

CHAPTER

# 5

# Climate Change

## CONTENTS

Introduction  
Climate Change Action Plan



# Introduction

A growing body of knowledge shows that climate change poses major threats to our nation's estuaries. As part of a network of coastal, place-based programs, the CBBEP and the communities it serves will be significantly affected by climate change. Predictions of climate change suggest that sea level rise, storm intensity and surge, drought, rainfall and hydrology, and acidification will be impacting our coastal zones during this century. With all these possibilities for the future, conserving and maintaining the valuable biodiversity and communities in the Coastal Bend area is more crucial than ever. The failure in designing and implementing effective avoidance, mitigation, minimization and adaptation strategies will result in large costs for addressing the climate change problem to the citizens of the Coastal Bend (Murdock and Brenner, 2016).

In 2016, the CBBEP collaborated with The Nature Conservancy to complete the Texas Coastal Bend Regional Climate Change Vulnerability Assessment (CCVA). The CCVA identified potential changes caused by a changing climate and environment in the Coastal Bend area and assessed how current changes in climate stability could have future effects on sea level, storms, hydrology, geomorphology, natural habitats and species, land use, economy, human health, infrastructure, and cultural resources. It also used future scenarios of climate to identify the impacts and vulnerabilities of the different sectors that represent relevant coastal environments and communities in the study area. Stakeholders of the Coastal Bend area provided input at a workshop regarding aspects that they considered relevant about their vulnerabilities and opportunities for building resiliency.

The study concluded with a series of recommendations for reducing vulnerabilities and promoting natural and community resiliency:

- Facilitate and support studies to better understand local biological, chemical, and physical effects of climate change. Bridge the gap between the climate science and the planning, management and decision-making communities by identifying the key information aspects needed to build resiliency in each of them. For example, the translation of key science-based vulnerabilities into easy to understand components of people's well-being and express them in monetary terms.

- Increase community resilience to most drastic hazards, such as storms, by building in redundancies (alternative or primary) in power generation that are based on natural gas, a more reliable energy source after storm rebuilding. Communities should adopt an early flood warning system and coordinate other adaptation measures through their planning and emergency departments to maximize public response to adaptation needs through education. Communities should look into creating incentives for the acquisition of repetitive loss properties. When possible retrofit infrastructure with energy efficient facilities.
- Build coastal resilience by restoring coastal habitats that protect communities and infrastructure. Coastal vegetation habitats, such as salt and freshwater marshes, should be allowed to migrate landwards together with SLR to minimize losses and maintain resiliency. Invest in a combination of grey and green infrastructure that builds resilient communities and take into account the social benefits and costs.
- Assist local governments in developing and implementing adaptive management plans that conserve and protect the Coastal Bend area's ecological services. Address climate adaptation, and the threats of SLR and storm surge in the Comprehensive Plans of the communities in the Coastal Bend area. For example - adjust plans and policies to require that new construction occur outside the flood areas and include these changes in the City's facilities plan. Involve all supporting industries such as utility providers in the planning process.
- Develop and implement educational programs and distribute literature about the effects of climate change. Education programs should cover a diverse group of topics from human health to storm preparedness to protection of natural infrastructure, among others.

These recommendations, along with guidance from Coastal Bend stakeholders, were used to develop objectives and actions for a Climate Change Action Plan that will increase the resiliency of the estuaries and communities in the Coastal Bend to the impacts of climate change. The primary focus of the Climate Change Action Plan is on (1) contributing to the scientific understanding of climate change and its impacts on human estuarine systems, (2) increasing the capacity of local communities to adapt and mitigate climate change impacts, and (3) providing educational opportunities related to local effects of climate change on human and estuarine systems to increase public awareness and foster behavior change.

**BLACK MANGROVES** have expanded their range within the Coastal Bend in recent decades. (Photo by Mission-Aransas NERR)



# CLIMATE CHANGE

## Action Plan

### GOAL

Understand, project, mitigate, and adapt to climate change impacts to increase resiliency of estuaries and coastal communities in the Coastal Bend.

### OBJECTIVES

- CC 1: Integrate climate change science into strategic planning and adaptive management.
- CC 2: Improve climate change literacy in order to build capacity for adapting and mitigating to climate change.

### ACTIONS

- CC 1.1: Facilitate and support studies to better project and understand the biological, chemical, physical, and ecological effects of climate change.
- CC 1.2: Assist in developing and implementing adaptive management plans that conserve and protect coastal resources and their ecosystem services by incorporating climate change.
- CC 2.1: Develop or use formal and informal climate change education materials that are locally relevant to enhance climate literacy.



## Climate Change 1.1

Facilitate and support studies to better project and understand the biological, chemical, physical, and ecological effects of climate change.

Climate change poses major threats to our nation’s estuaries. Changes in sea level, shifts in salinity and pH, changes in air and water temperature, and alterations in precipitation could result in the potential loss of habitats and associated species, as well as adverse impacts to local economies, development, and infrastructure. In order to improve the resiliency of these important ecosystems and the communities that rely on them, we must increase our understanding of changes in key data parameters relating to climate variability, strengthen our knowledge of climate change impacts on ecosystem structure and function, and use new data and information in modeling efforts to better predict future impacts of climate change on local resources. This data and information is essential for helping local communities and resource managers conduct assessments that determine which resources (i.e., people, infrastructure, and natural resources) are most vulnerable to climate variability and which climate phenomena and associated impacts could cause the greatest losses.

### STEP 1:

Facilitate research and monitoring of key abiotic parameters related to climate variability (e.g., temperature, precipitation, salinity, dissolved oxygen, pH, carbon dioxide, water level).

### STEP 2:

Support assessments of climate change impacts on ecosystem structure and function, including studies of the interaction between climate change and existing stressors (e.g., invasive species, urban development).

### STEP 3:

Use the results from Steps 1 and 2 to enhance modeling efforts (e.g., SLAMM) to better project future climate change impacts on local resources.

### STEP 4:

Use new data and models to build upon the Texas Coastal Bend Regional Climate Change Vulnerability Assessment and other climate change vulnerability assessments performed by partners.

### STATUS



**UNDERWAY:** CBBEP is partnering with TAMUCC to monitor coastal acidification in the Aransas Pass Ship Channel at the UTMSI research pier. The highly precise equipment, which will measure pH and pCO<sub>2</sub>, was funded by the EPA. CBBEP will also continue to support salinity gages located within the Nueces River Delta and the Rincon Bayou. These gages provide a source for long-term salinity records that can be used to evaluate changes over time.

### TIMEFRAME



**2017-2037:** Steps are considered on-going and will be implemented on a regular basis throughout the applicable life of this plan.

### COST



**ESTIMATED COST:** \$-\$\$

**POTENTIAL FUNDING:** CBBEP Programmatic Funds (EPA 320 funds, TCEQ, Local funds); CMP; EPA Gulf of Mexico Program; NOAA; NSF

### PARTNERS



**LEAD:** CBBEP

**POTENTIAL PARTNERS:** EPA; MANERR; NOAA; TCEQ; TNC; TPWD; TWDB; Universities (e.g., CCS, HRI, TAMUCC, UTMSI); USFWS, USGS

### PERFORMANCE METRICS



1. Number of CBBEP-supported research and monitoring projects that address climate variability.
2. Number of models utilizing local data to enhance climate change predictions.



## Climate Change 1.2

Assist in developing and implementing adaptive management plans that conserve and protect coastal resources and their ecosystem services by incorporating climate change.

The effects of climate change are increasingly apparent in the Texas Coastal Bend. These climate-driven changes will greatly affect our ability to conserve coastal resources and protect the communities that depend on their ecosystem services. Communities and resource managers must strive to increase coastal resiliency by developing adaptation strategies and plans that address the impacts of climate change that cannot be avoided. Climate change adaptation planning requires the identification and assessment of impacts that are likely to affect the planning area, development of goals and actions to best minimize these impacts, and establishment of a process to implement those actions. Planning for future climate change impacts will help reduce risks to people and infrastructure and will improve natural resource management and conservation strategies.

Many of the impacts and consequences of climate change are not new – they are simply exacerbated or accelerated. In many cases, the adaptation strategies needed to reduce impacts already exist and are often being implemented outside the context of climate change. Therefore, familiar actions can be used to support climate change adaptation, but some of these actions are likely insufficient for addressing the scale of potential changes. It will take a combination of existing, reconfigured, and new actions to meet the challenge of adapting to climate change. Most importantly, the potential impacts of climate change on coastal resources should be considered in all related planning activities.

STEP 1:	STEP 2:	STEP 3:	STEP 4:
Support efforts by local communities and resource managers to address resiliency through the development of climate change adaptation plans.	Support efforts to incorporate climate change in on-going local and regional planning efforts that address coastal resource management issues.	Ensure that climate change impacts are considered in all CBBEP conservation and management efforts, such as identification of land acquisition targets, species management planning, and restoration design and implementation.	Coordinate regional efforts to make Coastal Bend communities more resilient to storm events by helping them enroll in the Community Rating System.

### STATUS



**UNDERWAY:** The CBBEP partnered with TNC to complete the Coastal Bend Climate Change Vulnerability Assessment (CCVA) with funding from the EPA. The CCVA was completed in 2016 and included stakeholder recommendations for building local resiliency to climate change impacts. The CBBEP will continue to engage its partners in conversations regarding climate change resiliency and will work on implementing the CCVA strategies in the coming years.

### TIMEFRAME



**2017-2037:** Steps 1-3 are considered on-going and will be implemented on a regular basis throughout the applicable life of this plan.

**2017-2022:** Step 4 will occur during the first five years of plan implementation.

### COST



**ESTIMATED COST:** \$

**POTENTIAL FUNDING:** CBBEP Programmatic Funds (EPA 320 funds, TCEQ, Local funds); EPA; EPA Gulf of Mexico Program; NOAA

## **PARTNERS**



**LEAD:** Steps 1-3: CBBEP; Step 4: CBBEP, MANERR, TGLO

**POTENTIAL PARTNERS:** EPA; HRI; Local governments; TCEQ; Texas Sea Grant; TNC; TPWD; TWDB

## **PERFORMANCE METRICS**



1. Number of climate change adaptation plans developed by local communities within the program area.
2. Number of local and regional planning documents that incorporate strategies for adapting to climate change.
3. Number of communities within the program area enrolled in the Community Rating System.



## Climate Change 2.1

Develop or use formal and informal climate change education materials that are locally relevant to enhance climate literacy.

A climate-literate individual understands their influence on climate and climate’s influence on their life and society. Climate literacy requires an understanding of the essential principles of Earth’s climate system, knowledge of how to assess scientifically credible information about climate, the capacity to communicate about climate and climate change in a meaningful way, and the ability to make informed and responsible decisions with regard to actions that may affect climate.

In the coming decades, scientists expect climate change to have an increasing impact on human and natural systems. Reducing our vulnerability to these impacts depends not only upon our ability to understand climate science and the implications of climate change, but also upon our ability to integrate and use that knowledge effectively. The formal and informal education and outreach programs offered by CBBEP and its partners play a key role in educating the general public and students about climate change impacts on coastal resources and providing information about potential mitigation and adaptation options. Framing issues locally can be especially persuasive in climate change education and outreach. Education materials that focus on climate change impacts in the Coastal Bend will be the most effective at reaching people who are generally dismissive of climate science.

### STEP 1:

Support efforts to develop interpretive exhibits and displays that can be used at community events, festivals, and forums to educate Coastal Bend residents about local climate change impacts and the actions they can take to mitigate and adapt to impacts

### STEP 2:

Develop a regional climate change education and outreach toolkit that serves as a repository of information on climate change for local educators, teachers, and the general public. The toolkit could include maps of projected sea-level change, brochures and handouts that describe ways to limit carbon emissions and increase community resiliency, climate change curriculum for K-12 teachers, relevant climate change literature, regionally focused presentations on impacts and actions, and information on green building resources and networks.

#### STATUS



**NEW:** Implementation of new actions will take place following the adoption of the revised plan during the time period identified.

#### TIMEFRAME



**2017-2037:** Steps are considered on-going and will be implemented on a regular basis throughout the applicable life of this plan.

#### COST



**ESTIMATED COST:** \$  
**POTENTIAL FUNDING:** CBBEP Programmatic Funds (EPA 320 funds, TCEQ, Local funds); EPA; NOAA

#### PARTNERS



**LEAD:** CBBEP

**POTENTIAL PARTNERS:** CBBF; CCMSH; EPA; MANERR; NOAA; TCEQ; Texas Sea Grant; TGLO; TPWD; TSA; TWDB; Universities (e.g., CCS, HRI, UTMSI); USFWS

#### PERFORMANCE METRICS



1. Climate change education and outreach toolkit is developed and available on the CBBEP website.
2. Number of visitors to online climate change education toolkit.
3. Climate change interpretive display developed.