Threats to freshwater supply also exist in this region. The Southwest is threatened by potential decreases in snow pack and subsequent freshwater flows, as well as increasing temperatures, drought, insect outbreaks, wildfires, and flooding, as well as sea level rise and erosion in coastal areas. The Northwest is expected to realize changes in when snowmelt occurs annually as well as sea level rise, erosion, inundation, and ocean acidification in the coastal areas. Wildfires, insect outbreaks, and tree diseases also threaten this region (Melillo, Richmond, and Yohe 2014).

In Alaska and the Arctic, the region is experiencing the retreat of sea ice faster than originally expected, glaciers are reducing in size, and the temperature of permafrost is increasing. In Hawaii and the Pacific Islands, warmer water temperatures are contributing to coral bleaching

and diseases in the reefs. There are also threats to freshwater supply associated with projected sea level rise and saltwater inundation throughout the islands. Coastal flooding and erosion are also expected to become more significant in light of climate change (Melillo, Richmond, and Yohe 2014).

Table 2. National Climate Assessment Regions

For the purposes of the National Climate Assessment, the United States is broken down into regions that contain groups of states (Melillo, Richmond, and Yohe 2014, page 370).

Region	Composition
Northeast	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia, District of Columbia,
Southeast and Caribbean	Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, Puerto Rico, U.S. Virgin Islands
Midwest	Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin
Great Plains	Kansas, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Texas, Wyoming
Northwest	Idaho, Oregon, Washington
Southwest	Arizona, California, Colorado, Nevada, New Mexico, Utah
Alaska	Alaska
Hawai'i and U.S. Pacific Islands	Hawai'i, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Republic of the Marshall Islands, Republic of Palau, Territory of American Samoa, Territory of Guam

It is important to acknowledge the differences in severity of projected climate change impacts across these regions, as the perception of risk may be a big driver in the development of adaptation plans. However, at this point, it does not appear as though this type of comprehensive assessment has taken place. The National Climate Assessment provides some comparison (for example, water supply reductions will be exacerbated by climate change more dramatically in the Southwest than in other regions, but changes in participation in the most heavy rain events are most dramatic in the Northeast), but it does not contain a vulnerability index. Some historical indicators are reported on across the country, such as “billion dollar weather/climate disasters” that show a concentration in the Southeast, but this comparison is a summary of economic impacts primarily from hurricanes and tornadoes and doesn’t appear to take into account parameters such as loss of life, which may be the biggest cost of impacts such as increased severity of heat waves,

or more dramatically, threats to human wellbeing that may come if freshwater availability reaches a critical point. Still, it is important to acknowledge the way that risk is perceived in different areas, as it might provide insight into how climate change adaptation planning is approached by region or on the local level.

4 Methodology

Through a series of semi-structured interviews with adaptation planners, the aim of this study is to better understand the degree to which adaptation planners are discussing monitoring and evaluation of climate change adaptation effectiveness. In cases when these conversations are taking place, the goal is to gather insight into the barriers these areas face in moving forward with M&E as well as the bridges that have allowed them to make progress thus far. The underlying methodology of this study aligns with the concept of a rapid appraisal, as it looks to develop a “preliminary, qualitative understanding of a situation,” which in the case of this project is the degree to which M&E has been discussed and considered by adaptation planners (Beebe 1995). This work can help guide the creation of surveys to gather information for a larger set of areas by providing preliminary understanding of the issues these areas face. While rapid appraisals are most often used in rural, developing contexts, they have also been employed in data-poor situations in the developed world (Ong et al. 1991).

The rapid appraisal approach selected for this project aligns with that of the systems perspective, in which semi-structured interviews were conducted as the primary research technique (Beebe 1995). The systems perspective was chosen because a limited amount of information is readily available on M&E of climate change adaptation in the context of the United States, but it is incredibly hard to isolate factors relating to M&E from the rest of the complicated management systems in these areas, and the knowledge of interviewees at the local level directly involved in the work is especially important (Beebe 1995). This latter point is especially important given the

finding that there is limited transferability of terms used between adaptation projects, making them less meaningful outside of the context of specific projects (Bours, McGinn, and Pringle 2013). Additionally, not enough information is known about the challenges facing adaptation planners in these areas to execute a meaningful questionnaire survey, as this method is unable to “identify unanticipated, site-specific system relationships,” and therefore “unless the context of the data is understood, answers may be based on categories of reality different from those assumed by the question” (Beebe 1995). Rapid appraisals can be helpful in understanding the ways in which communities perceive their own needs, which is key for the goals of this study (Ong et al. 1991). It should be noted, however, that this rapid appraisal format is in no way meant to be a substitute for future survey research, but rather provides preliminary insight into the status of M&E in the coastal United States in an effort to foster dialogue on the subject (Cernea 1992; Ong et al. 1991).

The remainder of this section reviews the methods used in conducting this rapid systems appraisal. First, a description is provided as to how the representative sample of areas was identified, followed by a review of secondary data collection methods used. Next, the interview process and methods are detailed, including the use of semi-structured expert interviews and exemption procedures in alignment with the Human Subjects Internal Review Board exemption received for the project. Finally, anticipated results are presented.

4.1 Selection of coastal urban areas

For the purposes of this study, a representative sample of areas was developed for inclusion in the semi-structured interview process. The main parameter for inclusion in the research was that adaptation planning was already underway at the local level. In addition, representing areas of varying sizes and location throughout the United States was desired. Those areas already engaged in adaptation planning were prioritized in order to increase the likelihood that M&E had been

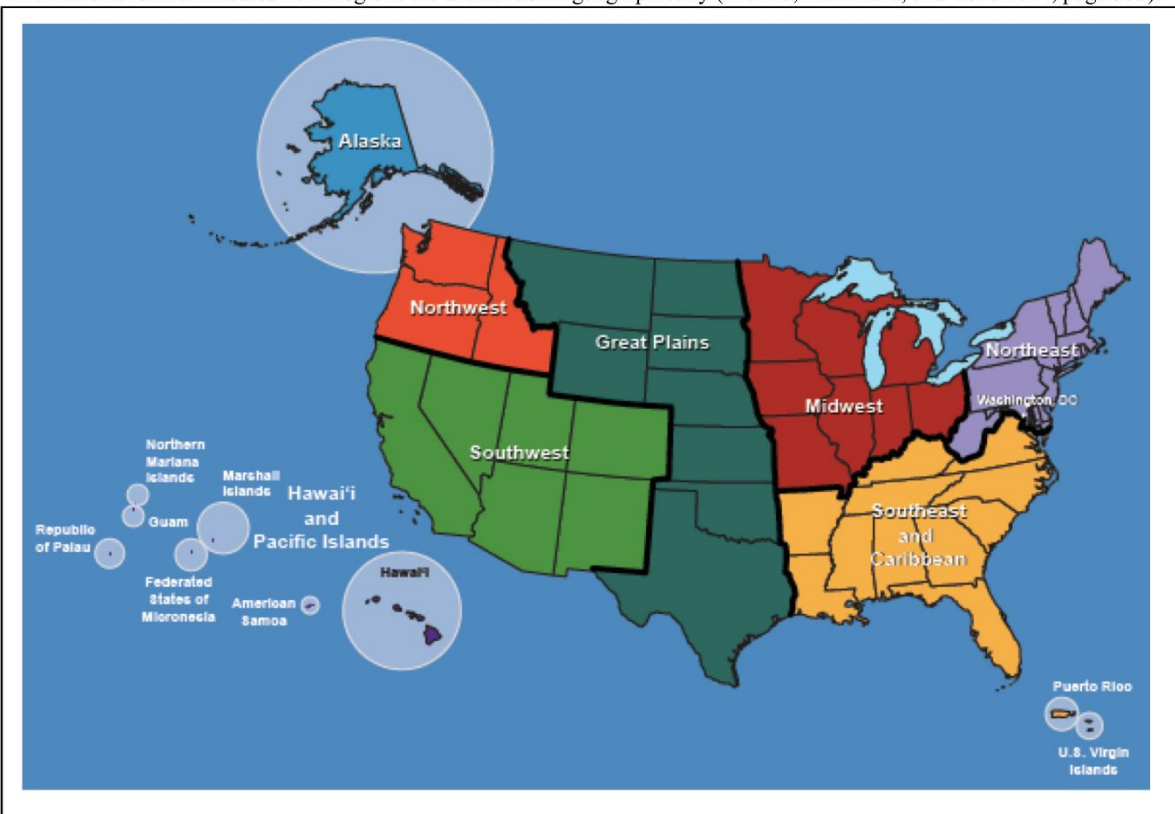
considered. It was assumed that interviews focused on the development and implementation of M&E plans are more informative if this consideration has already taken place. Therefore, the primary consideration for the inclusion of urban areas in this study was the status of each location's climate action plan (CAP) or similar planning document. CAPs are sets of strategies to address climate change; traditionally, these have focused on the reduction of greenhouse gas emissions (mitigation), but adaptation has begun to be included in these plans, as evident by recent tracking efforts of adaptation planning by the U.S. Environmental Protection Agency (EPA) (U.S. Environmental Protection Agency 2014). The determination of adaptation planning within these CPA strategies was made through guidance from EcoAdapt under its "State of Adaptation in the United States" project. The preliminary areas suggested by EcoAdapt were Chula Vista, California; Chicago, Illinois; Homer, Alaska; Kauai County, Hawaii; SE Florida Compact, Florida.

In order to create a representative sample, the set of cities suggested by EcoAdapt was altered and expanded. Distribution throughout the coastal United State was desired, as was a mix of population levels. Each of the areas suggested by EcoAdapt had populations that are considered low by the parameters used in the Siemen's U.S. and Canada Green City Index, with the exception of Chicago, which is seen as medium population level (Economist Intelligence Unit 2011), with the exception of the Southeast Florida Regional Climate Change Compact, which includes four counties. However, none of the cities within these Florida counties exceeds the status of low population. In finalizing the city selection, cities of medium and high population levels were targeted for inclusion.

Additionally, representing different coastal areas in the United States was a goal; therefore, the regions used within the National Climate Assessment project were followed as a guide and one area from each region was targeted for inclusion in the study. These regions are: Alaska, Great Plains, Hawaii and Pacific Islands, Midwest, Northeast, Northwest, Southeast and Caribbean, and Southwest. A map of these regions can be seen in Figure 5. It was decided to focus on regions that are considered coastal to marine systems in order to keep potential climate change impacts as consistent as possible; therefore, the Great Plains (and Chicago, Illinois) was excluded from the list of potential areas.

Figure 5: Graph of National Climate Assessment regions

The National Climate Assessment Regions are broken down geographically (Melillo, Richmond, and Yohe 2014, page 379).



Each of the remaining regions was accounted for within the list provided by EcoAdapt with the exception of Great Plains, Northeast and Northwest. In selecting areas of focus within the

remaining regions, cities of higher population levels were targeted. The Center for Climate of Energy Solutions (C2ES) website was consulted to select the remaining coastal locations for this study (Center for Climate and Energy Solutions 2014). C2ES tracks the status of local adaptation planning in the United States using four levels of adaptation planning progress. In order to maintain a focus on selecting areas already engaged in climate change adaptation planning, only those cities that had made the most progress (as in “Adaptation Plan Completed”) were considered. New York, New York (high population) was selected for the Northeast and Seattle, Washington (medium population) was selected to represent the Northwest. C2ES did not report any cities in the “Adaptation Plan Completed” phase within the coastal Great Plains region and therefore, this region was excluded from the project. According to this site, the total number of coastal cities with adaptation plans completed is four; three of these cities are included in the final list – Seattle, Chula Vista, and New York (Center for Climate and Energy Solutions 2014). The final list of areas included in the interview process was:

Table 3: List of areas included in the study

This list contains information on the population ranking based on the Siemens Green City Index as well as population data from the U.S. Census Bureau and the Kresge Foundation (“Kresge Foundation Awards SE Florida Regional Climate Change Compact \$975,000” 2012; Economist Intelligence Unit 2011; U.S. Census Bureau 2011).

Region	Location	Population Level
Alaska	Homer, Alaska	Low
Hawaii & Pacific Islands	Kauai County, Hawaii	Low
Northeast	New York, New York	High
Northwest	Seattle, Washington	Medium
Southeast & Caribbean	SE Florida Compact	High
Southwest	Chula Vista, California	Low

In total, three areas of low population were included, one with medium population, and two with high populations (which includes Southeast Florida Compact, although no single city within the compact exceeds Siemens low population ranking) (Economist Intelligence Unit 2011).

Population data is based on information published in 2011 by the U.S. Census Bureau in all cases except for the SE Florida Compact, for which population data came from a report on the area (“Kresge Foundation Awards SE Florida Regional Climate Change Compact \$975,000” 2012). While it would have been ideal to include cities of varying sizes in each area of the United States, the available number of cities with adaptation plans completed is low and there were not examples of cities with high population on the West Coast that had plans completed. Each of these areas is located in a coastal county, meaning that population density in these locations is likely high, based on NOAA’s State of the Coast project. Though each of these areas is considered to be coastal and therefore susceptible to at least some degree of similarity in terms of projected climate change impacts, their vulnerability is different by region, as was outlined in section 2.3.

4.2 Review of Climate Action Plans

Prior to engaging in the semi-structured interview process, each CAP was reviewed for secondary data and climate change action-related information was recorded (Harrell and Bradley 2009). Reviews were completed with the following information in mind: the year climate action planning began in the area, the year the CAP (with adaptation elements) was released, any update or plan progress reports released, the department under which the CAP is housed, the stage of the CAP, the number of iterations or reviews produced, partners involved in the planning process, and whether or not M&E plans for adaptation were included in the CAP. This information was reviewed in an effort to better understand the commitment to climate change planning for each area before engaging in the interview process. A review of the information outlined above helped to guide the interview process.

4.3 Data collection method

As previously stated, the primary data collection method for this study was one-on-one semi-interviews conducted to gather background information, expert knowledge, and opinion from interviewees (Harrell and Bradley 2009). Interviewing was used because information on possible conversations regarding M&E for adaptation in each area was not publically available. In cases when progress *was* reported on in CAP updates, it mostly focused on the implementation of the CAP and not the evaluation of strategies or initiatives within it; more detailed results of the CAP review can be found in Section 4.1. Semi-structured interviews were selected for this project in order to gather answers to specific questions while also allowing for the nuances of different CAPs, procedures, and planning stages to guide the conversation. Structured interviews are less useful in understanding complicated planning processes such as M&E (Drumwright and Murphy 2004). Similar studies on adaptation progress (not specific to M&E) have used interviews as the primary data collection method due to “complex factors that are irreducible to a few key variables” such as adaptation projects (Sovacool et al. 2012). Elite (or expert) interviewing was utilized, as the goal of the study was to understand implementation from the perspective of decision makers and/or those implementing the CAP protocols as opposed to the general public (Dexter 1970). Each of these tactics falls under the umbrella of a system perspective rapid appraisal, which was detailed in the introduction to Section 3.

The interviews were carried out in accordance with the University of Washington’s Internal Review Board exemption (#47085) received prior to the start of the interview process. Seven interviews were conducted over a six-week period with one representative from each location, except in the case of Kauai County, Hawaii, where an initial interview was conducted with two staff members at the state-level. This interview is not reflected upon here, as it was only used to

confirm that Kauai County was an appropriate area of focus. Interviewees were required to be involved in the planning of the CAP and/or its implementation. In most cases, government employees were interviewed, with the exception of the Southeast Florida Compact, in which the interviewee was a member of the Institute for Sustainable Communities. Due to the widely dispersed nature of the interviewees, all interviews were conducted over the telephone, with initial contact via email; even in cases when face-to-face meetings were possible, telephone interviews were used in order to remain as consistent as possible within the semi-structured format (Harrell and Bradley 2009).

Prior to each interview, contacts were given background on the project goals; general interview questions were sent prior to the telephone conversation, if requested. Follow up communication was handled via email, as initial understanding of the project topic was already gained in the one-on-one conversation. Each interview was recorded and notes were sent back to contacts for review, necessary updates, and approval. With the exception of the correction of minor details, none of the interviewees made changes to the notes taken from their interviews. Once notes were recorded and approved by the interviewee, recordings were deleted. Interview results were reported anonymously in terms of both name and position.

Each interviewee was asked to provide information on the aspects of adaptation planning listed below; questions were not necessarily presented in the order listed, but instead acted as a guide for the interview (Harrell and Bradley 2009; Beebe 1995). An interview template can be found in Appendix 2.

- (a) Status of evaluation of adaptation initiatives
- (b) Biggest barrier to moving forward with M&E
- (c) Biggest bridge for moving forward with M&E

- (d) Driver of adaptation progress to date
- (e) Partners involved in the creation of the plan or M&E strategies
- (f) Guidelines or tools used in the creation of the plan / planning for M&E

Through the interview process, the following nine data points were collected. Responses are summarized in Table 5 in Section 4.2 of this document. In some cases, check marks were used to represent different degrees to which each parameter was reported by the interviewee.

1. CC M&E for Mitigation: *Climate change monitoring and evaluation for mitigation*

This parameter was used to report the degree to which mitigation progress is tracked. This is intended to provide a comparison between the prevalence of mitigation tracking versus adaptation tracking. One check mark indicates that “some tracking” of mitigation is taking place, meaning that tracking of mitigation is taking place, but not across all mitigation initiatives or, mitigation is happening, but progress isn’t being reported out in a routine manner. Two check marks represents “significant tracking,” meaning that tracking across all mitigation efforts is taking place and reports have been produced to communicate out mitigation progress.

2. CCA M&E Considered: *Climate change adaptation monitoring and evaluation considered*

This parameter is to record instances in which M&E that aligns with the concept of *demonstrating effectiveness* (as opposed to tracking implementation progress) is taking place. One check mark for this category signifies that within the area, discussions are taking place regarding how to demonstrate effectiveness of adaptation strategies – the need to determine effectiveness has been recognized and the challenge has been considered. Two check marks means that based on the interview, it not only has been discussed, but is also an explicit future goal for the area.

3. CCA M&E Plans Exist: *Climate change adaptation monitoring and evaluation plans exist*

This parameter is to record responses regarding the existence of an M&E plan for adaptation strategies. This same parameter was included in the plan review but was included in the interview section as well to confirm whether or not an unpublished plan exists. One check mark signifies that a plan has been developed and two checks means that it is being implemented.

4. CCA M&E is happening: *Climate change adaptation monitoring and evaluation is happening*

While the definition of M&E used in this study is tied to determining effectiveness, many adaptation tracking plans focus on the degree to which plans have been implemented. Therefore, implementation of adaptation plans as an indicator of adaptation monitoring was recorded based on responses during the interviews. This information was recorded when interviewees indicated that their current measurement was the degree to which the plan had been put into effect. One check mark means that the interviewee reported that implementation was the metric used to determine adaptation progress. Two check marks means that adaptation strategies are being monitored for effectiveness.

5. CCA Planning Leader: *Climate change adaptation planning leader*

Each interviewee was asked if there was a department or individual that champions the adaptation planning process to gain a sense of adaptation leadership in the area. One check mark means that adaptation planning was housed under one department, but that no one person was on point at the champion. Two checks means that there is a lead individual and is indicated by two check marks.

6. Materials used in planning/implementing adaptation and/or M&E

Interviewees were asked to share any relevant materials used to guide the adaptation planning process. This applied to not only to M&E, but any aspect of *planning* for adaptation progress.

7. Biggest barrier: *The biggest barrier to moving forward with monitoring and evaluation*

Interviewees were asked to share the biggest barrier in their area to moving forward with M&E goals for adaptation.

8. Biggest bridge: *The biggest bridge that allowed for progress thus far*

Interviewees were asked to share the most important thing that had allowed them to make the progress they had made in adaptation planning to date. This was not necessarily tied to M&E but more generally linked to the current stage of adaptation of each particular area.

9. Driver: *What caused the areas to focus on adaptation?*

Interviewees were asked who or what was the catalyst for planning for adaptation and continuing to focus on it. This could be an individual, group, or characteristic of the area, such as vulnerability.

4.4 Expected Results

This study expected to find that for most of the areas reviewed, M&E has been considered but has not been planned for or implemented. However, it is expected that for all areas studied, interviewees will express progress in M&E for mitigation strategies. The study expected to find the following two barriers to be prevalent across areas where M&E for adaptation is not being actively pursued: insufficient resources to plan or implement M&E (i.e., funding, staff capacity) and lack of information/guidance on how to monitor and evaluate for adaptation. The first barrier to M&E was expected because studies on adaptation planning in general often cite funding limitations as significant barriers to implementing adaptation (Carmin, Nadkarni, and Rhie 2012).

Therefore, it is expected that this barrier will also exist for M&E of such plans. The second barrier is expected because M&E for adaptation is so complex and the field is so new. While organizations focused on M&E for adaptation such as ClimatEval do exist, adaptation plans are inherently local in nature and monitoring and evaluation plans must therefore be linked to specific place-based adaptation strategies. This makes sharing of information especially challenging (Adger and Barnett 2009).

It is expected that the following two bridges will be common responses throughout the interview process: funding received from an external organization and involvement of/support from an external organization. Anticipation for the first bridge stems from the apparent concentration in M&E of adaptation work coming from the development sector, where understanding the return on investment is a prominent reason for advancing the field (see Section 1.4 and Appendix 1). Secondly, it is expected that external funding will act as a catalyst in understanding the impact of adaptation funding. This is hypothesized because of the increasingly important role non-governmental organization play in the climate change adaptation space (Castán Broto and Bulkeley 2013).

4.5 Study limitations

This study is limited by the small sample size and varying positions of the interviewees within their respective areas. It is important to stress this latter point, as comprehensive knowledge of M&E progress in each area may be limited depending on viewpoint of each interviewee. Comparability of areas is also limited due to both the semi-structured nature of the interviews and the limited sample size. Additionally, the focus on governmental involvement in climate adaptation planning presents a possible limitation, as non-governmental organizations have become increasingly involved in adaptation planning (Castán Broto and Bulkeley 2013). As part

of the secondary data collection, non-governmental partners were recorded in order to increase awareness of these partnerships, but it would be helpful in understanding these partnerships to look closer at situations where climate change adaptation is driven by non-governmental organizations. While the advantages of conducting a rapid appraisal for this topic are discussed, comparability between areas is limited due to the relatively unstructured nature of the interview process.

5 Results

The results of this rapid systems assessment are reported in three sub-sections: secondary data collected during the planning document review, general findings across sites (including an analysis of the expected findings compared to the actual information gathered during interviews), and a more detailed summary of findings by location.

5.1 Secondary data collection

The secondary data points outlined in the methods section can be found in Table 4. This table provides a high-level overview of certain aspects of climate change planning in each area considered for this study. As evident by this table, initial climate action planning began first in Kauai County, Hawaii. The first instance of plans with adaptation components appear to be in Seattle, Washington; however, Seattle still reports that it is currently undergoing planning of a document that focuses solely on adaptation, reflecting the complicated nature of reporting on this topic and the variety of stages of planning that are possible. Initial adaptation plans were released between 2006 and 2013, with update reporting varying by location. There is a wide variety in the leading departments, planning stages, and partners engaged in planning at each location. New York, New York is the only area that appears to be engaging in M&E specifically for effectiveness, as they have completed a document that focuses on ranking coastal adaptation response strategies. Additional details on the planning background in each area can be found in section 4.3.

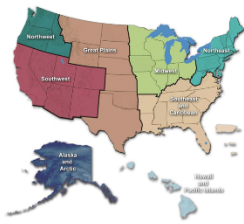


Table 4. Summary of secondary data collection

	Alaska & Arctic	Northeast	Pacific Islands	Southeast & Caribbean	Southwest	Northwest
	Homer, Alaska	New York, New York	Kauai County, Hawaii	SE Compact, Florida	Chula Vista, California	Seattle, Washington
Population Ranking	Low	High	Low	High *	Low	Medium
Initial planning date	2007	2007	1998	2010	2000	2006
(Adaptation) Plan of Focus	<i>City of Homer Climate Action Plan</i>	<i>A Stronger, More Resilient New York</i>	<i>Operations Sustainability & Climate Action Plan</i>	<i>Regional Climate Action Plan / Implementation Guide</i>	<i>Climate Adaptation Strategies</i>	<i>Climate Action Plan</i>
Year published	2007	2013	2013	2012	2011	2006
Progress report(s) for plan of focus	<i>Comprehensive Plan 2010</i>	<i>Progress Report 2014</i>			<i>Progress Report 2013</i>	<i>Progress Report 2007, 2008, 2009 - Highlights 2010, 2013</i>
Leading Department		Long-Term Planning & Sustainability	Mayor's Office **	SE Compact Steering Committee	Public Works	Sustainability & Environment
CAP stage: planning, plan completed, implementation, review	Implementation	Implementation & Review	Plan completed	Implementation	Implementation (adaptation) Review (mitigation)	Review (mitigation) Planning (adaptation)
Planning partners	ICLEI		Island Matters LLC; Kauai Planning and Action Alliance, Inc.	Institute for Sustainable Coms	SDC Climate Collaborative	Climate Impacts Group
CCA M&E in CAP ✓ Adaptation effectiveness		✓				

* Population data came from Kresge Foundation, unlike all other areas which came from 2010 U.S. Census Bureau

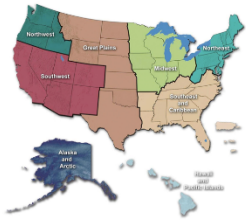
** Information learned in interview

Table 3 contains information from the review of climate action plans in each area (City of New York 2011; City of New York 2013; City of New York 2014; Seattle Office of Sustainability and Environment 2013a; City of Seattle 2006; Seattle Office of Sustainability and Environment 2013b; City of Homer 2007; ICLEI Local Governments for Sustainability 2007; City of Chula Vista 2013a; Climate Change Working Group 2011; SE Florida Compact 2012; Southeast Florida Climate Change Compact 2012; City of Kauai 2013).

5.2 General findings and analysis of expected results

The overall takeaway from the interview process is that despite making an effort to include only areas that have begun to implement some sort of adaptation strategy, not all areas have considered evaluation effectiveness of their plans. As previously mentioned, New York has already engaged in M&E of effectiveness of coastal adaptation plans, however, the interview focused specifically on the water and wastewater section of the plan. While effectiveness M&E is

not necessarily taking place in that specific area, it has been considered. M&E has also been considered in Chula Vista, Southeast Florida Climate Change Compact, and Seattle. These four locations are discussed first, following a discussion of Kauai County and Homer, where M&E does not appear to have been considered. In all six areas, interviewees confirmed that they were currently tracking the impacts of their mitigation strategies in some form, or it was represented in the planning documents available. This suggests that more support is needed in the implementation and development of M&E plans for adaptation than for mitigation. Findings that relate to adaptation planning across all areas can be found in the remainder of this section, with additional details by location in sections 4.3 and 4.4. A summary of interview information is in Table 5; each aspect tracked in this table is also discussed in the remainder of this subsection.

	Alaska & Arctic	Northeast	Pacific Islands	Southeast & Caribbean	Southwest	Northwest
	Homer, Alaska	New York, New York	Kauai County, Hawaii	SE Compact, Florida	Chula Vista, California	Seattle, Washington
CC M&E for Mitigation ✓ Some tracking ✓ Significant tracking	✓	✓✓	✓✓ *	✓✓	✓✓	✓✓
CCA M&E considered ✓ Discussed ✓ Is a future goal		✓✓		✓✓	✓✓	✓✓
CCA M&E plans exist ✓ Plans created ✓ Plans implemented						
CCA M&E is happening ✓ Implementation ✓ Effectiveness		✓		✓	✓	✓
Materials used in planning/implementing adaptation and/or M&E	Boulder, CO CAP *				Focus 2050	
Major CCA M&E drivers	Mayor's Interest in Climate Change	Vulnerability	Vulnerability	Political, Vulnerability	Approached by San Diego Foundation	Vulnerability

*This information was learned in a review of the plan, not though the interview

Table 5 includes information on gathered during the interview process (Seattle Interviewee 2014; New York Interviewee 2014; SE Florida Compact Interviewee 2014; Chula Vista Interviewee 2014; Homer Interviewee 2014; Kauai Interviewee 2014; City of Homer 2007).

Portions of the results of the interviews with adaptation planners aligned with expected barriers expressed in section 3.4, but neither of the anticipated bridges were reported. For the barriers, some responses were those expected (lack of information and insufficient funding) but additional barriers were also discussed. Barriers and bridges were recorded only for those areas that reported that they have considered M&E. For bridges, neither the support of external organizations nor external funding was expressed in response to the “biggest bridge” question. However, it is important to acknowledge that while the question was posed as the “biggest” barrier/bridge, some cities expressed more than one factor in response to these questions. Because this study represents a preliminary look at understanding M&E as part of the adaptation process, multiple barriers and bridges were included if they were expressed rather than insisting that each area highlight only one above others. It is important to be mindful, however, of how different respondents addressed the question. For example, Chula Vista reported that stakeholder engagement was the biggest bridge in that particular area, yet assistance from the San Diego Climate Collaborative was also expressed as important in other parts of the interview. Had Chula Vista responded with three bridges, as Seattle did, it might have been the case that the involvement of an external organization would have been reported as one of the bridges for the area. Tracking of all bridges and barriers expressed can be seen in Table 6. While this sub-section contains overall impression across locations, it may be more useful to consider the results by location, as discussed in Section 4.3.




Table 6. Summary of barriers and bridges reported by those areas considering M&E

		Northeast	Southeast & Caribbean	Southwest	Northwest
		New York, NY	SE Compact, FL	Chula Vista, CA	Seattle, WA
Barriers	Administration changes	x			
	Insufficient resources to plan or implement M&E		x		x
	Lack of information/guidance on M&E for adaptation			x	
	Mainstreaming adaptation				x
Bridges	Healthy economy				✓
	Leadership of local industry				✓
	Progressive community values				✓
	Regulations from the top down (city to agencies)	✓			
	Stakeholder engagement			✓	
	Strict planning timelines	✓			
	Strong leadership	✓			
	Trust / Collaboration		✓		

Table 6 includes information on barriers and bridges gathered during the interview process (Seattle Interviewee 2014; New York Interviewee 2014; SE Florida Compact Interviewee 2014; Chula Vista Interviewee 2014).

One observed difference between the barriers and bridges reported during the interview process was the number of factors identified. Across the four areas, four barriers were discussed, with the most frequently cited barrier being insufficient resources to plan for or implement M&E. The enabling conditions reported included more variety with no overlap between locations; interviewees frequently reported multiple bridges. This lack of overlap suggests a sentiment reflected by both the literature and the interviews, which is that planning for adaptation is often an organic process where progress is made possible by taking advantage of opportunities as they arise (Seattle Interviewee 2014; SE Florida Compact Interviewee 2014). This suggests that creating a climate for adaptation planning, and in this case specifically M&E, is harder to address than identifying what stands in the way of progress, as reflected by the creation of frameworks that

specifically focus on creating enabling conditions as well as adaptive capacity as an indicator for adaptation progress.

In New York, Chula Vista, SE Florida and Seattle, determining adaptation progress revolves around the tracking of implementation of preexisting plans. As these are the areas that have also considered M&E for effectiveness, this suggests that future work on understanding monitoring and evaluation progress should be focused on areas that are already reporting out on implementation progress, not just those areas that have a climate action plan completed. While implementation was an indicator of planning progress in these areas, it was quite evident that each of the interviewees in these locations knew that issue of effectiveness needed to be considering in addition to implementation. Still, it seemed as though little was understood on how to track anything other than implementation and that implementation acted as a proxy indicator. The possibly need for clear implementation tracking to take place before adaptation is considered seems obvious in retrospect, however, the initial thought behind focusing on places that have climate action planning in place was that M&E may have been considered from the beginning as part of the overall planning process. It has become evident that in a push to engage in adaptation action, implementing strategies is a way to show progress in adaptation, whereas M&E for effectiveness may take considerable time. This makes the existence of clear implementation plans a possible indicator for the readiness of considering monitoring and evaluation.

One of the data points included in the interviews was the use of preexisting planning guidelines and materials in the climate change adaptation planning process, whether specifically for M&E or more generally. This turned out to be quite limited. The only areas that seem to be drawing upon these types of documents were Chula Vista and Homer. Chula Vista expressed that the San Diego Foundation's Focus 2050 study had been pivotal in assisting the city in

understanding the projected climate change impacts in the region. Within Homer's Climate Action Plan, planning that had taken place in Boulder, Colorado, was mentioned as the guide for creating the city's report, though this was not mentioned in the interview. Other areas expressed sources of information that were not necessarily in the form of a formal report. For example, Seattle discussed the importance of drawing on the best practices of other cities when it came to adaptation planning, specifically in the San Francisco Bay area and in Vancouver. New York expressed that the EPA guidelines for adaptation may be beneficial if they were to include M&E-specifics, but that this also may be limited due to challenges of translating general recommendations to the specific nature of New York's strategies.

With the exception of the limited use of preexisting reports above, it seemed as most places were largely working to figure out M&E on their own. This reflects the sentiment that the sharing of lessons learned is limited (Stem et al. 2005) as well as the limited availability (or utility) of guidelines and toolkits. Though the background review of the state of the M&E field saw a variety of M&E frameworks for climate change adaptation, these mostly focused on developing contexts and none were directed specifically for the United States. As these areas begin to consider M&E in this context for the first time, it may be advantageous to foster communication of best practices and progress for the benefit of other cities that may be looking to consider M&E in the future. Because it is known that this consideration is beginning across widely dispersed areas, there may be an opportunity to foster communication across areas that are at the point of discussing M&E. It may be challenging to do this in setting where adaptation is being discussed more generally, as many places may not be at the point in which they are ready to discuss evaluative measures.

The interviewee's opinion on the biggest driver or catalyst for adaptation was an additional data point gathered during the interview. In four out the six areas, vulnerability to the impacts of

climate change was provided as the most significant driver. This was the case in New York, Kauai County, SE Florida and Seattle. New York's 2013 "A Stronger, More Resilient New York" report was created in reaction to Hurricane Sandy and the subsequent vulnerability realized by that storm. However, there were adaptation components within the 2011 "A Greener, Greater New York" as well and the catalyst for the creation of that report is less clear, as it was not the focus of the interview. The County of Kauai is moving forward with climate change adaptation planning by considering increasing the shoreline development setbacks already in place in order to account for sea level rise while an official state-wide sea level rise study is being considered. A mix of vulnerability and political pressure drove the creation of the SE Florida Compact and its subsequent Climate Action Plan. State representatives were frustrated by inconsistent sea level rise projections across jurisdictional lines, prompting the creation of a regional governance system under a unified sea level projection.

The two areas that expressed drivers for climate adaptation planning other than vulnerability were Homer and Chula Vista. In the case of Homer, the former Mayor James Hornaday attended a national convention on climate change action, though it was not clear from the interview or the secondary data collection which meeting was attended. The decision to create a CAP came directly from the mayor's office and the person in charge of the planning process was assigned to it as a special project. In the case of Chula Vista, the San Diego Foundation, who works to assist local governments in carrying out adaptation plans, approached the city. While these two cities provide examples in which vulnerability was not cited as the direct catalyst for the creation of the adaptation plan, consideration of climate change impacts can certainly be seen as a driver of the San Diego Foundation reaching out to Chula Vista, and it was mostly likely a component of the national climate conference that Mayor Hornaday attended. Therefore, this supports the idea

that continual awareness of the potential impacts of climate change is important in fostering climate change adaptation planning, but so too are external drivers to a lesser degree.

5.3 Results in areas where M&E is being considered

While it is helpful to review the findings in comparison to the expected outcomes and across locations, the limited number of focus areas combined with the nuanced nature of M&E for climate change adaptation requires additional explanation of the findings in each area. Each area seems to be at different stages of planning, with a variety of plan structures and degrees of entrenchment of climate change considerations in the cities themselves. This section discusses the findings for areas that have considered M&E of their adaptation initiatives. Quotes used come directly from interviewees, though interviewees have been kept anonymous, as has their titles/positions. Across each of the areas where effectiveness has been considered, institutionalizing (or mainstreaming) adaptation within the government and its daily processes was noted as a concern; this was discussed as both a bridge as well as something that could be improved in the area. In addition, significant stakeholder engagement has taken place in each of the following four locations. It seems as though in each of these places, strong top-down support is necessary in continuing to focus on addressing climate change; strong leadership was evident in each area included in this subsection and seems to be necessary in progressing in the adaptation planning process.

Chula Vista, California

Climate action planning has been occurring in Chula Vista since 2000, when the first plans to address carbon dioxide emissions were released (City of Chula Vista 2013a). Since then, the city has engaged in updated mitigation strategies (2008) and adaptation strategies (2011), with the most recent update on adaptation planning progress released in November 2013. It appears as

though community engagement is significant in this area, as much of the climate action planning work involves the Climate Change Working Group, which includes residents, businesses, and representatives from local community organizations (City of Chula Vista 2013a). There also seems to be a high degree of visibility when it comes to addressing climate change at the city level, as the area has been recognized by organizations including the EPA, Sierra Club, California Sustainability Alliance, and EarthWorks San Diego for the attention it has paid to these issues (Climate Change Working Group 2011).

Chula Vista's climate adaptation planning documents indicate that implementation progress is the main focus of the performance metrics within the 2011 Climate Adaptation Plans (Climate Change Working Group 2011; City of Chula Vista 2013b), but it was evident in the interview that the issue of M&E for effectiveness has been considered. Still, it was acknowledged that struggles remain regarding how to evaluate effectiveness and the interviewee stated that this concern is one they raise at every conference on adaptation. But, the question of how to conduct M&E has yet to be answered. Currently, measures of adaptation success focus on how well adaptation has been institutionalized by considering if they look through the lens of climate change when we make decisions or are making capital investments" (Chula Vista Interviewee 2014). The city looks at implementation to determine if they are moving forward with each of the tasks they committed to. Besides the challenge of defining success, the city has struggled with the availability of scientific information, though they have overcome it in one way or another (Chula Vista Interviewee 2014). They have data on climate impacts, but it is often the case that there are competing claims or models used to make projections. This muddies the water and it was included that the city would benefit from top-down direction in deciding which predictions to use throughout the region (Chula Vista Interviewee 2014). This same issue was surfaced during the

interview with the Southeast Florida Climate Change Compact, but was overcome in the creation of the Compact.

There is a clear recognition in that area that demonstrating success to stakeholders is crucial and reporting plays a major role in this. The biggest bridge that has allowed Chula Vista to move forward with adaptation work is the level of stakeholder support they have. They have “everyone involved” and this has led to a culture that prioritizes climate change adaptation. Part of the reason for this is that they report out frequently, making the plan “seem like its more living” and this fosters inspiration to do more (Chula Vista Interviewee 2014). In summary, the interviewee expressed the sentiment that “success breeds success – they see us succeeding and they get excited” (Chula Vista Interviewee 2014). Understanding the benefits of demonstrating success to the community is likely an additional driver of exploring M&E for effectiveness. The Environmental Resource Manager for the city is the clear champion of efforts to determine and report on progress; this person is the person in charge of communicating how the city is doing on any on issue (Chula Vista Interviewee 2014).

New York City, New York

New York has considerable resources for adaptation, which is reflected in the quality and comprehensiveness of the city’s planning documents. The Department of Environmental Planning (DEP) administers the city’s overarching PlaNYC initiative; the DEP was budgeted over \$1 billion of city funds for 2014 (Office of Management and Budget 2014). PlaNYC was launched in 2007 and under this project two main documents relevant to adaptation in the area have been released: “A Greener, Greater New York” (2011) and “A Stronger, More Resilient New York” (2013) (City of New York 2011; City of New York 2013). The 2011 plan contained six climate-change related goals, including assessing vulnerability to climate change, increasing the resilience of the city’s

natural and manmade structures, increasing the city's preparedness for extreme weather events, and fostering resilient communities through public outreach. Of the thirteen objectives under these goals, one relating to adaptation appears to be evaluative in nature: "identify and evaluate citywide protective measures" (City of New York 2011).

The first update report on this plan was released in April of 2014 and it indicated that evaluation of the city's coastal protection measures had been carried out in coordination with "academic institutions, scientists, and designers to develop pilot projects to test potential strategies and evaluate their costs and benefits" (City of New York 2014). The results of this effort was a report called Urban Waterfront Adaptive Strategies (Department of City Planning City of New York 2013), which contained "an inventory of best practices for enhancing coastal resiliency and was used to inform development of the City's coastal initiatives" (City of New York 2011). This report includes analysis of a variety of coastal protection initiatives, providing costs and benefits of different strategies as well as a framework in which managers can narrow down potential strategies to find plans that work best for their communities.

In 2013, the city released an additional plan called A Stronger, More Resilient New York in reaction to the impacts of Hurricane Sandy. The document contains 37 coastal protection initiatives and was also included in the 2014 update (City of New York 2013). Four key strategies guide this plan, taken directly from the report: "increase coastal edge elevations, minimize upland wave zones, protect against storm surge, and improve coastal design and governance" (City of New York 2013). The Progress Report 2014 provides a narrative on progress in these areas, which is focused on implementation and tracks the status of the implementation of the 2011 plan against the stated milestones in a table format ranking status of implementation (City of New York 2014).

For the New York interview, a generic preliminary email was sent to the Governor's office requesting a phone call with an individual involved in the planning of the city's climate adaptation initiatives; response came from an individual involved in the development and implementation of the Water and Wastewater Chapter of the 2013 Stronger, More Resilient New York plan. Therefore, water and wastewater plans are the focus of the interview. This chapter contains 15 initiatives, some of which were already being implemented at the time the plan was created and others that are new (City of New York 2013; New York Interviewee 2014). For those preexisting initiatives such as the Bluebelt Program for storm water management, an effort has been made to keep as many of the same metrics as possible. For new initiatives such as those aimed at protecting wastewater treatment plants in the event of an extreme weather event, tactics haven't yet been decided on. While they are working to quantify progress, they track on a project by project basis in order to understand where they are taking action; there are different ways to track, such as dollars invested, or facilities targeted for protection (New York Interviewee 2014). There is a challenge here in adequately representing what the benefits are in this type of protection; it is not just avoidance or preventing damage, but it's also the benefit of being able to bounce back quickly when you do have a storm and systems are not offline for days at a time. It was noted that putting a metric on that concept is difficult to do (New York Interviewee 2014).

In the case of wastewater management, it does not appear as though there have been tools that have been useful because of how specific the initiatives are – nothing seems to be available that can be applied to the specific situation the department is facing. There was, however, considerable stakeholder engagement during the four and a half month period when the plan was developed. Focus across chapters concentrated on three main questions: what happened during Sandy and why, what could happen in the future under climate change, and what can be done about

it? The biggest bridge to completing the complex report so quickly was strong leadership and an aggressive timeline. The deadline was strict under the same individual who had led the process for PlaNYC. Setting strong targets and getting people on board helped get the plan completed (New York Interviewee 2014).

While the 2014 update report did not include a section that evaluated the strategies of the 2013 Resilient New York document, this is expected to take place when the city updates its sustainability plan in 2015, as it is required by law every four years. When that process takes place, there will be a discussion of whether or not to stick with the current strategies or develop new ones, though they do not necessarily have set targets they are measuring against; it's not necessarily driven by how they are meeting preexisting goals (New York Interviewee 2014). While leadership is a strong bridge, lack of leadership is a potential barrier to moving forward, specifically in terms of administration changes. However, the previous administration moved to put specific items (such as the requirement to complete a sustainability plan every several years) into local law to ensure that this work would continue and to make it at least partially immune to political changes (New York Interviewee 2014). They also ensured that there was ownership of each piece of the plan and that each initiative had a home agency, the goal being even if there is not necessarily a drive from the top down, there is a driver at the agency-level (New York Interviewee 2014).

Seattle, Washington

Climate planning began in Seattle in 2006 with the city's initial mitigation document created in direct response to the Kyoto Protocol (City of Seattle 2006). Since then, Seattle has demonstrated its commitment to climate change mitigation through its ambitious goal of becoming carbon neutral by 2050; it is also the origin city of the Mayor's Climate Protection Agreement, which was started in 2001. In 2013, the city updated its 2006 Climate Action Plan in order to revisit

its mitigation strategies as well as address climate change preparedness more formally for the first time; the new report was a comprehensive update that focuses not only on the strategies of mitigation and adaptation, but also community planning and neighborhood design, a planning focus also seen in SE Florida (Seattle Office of Sustainability and Environment 2013a; Seattle Interviewee 2014). While climate change preparedness is included in the 2013 report, the city is currently undergoing detailed planning of a citywide initiative that focuses specifically on adaptation. There are a few adaptation strategies in the 2013 plan but it is limited, as the city is currently focusing on designing the more comprehensive strategy (Seattle Interviewee 2014). The city's biggest climate impact concerns are sea level, temperature, mountain pack, and participation. To date, much of the city's past and current adaptation progress can be attributed to the utility companies, which are very depended on natural processes and therefore have been considering adaptation for some time. The city looks to build on the progress these companies have made with an upcoming focus specifically on the transportation sector. While the adaptation plan has not yet been completed, it is clear that the city has considered how effectiveness of its future adaptation initiatives will be determined (Seattle Interviewee 2014).

One of the biggest challenges that Seattle recognizes as they look to consider effectiveness measures for adaptation is how to define success of an avoided impact as they look to invest money in adaptation; in essence, there is awareness that they need to show decision makers that they are adapting successfully. They have not been able to answer that question and the interviewee suggested that a good answer for measuring success does not currently exist. The way the city monitors adaptation progress centers around the question of if they are doing the things they said they would do; this concept is focused on more than any specific indicators at this point. Seattle also struggles with how best to make climate change considerations a natural part of decision

making process at all levels of government. The interviewee pointed out that the city already plans for weather conditions, but the issue remains of how to start to build in future climate conditions and account for uncertainty. They struggle with how to create some consistency throughout the government while also allowing flexibility that can lead to creative solutions; this is being work on by trying to build expertise into the planning process (Seattle Interviewee 2014).

As previously stated, Seattle looks to the success of other cities' adaptation initiatives for guidance, though there is also recognition that sharing best practices across cities is somewhat limited, as its utility is dependent on the way adaptation is applied in a specific location as well as the specific strategy that is selected. The example provided in the interview was that New York has decided not to consider a retreat strategy; this limits their coastal solutions because creating major dunes and bigger beaches to address wave attenuation is not an option. Seattle recognizes that a challenge comes from the differences in each specific context of adaptation, though it is anticipated that best practices will emerge more clearly over time. Specifically in the Pacific Northwest, they look to Vancouver and other areas of British Columbia to learn from past experiences. They also learn from New York and New Orleans, considering lessons learned from their recent extreme weather events (Seattle Interviewee 2014).

In addition, they include involvement with the C40: Cities Climate Leadership Group and Urban Sustainability Directors Network as a source of information and learning. The city looks for adaptation planning assistance outside of the government, including work with a number of different consultants. The utilities also contract researchers, but their work is more focused on data downscaling and modeling, whereas other contracted work is more high-level (Seattle Interviewee 2014).

Southeast Florida Regional Climate Change Compact, Florida

The Southeast Florida Regional Climate Change Compact consists of four counties (Broward, Miami-Dade, Monroe, and Palm Beach) and represents a structure that is significantly different from other areas included in this study. The Compact counties are home to 30% of the state's total population, or 5.6 million people; the organization was formed in 2010 in order to address mitigation and adaptation across jurisdictional boundaries (SE Florida Compact 2012). The Institute for Sustainable Communities (ISC) provides logistical and collaborative support for the Compact and the implementation of the region's climate action plan is funded in part by the Kresge Foundation ("Kresge Foundation Awards SE Florida Regional Climate Change Compact \$975,000" 2012). The regional CAP includes 109 cities under the four umbrella counties, twenty-four of which have signed on to the Mayor's Climate Agreement. This organization represents an experiment in regional governance and no regional entity has the ability to move forward with an action on its own (SE Florida Compact Interviewee 2014). In some instances, the cities have more power than the counties and in other cases the situation is reversed. Ultimately, addressing climate issues is a collective action problem and one has to create opportunities for the cities to recognize their own best interests in coordinating their efforts, which is a lot of what the Compact is focused on (SE Florida Compact Interviewee 2014).

The Compact does not appear to be a straightforward or simple structure to manage and it requires a considerable amount of attention and time. ISC can be seen as the secretariat for the Compact, handling a lot of administrative, technical and policy work (SE Florida Compact Interviewee 2014). ISC also helps to secure funding, as does the Nature Conservancy, who is seen as a trusted advisor in the area living shorelines. ISC is instrumental in keeping the Compact well organized and assists the Compact in four main ways: socializing the regional action plan,

supporting communication within the Compact and externally, managing funding to do cost benefit analyses (not yet completed), and the development of a set of indicators to better understand the learning that is taking place (to be completed summer 2014) (SE Florida Compact Interviewee 2014). It is evident that ISC plays a crucial role in the success of the Compact and that the organization's staff is deeply invested in its success.

The formulation of the Compact was considerably organic. One initial catalyst for its creation was that different sea level rise projections were being used by neighboring jurisdictions. Each area was reporting varying rates, inundation scenarios, expected impacts, and different strategies at the city and county level. This resulted in two negative impacts in the area. The first was confusion within the regional media on communicating about these issues and the second was an issue of advocacy; Congressional staff was frustrated because they were receiving different sources of information on sea level rise projections. This led to the development of a uniform sea level rise scenario for the area that was a political activity as much as a science and technical one (SE Florida Compact Interviewee 2014). This need was recognized at an opportune time, as the Kresge Foundation had open-ended funding to start model adaptation projects (SE Florida Compact Interviewee 2014). At the time, the funding was secured for work in Southeast Florida through the Climate Leadership Initiative at the University of Oregon. The staff member that secured this funding moved to ISC, bringing the project along as well. The same individual has been facilitating the process from the beginning, over five years (SE Florida Compact Interviewee 2014).

The Compact recognizes that climate change impact science is evolving and they have worked that dynamic into the planning process; the Compact's science committee has plans to reconvene now that the 5th IPCC report is being released. The Compact's planning structure seems

to be based heavily on the principles of adaptive management and the incorporation of learning into alterations to the plans; new CAPs are to be created every five years to ensure that the best available science is being used in the formation of strategies. This gives the Compact the opportunity to evaluate its current actions on a set timescale. This decision to create new plans every five year came directly from recognition that the science was evolving and that it was important to incorporate new information in the action planning process in order to make it as dynamic as possible, recognizing that many of the early actions were unknown and untested (SE Florida Compact Interviewee 2014). It also recognized from the beginning that working within the new environment the Compact meant there would be a lot of trial and error (SE Florida Compact Interviewee 2014).

The focus to date has been on taking advantage of opportunities as they arise and the primary objective is carrying out a number of workshops focused on specific sectors throughout the different counties. In this first iteration of the plan, much of the focus is on working climate change consideration into land use and transportation infrastructure planning. The goal has been to entrench climate change into the comprehensive growth plans of different areas in order to influences subsequent work plans from the top down; the result is that cities adopt these plans by ordinance (SE Florida Compact Interviewee 2014). Each of the four counties has done this, but in different ways as they are structured differently. Similar to Seattle, the SE Florida Compact is looking past mitigation and adaptation to fundamentally change the way the region is structured and the ways in which communities are organized. This strategy was described as a physical reordering of South Florida that takes into consideration major issue such as mobility within the region (SE Florida Compact Interviewee 2014).

The ISC intends to publish baseline indicators and progress to date by the end of the year; going forward, they will publish annual reports on the status of plan implementation. The ISC is considering a variety of adaptation activities and acknowledged that while there will be a lot of outputs from this work, it is likely not possible to make grand statements about percent reductions in vulnerability. Beyond implementation, the goal is to make a qualitative assessment about improvements to risk, but this is seen as a considerable challenge (SE Florida Compact Interviewee 2014). The Compact is essentially figuring out the M&E components as they go; it was expressed that they may end up looking at a balanced scorecard approach, to be further considered in the summer of 2014. The evaluative efforts are recognized as experimental and ISC must determine how to gather data and present it to the Compact in a way that makes it meaningful; it is anticipated that it is going to take a few iterations to allow for the Compact to react to what is presented in order to figure out what information will aid them in their decision making (SE Florida Compact Interviewee 2014).

In this sense, the biggest bridge is that the group can work effectively together, which is seen as a necessity for adaptive management. Building these relationship and being able to work together despite having different interests were much harder to establish than figuring out the specific processes is expected to be. The overall reflection is that the creation of the Compact has worked out perhaps better than hoped (SE Florida Compact Interviewee 2014). The biggest barrier the Compact currently faces when considering M&E of adaptation strategies is staff time and capacity. The individual championing the effort is looking to his extensive past experience in adaptive management to guide the evaluation process, indicators for which have not yet been developed. The ISC has sufficient resources to make good on their current grant from the Kresge Foundation (which includes the development of the indicators), but ISC sees the need for another

two or three full time individuals supporting the Compact. This is seen as the biggest challenge (SE Florida Compact Interviewee 2014).

5.4 Results in areas where M&E is not being considered

The interview results composing this section did not communicate that M&E was a consideration for climate change adaptation. However, interviews from these areas provide insight into why this consideration may not have taken place. Quotes used come directly from interviewees, though interviewees have been kept anonymous, as has their title/position.

Homer, Alaska

The general impression from both the review of planning documents for Homer and the interview is that adaptation efforts were concentrated around the release of the city's Climate Action plan in 2006 but that no formal update exists or is scheduled to be developed. The main catalyst for Homer's climate action planning was former Mayor James Hornaday's attendance at a national convention on climate change in 2007 (ICLEI Local Governments for Sustainability 2007). This experience led to the creation of the Homer Global Warming Task Force in January 2007; the group was charged with providing recommendations on reducing the city's greenhouse gas emissions and preparing for climate change. Homer joined ICLEI in March 2007 to receive planning assistance and eventually Homer agreed to be "one of five local governments helping to develop ICLEI's Climate Resilient Communities program" (ICLEI Local Governments for Sustainability 2007). The City of Homer Climate Action Plan was published in December of 2007. ICLEI reports that adaptation progress that has taken place, such as designation of larger flood plains in reaction to two 100-year floods occurring in 2002, but an official update report describing adaptation progress has not been created. According to the CAP, climate planning documents created for use in Boulder, Colorado were used as a guide for Homer's CAP development.

The 2007 plan includes mitigation and adaptation initiatives, some with more measurable outcomes than others. According to ICLEI, climate change impacts in Homer were evaluated and three main goals were identified: protect existing infrastructure, undertake emergency preparedness measures, and adopt wise policies for future development (ICLEI Local Governments for Sustainability 2007). The plan does not remark on when an update might take place, but does state “the adaptation recommendations in the Homer Climate Action Plan should be updated as new information becomes available” (ICLEI Local Governments for Sustainability 2007). A document released by ICLEI three years after the implementation of the plan began states that most effort has revolved around addressing “current problems with knowledge that climate change may make recently experienced impacts more severe” (ICLEI Local Governments for Sustainability 2007). At that time this document was released, Homer had “not yet proposed major changes or relocation of low-lying infrastructure” due to issues of funding, though low-cost upgrades were reported as having taken place (ICLEI Local Governments for Sustainability 2007).

Within the formal plan, a section on implementation was included and focused on the creation of a “Sustainability Fund” intended to provide monetary support for the implementation of the CAP (ICLEI Local Governments for Sustainability 2007). The report lists possible revenue streams, including public and private grant funding, a tax on fuel transferred within the city, and a fee to park at the Homer Spit. The CAP identifies twelve ways in which these funds might be used, including the creation of handbooks, sponsorship of city events that address global warming issues, updates on climate change information on the city’s website, and the completion of applications for grant funding for the implementation of the CAP (ICLEI Local Governments for Sustainability 2007). The CAP lists one city staff member in its acknowledgement section, intended to be the primary contact for this study, but the individual no longer works for the city.

This particular individual's departure from the city's government was mentioned in the interview, as they had been considered the champion of the planning process and the initiative is no longer the prime duty of any one staff member. It was noted that it is still being worked on and there is a position within the Public Works Department that is involved to some extent in tracking cost savings from energy reduction efforts specifically for government-owned buildings and transportation; however, the interviewee stated that improvements could be made on quantifying and tracking this information. It was mentioned in the interview that a PhD student is currently conducting research on enabling conditions for climate change adaptation planning (not specific to M&E) in Alaska and that this student found that the city has fallen short in terms of ongoing measurement by only measuring the energy use of government structures (Homer Interviewee 2014).

According to the interview, the best thing to come out of the 2007 CAP is considered to be the energy fund – money saved from energy use adjustments in the structures will be built back into the fund for future energy work. There is not a formal plan to revisit the CAP but it has not been dropped either. In general, the biggest barrier the city faces when it comes to climate planning is capturing the attention of the city council to provide funds; the challenge is that it is a lot easier to do so if you can show a return on the council's investment by demonstrating that spending funds is going to save funds. There is continual pressure in Homer to do more with less and this is a barrier to adaptation planning. The most significant bridge that has allowed Homer to move forward with climate change action planning in general are the progressive community values of the city. The environmental concern of non-governmental organizations is strong; the community values climate action and environmental stewardship. A Comprehensive Plan for the city was released in 2010 and while it includes a chapter on energy usage, this was not initially planned; a

group of middle school students attended a city council meeting regarding the Comprehensive Plan and asked that energy be considered in a manner similar to Juneau. It was decided after that council meeting to include a chapter on energy usage in the Comprehensive Plan (Homer Interviewee 2014).

Kauai County, Hawaii

The State of Hawaii requires that adaptation be considered in all decisions at varying levels of local government, though specific guidelines are not included (Kauai Interviewee 2014). Kauai County published its “Operations Sustainability and Action Plan” in 2013. This document includes a section on anticipating climate change, which has the goal of monitoring and preparing for the “impacts of sea level rise on County facilities and operations” (City of Kauai 2013). The document acknowledges that Kauai must “exert considerable efforts and funding to improve data collection methodologies” and that “better metrics will generate more accurate results” but these statements are related the full set of goals, not specifically the one that aligns with adaptation efforts (City of Kauai 2013). The two strategies under the goal of preparing for climate change are to assess the projected impacts of climate change, including drought, flood, and sea level rise. These goals do not include any actual adaptation actions (City of Kauai 2013). This lack of M&E consideration for adaptation was reflected in the interview, which was with an individual specifically involved in the regulatory process of shoreline setback for the County.

In 2008, the County passed a Shoreline Setback and Coastal Protection Ordinance (No. 863). This ordinance requires development projects are planned at an increased distance from the shore. While this may seem like a climate change adaptation strategy, it actually came about from a study on erosion projections for the island and the set back is not based off of climate change data or expressly established to address climate change sea level rise. There is a request, however,

that the County of Kauai consider including an additional 20-foot requirement for shoreline development projects as an interim step while a comprehensive sea level rise analysis is completed for the state. Because the state is undergoing a sea level rise vulnerability assessment at the current time, the interviewee expressed that it was too early for there to be considerations of M&E for adaptation strategies, but that once the report is finished, it is expected that a number of counties will begin to incorporate the projection included in the study into their regulations (Kauai Interviewee 2014). The University of Hawaii and Sea Grant have made statements about what sea level rise would look like if certain areas of Hawaii saw specific increases, but these are not the type of robust statements that have led to regulation changes. There is awareness that the development sector and shoreline property owners are going to want to see clear scientific analysis driving regulation, as there is considerable threat of lawsuit in any case where expensive shoreline properties are threatened (Kauai Interviewee 2014).

6 Discussion

Barriers to M&E recorded during the interview process reflect several of the challenges expressed in the 2013 UKCIP document referenced in Section 1.3. For example, Chula Vista expressed the concern that the impacts they are preparing for may not take place for decades. Seattle discussed its concerns regarding the uncertainty of the timing and intensity of impacts, as well as the challenges associated with sharing best practices across different contexts and locations. Seattle and New York mentioned the challenge of demonstrating the success of an avoided impact. Several of the UKCIP challenges were not mentioned, including the idea of shifting baselines, the ability to determine attribution, and challenges to understanding the meaning of specific terms used in different contexts. Perhaps this suggests that while considerations of M&E have exposed certain challenges, focus on the topic has not yet led to awareness of additional challenges that may become more evident as discussions of M&E continue. Regardless, it is

evident from this rapid appraisal that M&E for climate change adaptation is in the preliminary stages of being considered for and incorporated into climate action plans; there is much improvement that could be made in terms of moving the field forward within the United States.

At the onset of this project, two methods for determining progress of climate change adaptation planning were explicitly targeted to understand the extent to which they were occurring: implementation and effectiveness. It was clear that implementation tracking was occurring in many locations based on the CAP updates released, yet the question remains as to which areas looked to move towards understandings of effectiveness. However, it seems as though the concept of creating new plans or implementing new strategies may be taking place without evaluation of current strategies. While revisiting strategies is not the same as evaluating effectiveness, it seems to be more robust than tracking implementation. This was seen in New York where plans are updated every four years, and SE Florida, where plans are updated every five years. Revisiting plans and considering new strategies allows for plans to be updated based on the newly available science, which should improve the planning process in that it allows adaptation planners to reconsider assumptions made under the best available science at the time when the strategies were created. While this is not an understanding of the impact strategies have made on adaptation overall, it is perhaps one way to make adaptation planning more robust in cases in which M&E planning is encountering road blocks.

Many areas still struggle with the challenge of securing adequate funding and other resources to move forward with adaptation in general as well as M&E specifically. It seems as though there is a role to play in better demonstrating the need for improvement in the field to potential funding sources such as the third sector and subsequently linking cities that are poised to move forward with adaptation (yet lacking funds) with potential funders. This may be especially

important as areas are looking to make considerable changes to their entire structures in order to adapt to projected changes in the areas. In a 2013 article by Joyce et al. on mitigation and adaptation strategies in North American rangelands, the authors discuss the concept of system transformation, which is said to be needed when a system can no longer adapt to climate change (Joyce et al. 2013). It seems as though this concept is being considered in the areas of Seattle and Southeast Florida, as these two areas are looking past adapting their current development plans in order to reorganize the complete underlying structure of the city plans. As these major changes are seen as needed, securing funding to make necessary changes, as well as the staff that is required to carry out plans, is going to be essential.

7 Conclusion

Perhaps we are not yet to a point where there is adequate understanding of the need to demonstrate effectiveness of adaptation strategies, that we are still in the mindset that “doing good” and implementing strategies is enough to protect communities from the impact of climate change (Bours, McGinn, and Pringle 2013). This study concludes that a significant gap exists relating to the dissemination of information on monitoring and evaluation of adaptation as well as the guidance and assistance needed to organize and implement complicated plans. Due to the extremely area-specific nature of adaptation, it makes sense that conversations and collaboration are beneficial for achieving progress, yet frameworks for adaptation M&E were not mentioned as helpful or as having even been referenced. It is important to point out that just because they were not referenced as being used. Because sharing lessons learned appears to be so important, there is a role to play in disseminating information and sharing lessons learned in such a dynamic field. It remains clear that adaptation must continue to take place and the more success that can be demonstrated, the better the case for advancing the practice, as was reflected specifically during the interview with Chula Vista (Chula Vista Interviewee 2014).

While it appears as though no one set of guidelines nor suite of tools is utilized by the areas considered in this study, assistance in the form of collaboration across locations does appear to be key. Whether this is through formal regional governance structures such as the Southeast Florida Climate Change Compact, by sharing lessons learned, as was the case with Seattle and the surrounding Pacific Northwest cities, or through support of a regional collaborative such as the San Diego Foundation, a major take away of this study is the importance of an open dialogue between practitioners. Because of the complicated and local nature of climate change impacts, it seems unlikely that any one set of tools will be perfectly adaptable to a variety of areas. Therefore, it a potential next step would be to work to foster dialogue between places that are explicitly considering M&E by bringing these interested parties together to discuss the concept outside of a more general focus on adaptation planning. It is assumed that discussing M&E apart from general adaptation strategies would be easier in the context of a workshop, e.g., Homer ex-mayor, or focus group specifically targeting evaluation.

In the end, climate change adaptation planning is still new in the United States and this fact has not been lost on the areas of focus; most of the interviewees stressed that they were either one of the first places to engage in climate adaptation planning, that they had received special recognition for their efforts, or that they had clear goals of progressing in tracking systems such as the C2ES site. Indeed, these places have made considerable strides in a climate change strategy that is hard to plan, fund, and administer. Monitoring and evaluation is far from prevalent, but this is not surprising in such a new and emerging field; however recognizing this gap and the challenges that have led to it is important for organizations looking at lend assistance and expertise as local governments start to contemplate this issue. For these reasons, the concept of the rapid appraisal completed for this study must be supplemented with a more comprehensive survey to

understanding what areas in the United States are struggling with moving forward with M&E. This study found that isolating M&E from the full adaptation planning system was challenging. In order to learn more in the form of a survey, it is suggested that a survey be created in which practitioners align the status of their projects with example situations instead of answering closed-ended question which may be misunderstood. Better understanding the areas that are considering monitoring and evaluation for climate change adaptation can help to foster dialogue and increased collaboration across regions and create a network into which best practices for M&E can be shared.

8 References

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9 Appendices

APPENDIX 1: The case for monitoring and evaluation across sectors

The following section provides information on the need for monitoring and evaluation demonstrated by a variety of organizations. While it is not an exhaustive review of available material, it is intended to give a sense of the state of the conversation on M&E outside of the United States.

There is recognition across sectors that not only do adaptation strategies need to be implemented, their impact on adaptation must also be tested and reviewed; the problem is too complex and not well enough understood to assume progress is being made (Bours, McGinn, & Pringle, 2013). Academia has begun to analyze the gap in evaluation, but practical steps are also being taken by development organizations, national and city governments, private foundations, and non-governmental organizations, reflecting a cross-sectoral recognition of the need for effective evaluation of adaptation efforts. As unique challenges make M&E planning difficult, there is a strong need to support practitioners looking to evaluate their strategies such they have confidence that their adaptation efforts are producing real, measurable results. While interest in this topic from each of these sectors is evident, their reasoning for sound M&E seems to differ depending on the angle from which they are viewing the need to adapt to climate change, though some trends are apparent across all sectors such as the ability to determine if stated objectives were achieved and the difficulty of creating effective M&E plans. Because it is not clear what specific challenges climate change will pose, it is also unclear how to measure progress in the field of adaptation; current attempts to do so reflect different interpretations of the problem (Bours et al., 2013).

Consideration of M&E for climate change adaptation is not only happening in academia; a number of sectors have begun addressing M&E for a variety of purposes. The United Nations Development Program (UNDP) began stressing the need for climate change adaptation M&E as early as 2007 in the report “Monitoring and Evaluation Framework for Adaptation to Climate Change” (UNDP, 2007). Recognizing the importance of M&E as it relates to development investments stemming from the Special Climate Change Fund and the Least Developed Country Fund, this document recognizes that the impacts of climate change may not be expected until long after the conclusion of each development project of focus. Yet, there is still a need to imbed adaptation and resilience into projects even if the outcomes may not be measureable during the life of the project. In this sense, the UNDP points out a need for M&E that involves process-based indicators as a way to shorten the timeframe in which managers can evaluate progress (UNDP, 2007). M&E for CCA was revisited in 2013 when UNDP acted as a partner on the “Community Based Resilience Assessment (CoBRA) Conceptual Framework and Methodology,” in which the importance of continual monitoring is stressed as a way to assess the impact of interventions that have changed in scale or are completely new initiatives (United Nations Development Programme, 2013).

In supporting sustainable international development, the Global Environment Facility (GEF) has been heavily involved in addressing M&E for CCA and thus has demonstrated the need for effective frameworks for the implementation of such strategies. GEF has also made requests for improved integration of monitoring and evaluation into results based management by the Adaptation Fund, signifying the importance of this issue (Adaptation Fund, 2010). In a presentation to the Adaptation Fund Board’s Ethics and Finance Committee, Robert van den Berg, Director of the Evaluation Office of GEF stressed the “link between monitoring and evaluation

and results-based management,” arguing that “evaluation could provide an important ‘reality check’ to ensure that an organization was achieving its pre-determined objectives and targets” (Adaptation Fund, 2010). Monitoring and evaluation became a continual theme for the AF in subsequent board meetings and frameworks.

Numerous documents indicating the need for sound M&E practices for CCA have been released in association with GEF over the past five years. In 2008, GEF commissioned a study that was funded by the Department for International Development and produced by the Institute of Development Studies called “Evaluation of Adaptation to Climate Change from a Development Perspective” (Hedger et al., 2008). This publication discusses the role that M&E plays in understanding what has truly been accomplished thus far in the field of M&E for CCA. However, M&E is also important for other, more specific reasons. These reasons, as cited in the 2008 report, include leveraging funding and support when success is demonstrated, generating political momentum, helping to evolve approaches to evaluation of development assistance, and creating a better understanding of the ways in which development and adaptation are linked (Hedger et al., 2008).

Furthermore, GEF acknowledges that as of 2008, it was likely that adaptation initiatives throughout the world would increase in scale due to increases in funding from sources that included Official Development Assistance, the Adaptation Fund, and private foundations. At this point in time, they also recognized that United Nations Framework Convention on Climate Change (UNFCCC) was and would continue to focus on deliverables of CCA; GEF stressed that in light of these likely investments, M&E is necessary to ensure that “funds are spent equitably, efficiently, and effectively in ways that will provide flexibility and are sustainable within development efforts” (Hedger et al., 2008). The following year, GEF released “Implementation of Results-Based

Management under the Least Developed Countries Fund and the Special Climate Change Fund” (LDVF and SCCF, respectively). In conjunction with the approval of this document by the LDCF/SCCF Council, GEF Agencies were also required to monitor and report on progress annually (Global Environment Facility, 2009).

GEF’s focus on M&E for CCA was also apparent in 2011 when the organization hired a consultant to work with the group Climate-Eval on “Tracking Progress for Effective Action: A Framework for Monitoring and Evaluation Adaptation to Climate Change” (Sanahuja, 2011). This document, focused on disaster risk reduction, references the same cases for CCA M&E as listed in the 2008 document, but revisits the topic to stress that monitoring is important to address deviations in plans and adjust actions as necessary, allowing for assurance that “deliverables are being achieved” (Sanahuja, 2011). This is especially important in light of the potential for significant future investments in adaptation, when M&E will “become a key component in measuring progress and effective performance of expenditures” (Sanahuja, 2011).

In 2012, GEF introduced the “LDCF/SCCF Adaptation Monitoring and Assessment Tool (AMAT)” as a way to specifically look at portfolio-level progress towards reaching desired outputs, with evaluations being conducted three times over the life of a project (Global Environment Facility, 2013). This initiative, currently in a pilot phase in which Agencies can include indicators that relate to specific projects but also tie into portfolio objectives, is a way in which the organization is continuing to address how to best monitor and evaluate progress at the portfolio-level (Global Environment Facility, 2013). The fact that GEF has revisited the topic of M&E for CCA a number of times since 2008 and is currently in the pilot phase of AMAT suggests that the organization recognizes that there is more to be done in order to determine the best way to

implement M&E for development projects, despite the amount of attention it has already paid to the topic.

The Organization for Economic Co-Operation and Development (OECD) addressed CCA M&E a 2012 paper “Monitoring and Evaluation for Adaptation: Lessons from Development Co-operation Agencies” and then again in a 2013 paper “National Adaptation Planning: Lessons from OECD Countries” (Lamhauge, Lanzi, & Agrawala, 2012; Mullan, Kingsmill, Matus Kramer, & Agrawala, 2013). OECD presents three challenges to assessing the progress of OECD adaptation plans, the third being that many adaptation plans have been at such a high-level focus and therefore have limited detail, that progress towards creating sound M&E plans is very limited. The organization looks to M&E as a way to ensure “political support for government action and therefore support for continued funding” but also points to it as a way to “identify what works and what does not, thereby helping adaptation programs [sic] to improve their effectiveness over time” (Mullan et al., 2013). Similar to other development organizations, OECD recognizes that “monitoring progress is an inherently complicated task, because some of the most important outcomes (e.g. reducing deaths in heat waves and floods in the 1940s) will not be measurable for decades to come” (Mullan et al., 2013).

In “An Operational Framework for Tracking Adaptation and Measuring Development (TAMD)”, the Institutional Institute for Environment and Development (IIED) noted an increase in focus on climate change adaptation among developing country governments, their ministries, departments and agencies, international institutions, donor governments, and Multilateral Development Banks, in addition to other development agencies and institutions. As the attention paid to adaptation increases within this community, IIED recognizes the need for “results frameworks that enable these stakeholders to assess the success of adaptation interventions”

(Brooks et al., 2013). While results frameworks often use ratios of outputs and inputs to assess the level of efficiency of adaptation investments, IIED argues that this approach is too narrow. In the TAMD framework, IIED approaches the topic from a wider view as a way to shift the overall focus to the “issue of effectiveness, or how well adaptation interventions and investments perform in delivering their stated objectives (i.e., with respect to intended outcomes and impacts)” (Brooks et al., 2013). The need to address these perceived shortcomings of current results frameworks led to the creation of the TAMD framework, which IIED states “is sufficiently practical, flexible and transparent” and can be “applied in, or modified for, a wide variety of contexts and over a range of different scales, from the national (and supranational) to the local” (Brooks et al., 2013).

The “Learning to ADAPT: monitoring and evaluations approaches in climate change adaptation and disaster risk reduction – challenges, gaps and ways forward” document published by Strengthening Climate Resilience (SCR) in 2012, recognizes the increase in focus on M&E for CCA, viewing its approach as just one contribution to “the emerging debate on monitoring and evaluation in the context of climate change adaptation and disaster risk reduction” (Villanueva, 2010). This document makes a similar case to that of IIED, in that SCR highlights issues with M&E approaches that focus on inputs and outputs versus processes. As SCR argues, “evaluation approaches implicitly assume that once appropriate measures are identified and projects implemented, this will protect communities against climate impacts. In other words, the focus is on the ‘what’ rather than on the how or why” (Villanueva, 2010). Therefore, monitoring and evaluation of adaptation strategies is especially necessary through process-based, dynamic approaches, which the adaptation community currently lacks (Villanueva, 2010).

Intergovernmental organizations have also demonstrated the challenges of and need for monitoring and evaluation for climate change adaptation through a number of frameworks and

documents. The UNFCCC has highlighted the need for effective monitoring and evaluations of climate change adaptation initiatives in multiple releases, including a 2010 synthesis report on “effects undertaken to monitor and evaluate the implementation of adaptation projects, policies, and programs” (United Nations Framework Convention on Climate Change, 2010). M&E of adaptation initiatives is important to the UNFCCC because it allows for practitioners to determine the effectiveness of an adaptation initiative as it relates to its stated objectives through an unbiased and systematic approach. As part of the adaptation process, M&E also allows decision makers the opportunity to alter their targets and processes based on monitoring results, which is especially important in light uncertainty (United Nations Framework Convention on Climate Change, 2010). The UNFCCC also mentions the role M&E plays in understanding the justification of financial support of CCA efforts.

In 2012, the United Nations Environment Programme (UNEP) released its “Ecosystem-Based Adaptation Guidance: Moving from Principles to Practice” (Travers, Elrick, Kay, & Vestergaard, 2013). This document presents two forms of monitoring and evaluation that together can help to make the case for ecosystem-based adaptation (EBA) by advocating for adaptive management, transparency, and accountability. The two types of M&E are long-term and project which intend to “support the generation of an evidence base for decisions making with respect to EBA” (Travers et al., 2013). Through context-specific indicators presented in the “Ecosystem-Based Adaptation Guidance,” it is intended that decision makers are able to generate such evidence. Within UNEP’s guidance, M&E is said to be instrumental in informing the “process of selection [and] design and implementation of initiatives selected with an EBA lens.” The M&E guidance in this document aim “to shape the key questions to be addressed in the project design phase and through the life-cycle of the EBA initiative.”

In the 2012 “Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation” special report by the Intergovernmental Panel on Climate Change expressed “high agreement” with “robust evidence” that “an iterative process of monitoring, research, evaluation, learning, and innovation can reduce disaster risk and promote adaptive management in the context of climate extremes” (IPCC, 2012). As the report states, gaps in knowledge associated with the complexity, uncertainty and long-time frames inherent of climate change adaptation can be addressed though improved observation and research that is used in the design process of adaptation strategies. The report continues by pointing to the need for avenues in which practitioners can engage in “joint target setting, coordination, monitoring, and evaluation” in order to improve the definition of roles and responsibilities of governments and non-governmental organizations and to ensure limited duplication of efforts. It appears as though this coordinated approach to M&E for climate adaptation has yet to be developed (IPCC, 2012).

Regional and national governments have also begun to express the need for improved M&E for CCA. In 2009, the European Topic Centre on Air and Climate Change (ETC/ACC), now the European Topic Centre on Climate Change impacts, vulnerability and Adaptation (ETC/CCA), discussed the issue in a technical paper on the development of indicators for CCA (Harley & van Minnen, 2009). Special attention was giving to the “vulnerability of European biodiversity to climate change” (Harley & van Minnen, 2009). The need for M&E in this instance was centered on policy initiatives; it was highlighted that decisions-makers need to be able to understand climate change impacts and react to them, not only from an environmental health standpoint, but also in terms of social and economic systems (Harley & van Minnen, 2009). The document points out a number of reasons why effective indicators are needed as part of M&E. First, indicators for evaluation of CCA policies can help to “simplify, quantify, standardize and communicate complex

and often disparate data and information” (Harley & van Minnen, 2009). Furthermore, M&E is addressed in relation to funding streams, as indicators can “target, justify and monitor funding for adaptation programs;” these indicators can also aid decisions makers in communicating about their work with other sectors as well as compare successes to other projects in different “sectors, regions and countries” (Harley & van Minnen, 2009). The ETC/ACC also looks to the role that indicators can play in informing “climate change negotiations in the international political arena” and “mainstreaming adaptation through links between sectors and related indicators” such as biodiversity/water and climate change impacts (Harley & van Minnen, 2009).

The ETC/ACC goes further to provide five specific instances in which it is expected sound M&E can be used. The following list has been taken from the 2009 technical paper:

- Member State governments wishing to evaluate the success of national adaptation policies and inform future policy development;
- European institutions and agencies wishing to evaluate the standard of adaptation across the EU and within Member States to justify funding and program [sic] decisions;
- European funding bodies wishing to evaluate the impact of adaptation supported across the EU and within Member States to account for funding and inform program [sic] planning;
- International community wishing to develop a comparative measure of the adaptation status of the EU and its Member States in the context of international climate change negotiations; and
- International funding bodies (to which EU Member States provide substantial resources) wishing to evaluate the impact of adaptation supported across especially non-Annex I (developing) countries to account for funding and inform program [sic] planning (Harley & van Minnen, 2009).

In 2013, ETC/CCA released an update on the status of its adaptation indicators, in which several of the sentiments regarding the need for M&E listed above were reiterated (Hildén & Marx, 2013).

Within the EU, the United Kingdom's Department for Environment, Food & Rural Affairs (DEFRA) has addressed the need to measure climate change adaptation such that citizens have confidence in the decisions of the EU and that governmental programs aimed at addressing climate change adaptation are "achieving maximum value for money" (DEFRA, 2010). DEFRA spoke to the importance of M&E for CCA in the 2010 report "Measuring Adaptation to Climate Change – A Proposed Approach" (DEFRA, 2010). This document also points to M&E as a way for governments to back efforts that strive to ensure public services and the economy are adequately prepared for the impacts of climate change. Measurement of adaptation can help the government decide on how to allocate resources and direct efforts to those areas that need the highest degree of support in adapting to climate change (DEFRA, 2010). Climate change is anticipated to impact some of the most vital aspects of society such as public health, energy supply, water supply, and transportation, and therefore, the EU views their understanding of the impacts of CCA as "crucial" (DEFRA, 2010).

United Kingdom's Climate Impact Program (UKCIP) "supports adaptation to the unavoidable impacts of a changing climate" and acts as a resource for those looking to incorporate climate change into adaptation concepts (Bours et al., 2013). In 2011, the group published the AdaptME Toolkit, which takes the form of both a framework report and an online resource. Created in response to "a growing demand for practical support in evaluating adaptation progress and performance," this resource discusses the need for CCA M&E as a way to "stimulate [sic] a process of ongoing improvement" and determine how well an adaptation intervention may have worked (Pringle, 2011). According to the AdaptME toolkit, M&E has a role to plan in effectiveness, efficiency, equity, accountability, assessing outcomes, learning, bettering future interventions, and making comparisons between projects. UKCIP also views M&E as a way to

assist practitioners in better understanding adaptation from the viewpoint of different stakeholders (Pringle, 2011). Still, UKCIP stresses that the most important role that CCA M&E plays is related to continual learning, that M&E will enable more informed decisions to be made in the future, thus “strengthen[ing] future adaptations”(Pringle, 2011).

In 2013, UKCIP released, in partnership with the organization Climate-Eval, a report called “Monitoring & Evaluation for Climate Change Adaptation: A Synthesis of Tools, Frameworks and Approaches” (Bours et al., 2013). Dr. Saleemul Huq, Director of the International Centre for Climate Change and Development, provides an introduction to this document, cautioning that while many stakeholders have begun to implement adaptation strategies, there is not yet a clear understanding of what works and what does not, as well as why or how results are realized. Evaluation methods, Dr. Huq stresses, must be able to evaluate their progress at a variety of levels, from international down to individual households and it is important to understand what works so that best practices can be shared among the adaptation community (Bours et al., 2013).

The Australian Government has paid similar attention to M&E for CCA, acknowledging that effective M&E was essential in a number of reports since the release of their National Climate Adaptation Program in 2007, such as the 2012 “A Plan for Implementing Climate Change Science in Australia” (Department of Climate Change and Energy Efficiency, 2012). In 2013, the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education released “Climate Adaptation Outlook: A Proposed National Adaptation Assessment Framework”, described as “the first of a structured series of reports on how well placed Australia – including its businesses, communities and institutions – is to manage the impacts of unavoidable climate change” (Department of Industry; Innovation; Climate Change; Science; Research and Tertiary Education, 2013). This report discusses how Australia is especially vulnerable to climate risks and

because of this, adaptation is important for the country. The government acknowledges through this report that it is “vital” for Australia to understand how effective it is in terms of CCA, as the risks from climate change threaten the economy, communities, and the natural environment.

From the environmental standpoint, Natural England is a non-departmental public body that operates under the Secretary of State for DEFRA. This group is explicitly focused on the protecting and improving the country’s natural environment, boasting collaborative efforts with stakeholders as diverse as farmers, city planners, researchers and scientists, as well as the general public (“About Us,” n.d.). In July of 2010 the Natural England-commissioned report “Climate Change Adaptation Indicators for the Natural Environment” recommended indicator development for the adaptation of natural systems across areas managed by DEFRA (Natural England, 2010). The organization points out that “there is a need to shift from work that purely aims to build adaptive capacity to work that also results in the delivery of adaptation” and because of this, indicators to measure adaptation progress are needed (Natural England, 2010).

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APPENDIX 2: Interview Template

General overview: Thank you for taking the time to participate in this interview. The purpose of this study is to better understand the challenges that major cities face in planning for the uncertain impacts of climate change. As a city that already has engaged in this process through the development and implementation of a climate change adaptation plan, your insight into the process is helping in further developing this field. This study is specifically focused on the monitoring and evaluation aspect of climate change adaptation planning.

Sample interview structure and questions:

- Have you been able to review the research purpose and objectives previously sent to you?
Do you have any further questions regarding the intentions of this study?

Answer any questions and state purpose and goals if needed.

- Tell me about the current state of climate adaptation planning in your city?
 - When was the plan first implemented?
 - Who is responsible for the implementation of the plan?
- What was your role in creating the plan? To what extent are you still involved in its development/ implementation?
- Monitoring and evaluation plans are those that allow managers to determine what is working (so it can be more thoroughly exploited) as well as what isn't working (so it can be corrected). Is monitoring and evaluation part of your city's current climate change adaptation plan?
→ If yes, what is the status of this plan? (Planned, partially implemented, fully implemented)

If yes, are there materials or resources that have guided your development/implementation of this plan?

Are there any clear next steps the city plans to take?

→ If no, what are the obstacles to implementing this type of evaluation? Has it been attempted, discussed or considered to date?

- What would it take for your city to reach its desired goals when it comes to monitoring and evaluation of climate change adaptation?
- Are there specific tools and resources you've heard about for developing this type of plan, whether they have been consulted or not?
- Each city being looked at through this study has a mitigation plan in addition to one focused specifically on adaptation. Tell me about the development of mitigation metrics and how that process was similar or different from the consideration of adaptation ones.
- Has it been easier or harder to address mitigation or adaptation? In what ways?

APPENDIX 3: City profiles, plan overviews, and interview notes

Appendix 3 provides background on climate change planning in each area, specifically focused on adaptation planning. It also includes full summaries from the interview conducted.

A3.1 Chula Vista, California

RELEVANT PLANS

Climate Adaptation Strategies, Implementation Plans (May 2011)

Climate Action Plan, Implementation Progress Report (November 2013)

BACKGROUND AND CLIMATE PLANNING OVERVIEW

Population: 243,916(U.S. Census Bureau, 2011)

Initial planning date: 2000

Leading department: Public Works

CAP stage: implementation (adaptation), review (mitigation)

Planning partners: SDC Climate Collaborative

Chula Vista has received a number of awards related to their climate planning work, including recognition from the EPA, ICLEI-Local Governments for Sustainability, California Sustainability Alliance, California Center for Sustainable Energy, San Diego Gas & Electric, Sierra Club, and EarthWorks San Diego (Climate Change Working Group, 2011). According to the City of Chula Vista Climate Action Planning – Climate Change Working Group website, the city started implementing its first CAP (Carbon Dioxide Reduction Plan) in 2000 (City of Chula Vista, 2013b). Updated climate change mitigation strategies were added to this report in 2008, with adaptation strategies first appearing in the 2011 “Climate Change Adaptation Strategies, Implementation Plans” document (City of Chula Vista, 2013b). The city has created a multi-stakeholder group called the Climate Change Working Group (CCWG), made up of residents, businesses, and community organization representatives, that is specifically focused on these issues, including the development of these plans and their associated strategies (City of Chula Vista, 2013b).

The CCWG was involved in a climate change impact assessment, from which the climate adaptation plan was developed; the group recommended eleven adaptation strategies within the

following sectors: energy and water supply, public health, wildfires, ecosystem management, coastal infrastructure, and the local economy sectors (Climate Change Working Group, 2011). The expected impacts of climate change in the area as expressed in the 2011 Implementation Plans are “hotter and drier weather, diminished imported water supplies, more poor air quality/heat wave days, more frequent wildfires, shifts in habitat and species distribution, and increased rates of sea level rise” (Climate Change Working Group, 2011).

The CCWG was asked by the City Council to provide additional details on their adaptation strategies, which included implementation plans that address timelines, steps and costs. Each strategies has its own implementation plan provided in the 2011 Climate Adaptation Strategies document include an overview of climate change impacts, the programmatic approach to addressing the impact, performance metrics, a timeline, and expected financial needs for implementing the strategy. It was reported that 49% of the total \$554,000 would be provided to be begin implementation of eight of the eleven strategies each year for three years and other potential funding sources include state and federal grants, utility public good charges, and offset/mitigation fees (Climate Change Working Group, 2011). The strategies can be found in Table 1.

Table 1: Climate adaptations strategies for Chula Vista, Florida, taken directly from the 2011 plan (Climate Change Working Group, 2011):

#1: Cool paving	#7: Extreme heat plans
#2: Shade trees	#8: Open space management
#3: Cool roofs	#9: Wetlands preservation
#4: Local water supply and reuse	#10: SLR and land development codes
#5: Storm water pollution prevention/reuse	#11: Green economy
#6: Education and wildfires	

Performance metrics for the eleven strategies mostly focus on implementation indicators. The first strategy, cool paving, includes two metrics: the temperature reduction achieved in cool paving test sites as well as the extent to which these technologies are used throughout the city (Climate Change Working Group, 2011). Another example is strategy four, for which metrics are

the number of new residential and commercial projects that engage in new water management design and standards as well as funding for the retrofitting of existing buildings with water collection and reuse systems. Within the education and wildfire initiative, one metrics is focused on impact, as the city looks to understand changes in “community awareness from outreach and education” though the use of surveys (Climate Change Working Group, 2011).

In the November 2013 update, Chula Vista used four implementation progress stages:

1. Completed: all required implementation steps have been completed
2. Ongoing: all required initial steps have been completed, but components is still actively being implemented
3. In progress: implementation steps are still being developed and pursued based on the original implementation plan
4. On-hold: implementation has not proceeded due to a programmatic barrier (such as funding)

The report indicated that 67% of the adaptation strategies were either completed or ongoing and another 37% were still being actively pursued. One only adaptation strategy remained in the on-hold category at the time of the November 2013 update (City of Chula Vista, 2013a).

A3.2 Homer, Alaska

RELEVANT PLANS

City of Homer Climate Action Plan (2007) – *includes mitigation & adaptation measures*
Comprehensive Plan (2010) – *includes energy plan*

BACKGROUND AND CLIMATE PLANNING OVERVIEW

Population: 243,916(U.S. Census Bureau, 2011)

Initial planning date: 2000

Leading department: Public Works

CAP stage: implementation (adaptation), review (mitigation)

Planning partners: SDC Climate Collaborative

According to an ICLEI case study on Homer's climate adaptation progress, the city's CAP was created after Mayor James Hornaday attended a national convention on climate change in which experts presented on science and policy; this was the catalyst for the creation of the Homer Global Warming Task Force (ICLEI Local Governments for Sustainability, 2007). The Task Force was commissioned in January 2007 and was charged with providing recommendations on how to reducing GhG emissions and prepare for climate change. Homer joined ICLEI in March 2007 to receive planning assistance and eventually Homer agreed to be "one of five local governments helping to develop ICLEI's Climate Resilient Communities program" (ICLEI Local Governments for Sustainability, 2007). The case study document describes adaptation progress that has taken place, such as increased flood plains in reaction to two 100-year floods occurring in 2002. However, an official update report describing CAP progress has not been created. According to the CAP, the plan was modeled after Boulder's climate program.

The 2007 City of Homer Climate Action Plan includes both mitigation and adaptation measures. The main adaptation objectives are:

- Be proactive in helping to create a resilient local economy;
- Protect existing infrastructure from the impacts of climate change;
- Undertake emergency preparedness measures to reduce risks related to climate change; and
- Adopt wise policies for future development (City of Homer, 2007).

Within these four objectives, a number of strategies were created. Some initiatives are measureable, such as "increase fire fighting capability" while others are more general, such as "anticipate and promote new opportunities in local agriculture" (City of Homer, 2007). The plan does not remark on when an update to the plan might take place, but does state "the adaptation

recommendations in the Homer Climate Action Plan should be updated as new information becomes available” (City of Homer, 2007).

A section on implementation is included in the plan, which focuses on the creation of a “Sustainability Fund” intended to monetarily support the implementation of the CAP. The report lists possible revenue streams, including public and private grant funding; a tax on fuel transferred within the city; and a fee to park at the Homer Spit. The CAP identifies twelve ways in which these funds might be used, including the creation of handbooks, sponsorship of city events that address global warming issues, updates on climate change information on the city’s website, and apply for grant funding for the implementation of the CAP (City of Homer, 2007).

A3.3 Kauai County and State of Hawaii

RELEVANT PLANS

Shoreline Setback and Coastal Protection (Ordinance No. 863) (2008)

County of Kauai Government Operations GHG Inventory 2007-2011 (2012)

County of Kauai Operations Sustainability and Climate Action Plan (2013)

BACKGROUND AND CLIMATE PLANNING OVERVIEW

Population: 67,091 (U.S. Census Bureau, 2011)

Initial planning date: 2000

Leading department: Mayor’s Office

CAP stage: vulnerability assessment

Planning partners:

Affiliations: Mayor’s Climate Protection Agreement

In 2008, Kauai County passed a shoreline setback ordinance (Ordinance No. 863) requiring that shoreline development take place a certain distance from the shore; distance is determined based on projected erosion rates or plot depth. While this may act as an adaptation strategy due to development setbacks stemming from erosion, it is not necessarily rooted in climate change adaptation planning (Council of the County of Kauai, 2008). However, climate action planning can be seen in a few other areas.

Kauai has reported on its greenhouse gas emissions through a 2012 report that inventoried emissions from 2007-2011 and developed an Operations Sustainability and Climate Action Plan in 2013. The Sustainability Plan was developed under the directive of the Mayor. Kauai made a climate action plan detailing how the government can address climate change internally (City of Kauai, 2013). This document includes a section on anticipating climate change, which has the goal of monitoring and preparing for the “impacts of sea level rise on County facilities and operations” but does not go into further detail (City of Kauai, 2013).

A3.4 New York, New York

RELEVANT DOCUMENTS

PlaNYC 2030: A Greener, Greater New York (2011)

PlaNYC 2030: A Stronger, More Resilient New York (2013)

PlanNYC 2030: Progress Report (2014)

BACKGROUND AND CLIMATE PLANNING OVERVIEW

Population: 8,175,133 (U.S. Census Bureau, 2011)

Initial planning date: 2007

Leading department: Department of Environmental Protection, Long-term Planning & Sustainability (Mayor’s Office)

CAP stage: Implementation, evaluation expected w/next sustainability plan

Planning partners: None

At the city-level, New York has considerable capacity for adaptation planning and it appears as though environmental protection is a priority. The Department of Environmental Protection administers the PlanNYC; the DEP was budgeted over \$1 billion of city funds for fiscal year 2014 (Office of Management and Budget, 2014). New York City’s PlaNYC was originally released in 2007 with an updated version created in 2011; the latter is the source of the following information (City of New York, 2011). This plan contains 132 initiatives across ten focal areas and over 400 milestones for the end of 2013. Within the plan, there are chapters that pertain to different aspects of the city, including climate-related sections such as Air Quality, Energy, and Green Buildings. There is also a chapter dedicated solely to Climate Change, containing the city’s

resilience strategies. The two main goals for the climate change section as highlighted in the introductory overview of the full plan are to “reduce greenhouse gas emissions by more than 30%” and “increase the resilience of [New York’s] communities, natural systems, and infrastructure to climate risks” (City of New York, 2011). Within the chapter on climate change, six goals with thirteen objectives are identified, as seen in Figure 1.

Figure 1: Climate change plan as stated in the 2011 “Greener, Greater New York” plan, page 151(City of New York, 2011)

While it does not appear as though evaluation plans for resilience strategies have been fully planned or implemented, the city has recognized the need for M&E. This is seen at the objective-level, such as in objective 9: “identify and evaluate citywide coastal protective measures” (City of New York, 2011). Other mentions of the need for evaluator are:

- Plan to create a “climate risk assessment tool” to use in prioritizing actions and determining the effectiveness of management decisions;
- Routinely conducted vulnerability assessments to aid in monitoring effectiveness of resilience strategies; and
- Cost and benefits analyses of past adaptation efforts in other coastal cities as well as pilot projects implementing different strategies along the city’s waterfront (City of New York, 2011).



The plan includes an extensive list of implementation milestones to be completed by the end of calendar year 2013 (City of New York, 2011).

In 2013, the city released an additional plan called A Stronger, More Resilient New York, which contains 37 coastal protection initiatives (City of New York, 2013). Four key strategies guide this plan, taken directly from the report:

1. Increase coastal edge elevations,
2. Minimize upland wave zones,
3. Protect against storm surge, and
4. Improve coastal design and governance (City of New York, 2013).

The Progress Report 2014 provides a narrative on progress in these areas focused on implementation; in contrast, it tracks the status of the implementation of the 2011 plan against the stated milestones in a table format ranking status of implementation (City of New York, 2014).

A3.5 Seattle, Washington

RELEVANT PLANS

Seattle, a Climate of Change: Meeting the Kyoto Challenge (2006)

Progress report (2007, 2008, 2009)

Seattle Climate Action Plan (2013)

Seattle Climate Action Plan Implementation Strategy (2013)

Accomplishments Report (2013)

Moving the Needle: Seattle's Environmental Progress Report (2014)

BACKGROUND AND CLIMATE PLANNING OVERVIEW

Population: 608,660 (U.S. Census Bureau, 2011)

Initial planning date: 2006

Leading department: Office of Sustainability & Environment

CAP stage: Implementation, (currently planning for adaptation)

Seattle has a number of climate-related plans, with the first being a 2006 reaction to the Kyoto Protocol, which contained information on reducing greenhouse gas emissions (City of

Seattle, 2006). The city has progressive goals relating to mitigation efforts, including one of carbon neutrality by 2050 (Seattle Office of Sustainability and Environment, 2013b). Mitigation efforts have been reported on extensively (City of Seattle, n.d.). The Seattle Action Plan was released in June of 2013 with an Implementation Strategy published in October; a brief Accomplishments Report was also released that year. This set of reports is the city's first to include adaptation strategies. A more comprehensive update on CAP was released in April 2014 (Seattle Office of Sustainability and Environment, 2014).

Seattle's Climate Action Plan of 2013 discusses Seattle's past action as a leader in climate change, including being the first city to create a green building goal in 2000 and former Mayor Nickel's launch of the Mayor's Climate Protection Initiative in 2001 (Seattle Office of Sustainability and Environment, 2013b). The adoption of the 2006 Climate Action Plan made the city one of the first in the country to do so. The 2013 plan can be seen as an update of the 2006 initiative. The plan is broken down into five sections: background, reducing emissions, preparing, what you can do, and what others are doing (Seattle Office of Sustainability and Environment, 2013b). The focus of this review of the plan is on the preparing section. The report presents the problem the city faces in a simple way, stating that "climate change will shift the frequency, intensity, and timing of [flooding, heat waves, and extreme high tides], and what we now consider an extreme event will be the new normal" (Seattle Office of Sustainability and Environment, 2013b). The city considers its biggest climate change risks to be temperature, precipitation, and sea level rise.

Within the Preparing for Climate Change section, the report acknowledges, "the systems, plans, and infrastructure put in place to enhance resilience to climate impacts must be grounded in the best available science of the time and frequently re-evaluated as new information becomes

available” (Seattle Office of Sustainability and Environment, 2013b), This section of the plan is broken down into five types of actions below.

1. Assessment and planning
2. Natural systems
3. Utility systems (electricity, water supply, and drainage)
4. Land use and the built environment (land use, transportation, buildings)
5. Community preparedness (public health, emergency planning, and food systems)

The plan states that these actions, detailed further within the plan, are to be implemented by 2015 and are intended to “provide the information and the framework necessary to develop longer-term strategies.” Under “assessment and planning,” it is indicated that by 2014 the city intends to have a “comprehensive adaptation strategy that integrates the City’s planning efforts across all relevant departments and considers both the cost and of implementing actions to improve our ability to adapt and the potential cost of inaction” (Seattle Office of Sustainability and Environment, 2013b). The plan also stresses that residents are to be involved in the development of this plan. As these overarching five action and the actions detailed under them are focused on implementation, it is not surprising that they are not targeting effectiveness, but rather focused on implementing. There is also considerable attention paid to under-served residents. Impact assessments are also included as part of the actions, including assessing impacts of sea level rise on infrastructure and climate impacts on the transportation sector (Seattle Office of Sustainability and Environment, 2013b). The plan mentions a full update on progress to be released in 2014.

The Implementation Strategy was also released in 2013 and includes the following for each action:

- 2013 Implementation Tasks,

- 2014 Implementation Tasks,
- Needed Policy Decisions,
- Existing Resources,
- Needed Resources, and
- Policy Engagement (Seattle Office of Sustainability and Environment, 2013c).

This report also includes a discussion of priority areas of focus, the first of which is the development of an adaptation plan for the city (Seattle Office of Sustainability and Environment, 2013c). The 2013 Accomplishments Report details implementation progress of the CAP, focused on mitigation efforts (Seattle Office of Sustainability and Environment, 2013a).

A3.6 Southeast Florida Regional Climate Change Compact, Florida

RELEVANT DOCUMENTS

Compact Agreement (2010)

Policy and Advocacy Implementation Report (2011)

A Region Responds to a Changing Climate: Regional Climate Action Plan (2012)

Implementation Guide (2012)

Adaptation Areas White Paper (n.d.)

BACKGROUND AND CLIMATE PLANNING OVERVIEW

Population: 5.6 million (SE Florida Compact, 2012)

Initial planning date: 2010 (creation of Compact)

Leading department: Representatives across different counties

CAP stage: implementation

Planning partners: Institute for Sustainable Communities

The Compact consists of four counties (Broward, Miami-Dade, Monroe, and Palm Beach), which are home to more than 5.5 million people – 30% of the total population of Florida. The Compact was started in 2010 and has three main goals, directly taken from the Compact’s website:

- Develop annual Legislative Programs and jointly advocate for state and federal policies and funding;

- Dedicate staff time and resources to create a Southeast Florida Regional Climate Action Plan to include mitigation and adaptation strategies; and
- Meet annually in Regional Climate Summits to mark progress and identify emerging issues.

The driver of the development of the Compact appears to be “regional challenges and threats from global climate change on the 5.6 million residents of [the] region” (SE Florida Compact, 2012). The Compact and its efforts have received attention from the White House, as it was chosen for a Council on Environmental Quality listening session in 2010 (SE Florida Compact, 2012). Twenty-four municipalities within the Compact counties have signed to Mayor’s Climate Action Pledge.

The Regional Climate Action Plan was released in October 2012 with an accompanying Implementation Guide. There are seven “goal areas” in the plan, under which are 110 action items. The timeframe to complete these actions is five years with plan updates to be produced annually. The area has decided on a unified sea level rise projection and has completed an inundation vulnerability assessment. The Compact Staff Steering Committee is a multi-stakeholder group that includes federal, state and county partners (CAP); the group recommended the creation of three different teams to work on mitigation and resilience initiatives within the compact counties. The three teams are Built Environment, Transportation, and Land and Natural Systems; each group has at least thirty members with representation from academia, non-profits, the private sector, and varying levels of government. Action Plan recommendations are in the following seven categories, taken directly from the plan:

1. Sustainable Communities and Transportation Planning,
2. Water Supply, Management and Infrastructure,
3. Natural Systems,

4. Agriculture,
5. Energy and Fuel,
6. Risk Reduction and Emergency Management, and
7. Outreach and Public Policy (Southeast Florida Climate Change Compact, 2012).

The plan acknowledges the challenges that the Compact faces in the implementation process, as there are over 100 local governments in the area at different stages of mitigation and adaptation planning and with different institutional structures.

The seven goals are as follows and align with the seven categories above:

1. Reduce financial and physical losses in our building stock by reshaping where and how we build.
2. Reduce greenhouse gas emissions by planning, designing, and prioritizing walkable, affordable communities supported by sustainable multimodal transportation options.
3. Advance water management strategies and infrastructure improvements needed to mitigate for adverse impacts of climate change and sea level rise on water supplies, water and wastewater infrastructure, and water management systems.
4. Implement monitoring, management, and conservation programs designed to protect natural systems and improve their capacity for climate adaptation.
5. Ensure the continued viability of agriculture in Southeast Florida through policies that [sic] remove barriers to production, promote economic incentives, improve water reliability, and provide research on best management practices, thereby encouraging sustainable production in the face of a changing climate.
6. Increase renewable energy capacity and reduce consumption of electricity and fuel.
7. Provide a more resilient natural and built physical environment in light of climate change.

8. Communicate the risks related to climate change and the value of adapting policies and practices to achieve resilience throughout the region.
9. Guide and influence local, regional, state and federal climate change related policies and programs through collaboration and joint advocacy (Southeast Florida Climate Change Compact, 2012).

The implementation plan contains milestones for each action as well as potential partners, funding sources, and policy needs. Though the plan mentioned annual updates, an update has not yet been released.

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