Module 1B: Climate Adaptation Fundamentals and Models

Overview

1. Introducing climate adaptation
2. Elements of successful adaptation planning
3. Special Presentation by Ashlee Grace, GLAA-C
4. Adaptation models
5. Identifying our adaptation priorities

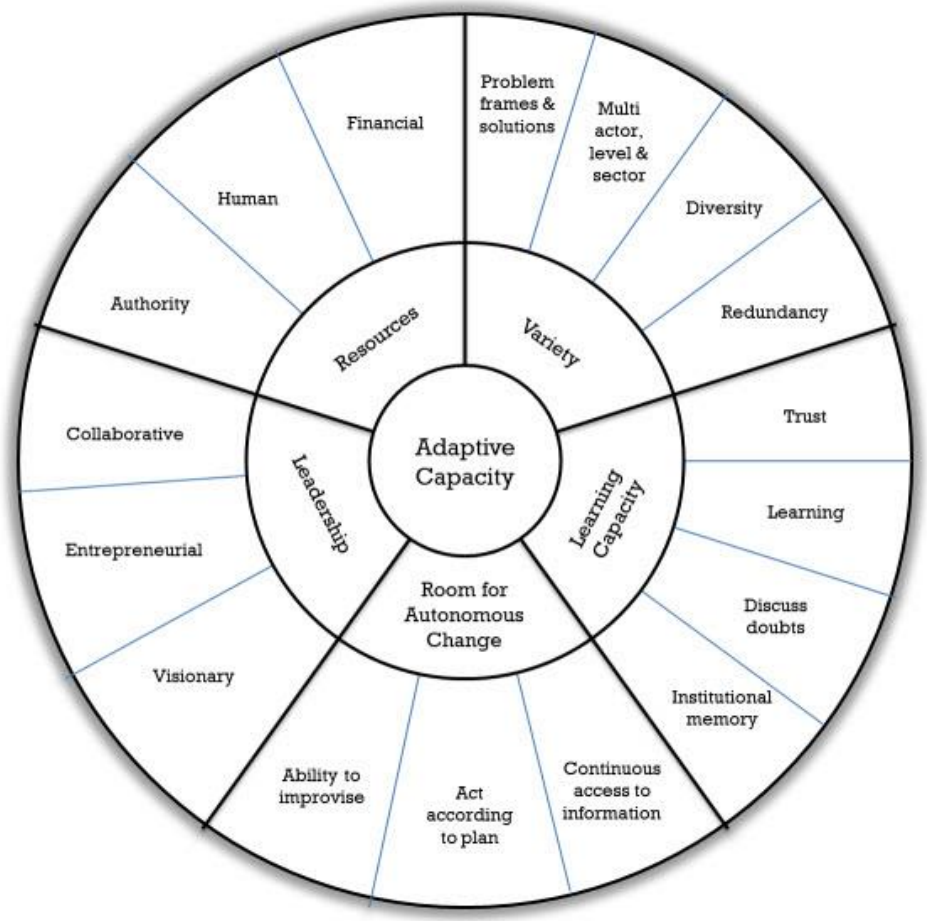


Image source: Adaptive Capacity Wheel, Gupta et al, 2010

Introducing climate adaptation

WHY ADAPTATION PLANNING IS CRITICAL FOR GREAT LAKES CITIES

Introducing climate adaptation

Climate change is *already* in motion: lowering GHG emissions is essential, but not enough

Mitigation: take action to reduce greenhouse gas emissions and prevent worst-case climate change scenarios

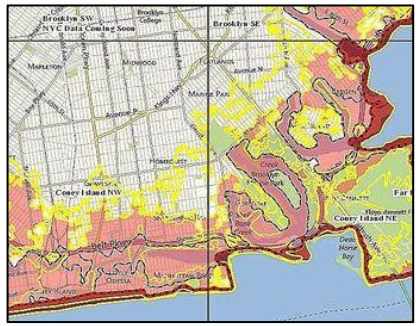
"Avoid the unmanageable"

Adaptation: take action to reduce vulnerability and increase resilience to existing and projected climate change impacts

"Manage the unavoidable"

Introducing climate adaptation

Adaptation is context-specific and can take many forms



Updated flood map

Green infrastructure

Cool pavement

Urban forestry

Adaptation may be…

- Intentional or a benefit of actions taken for other purposes
- Reactive or proactive
- To current or expected future conditions
- Localized or widespread
- Focused on reducing negative impacts
- Focused on increasing opportunities

Adaptation usually builds on existing programs that reduce vulnerability, e.g.:

- Heat alert and response programs
- Vector control programs
- Stormwater management

Image sources (clock-wise from top left): Inside Climate News, 2013; DOE/NREL, Chicago City Hall; Flickr, Andrew, Hyde Park Canopy; Phys.org, Cool Pavement, 2012

…and more!

Introducing climate adaptation

Reactive vs. Proactive adaptation

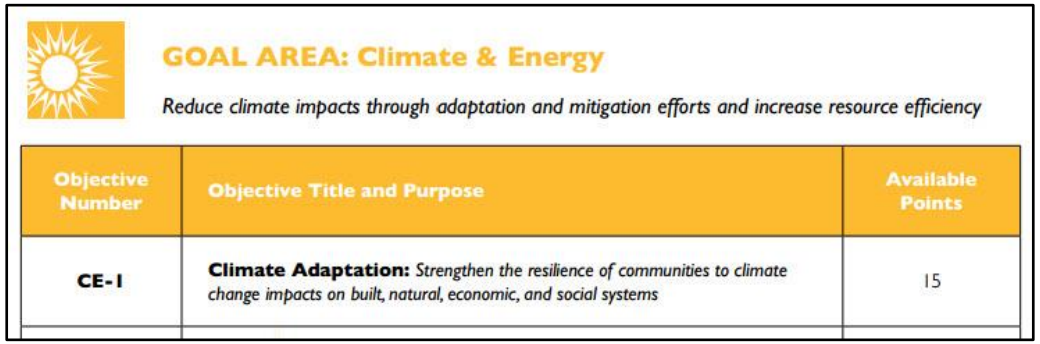
- Following Hurricane Hazel in 1954, Ontario developed regulations that restricted developments on flood plains
- Following heat waves in the 1980s and 1990s, many municipalities developed heat alert and response systems
- Hurricane Sandy gave adaptation a national boost.

*"I skate to where the **puck is going to be**, not where it **has been**." - Wayne Gretzky*

- Using historical climate trends and projection models, we now aim to reduce or prevent the impact of such future events.
- *Proactive* form of adaptation is especially important for:
  - Climate impacts that could inflict major damage and suffering
  - Long-lived, costly infrastructure
  - Natural systems that educe municipal climate risks

Introducing climate adaptation

Adaptation is moving to the mainstream



GOAL AREA: Climate & Energy

Reduce climate impacts through adaptation and mitigation efforts and increase resource efficiency

Objective Number	Objective Title and Purpose	Available Points
CE-1	**Climate Adaptation:** *Strengthen the resilience of communities to climate change impacts on built, natural, economic, and social systems*	15

STAR Community Rating System

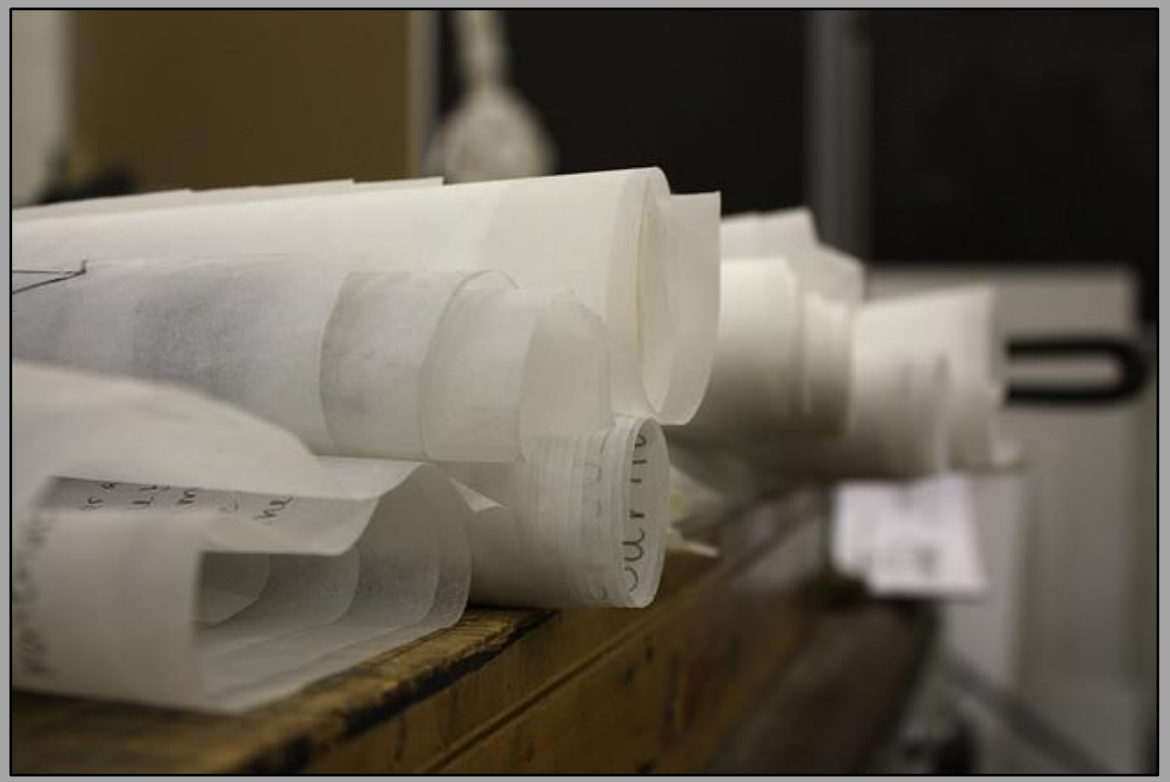
Nationwide (US) sustainability rating system includes points for climate adaptation

More info: http://www.starcommunities.org/

ISO International Organization for Standardization

ISO 37120 Sustainable Communities Standard

Sustainable Municipal Water Management in the Great Lakes and St. Lawrence Basin



Elements of successful adaptation planning

A COLLECTION OF BEST PRACTICES

Elements of successful adaptation planning

Chicago Climate Action Plan's 5 Themes

1. Build resilient infrastructure and management systems
2. Embed climate readiness in routine planning process
3. Look for win-win (no regrets) actions
4. Take incremental steps
5. Be aware and flexible, continually incorporating new data

Source: Chicago climate action plan

Elements of successful adaptation planning

Adaptation process: iterative, non-linear, transparent

- Identify risks and vulnerabilities
- Plan, assess, and select options
- Implement
- Monitor and evaluate
- Revise strategy and research; share lessons learned

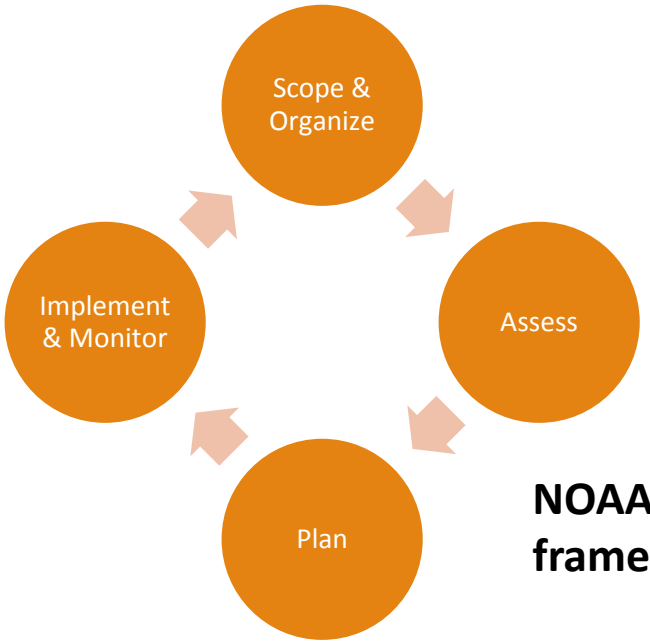
Stakeholder engagement throughout process

Source: NCA 2014, Adaptation, Section 1: Adaptation Process

Elements of Successful Adaptation Planning

Consult “expert” roadmaps & checklist

There is no one-size-fits-all adaptation model, but there helpful guides and checklists that spark “adaptive thinking”



NOAA Coastal Center’s framework for adaptation

Example adaptation checklist

suggested checklist for governments on how to prepare for climate change

MILESTONE 1: Initiate your climate resiliency effort (Chapters 4-7)
- ☐ Scope the climate change impacts to your major sectors (Chapter 4)
- ☐ Pass a resolution or administrative order directing your government to prepare for climate change (Chapter 4)
- ☐ Build and maintain support to prepare for climate change (Chapter 5)
- ☐ Build your climate change preparedness team (Chapter 6)
- ☐ Identify your planning areas relevant to climate change impacts (Chapter 7)

MILESTONE 2: Conduct a climate resiliency study (Chapters 8-9)
- ☐ Conduct a climate change vulnerability assessment (Chapter 8)
- ☐ Conduct a climate change risk assessment (Chapter 9)
- ☐ Prioritize planning areas for action (Chapter 9)

MILESTONE 3: Set preparedness goals and develop your preparedness plan (Chapter 10)
- ☐ Establish a vision and guiding principles for a climate resilient community
- ☐ Set your preparedness goals
- ☐ Develop, select and prioritize your preparedness actions

MILESTONE 4: Implement your preparedness plan (Chapter 11)
- ☐ Ensure that you have the right implementation tools

MILESTONE 5: Measure your progress and update your plan (Chapter 12)
- ☐ Develop and track measures of resilience
- ☐ Update your plan

Checklist source: Center for Science in the Earth System, 2007

Elements of successful adaptation planning

Dealing with uncertainty

1. Acknowledge uncertainties
2. Manage uncertainties
   - Prepare for a range of extremes
   - Prioritize “no regrets” programs
   - Incorporate uncertainty into plans
3. Be firm about what we *do* know
   - Temperature is increasing
   - Precipitation patterns changing
   - More extreme events
   - Previous norms no longer hold

Identifying our adaptation priorities

Identifying our adaptation priorities

Identify impacts and consequences

1. Identify climate change impacts and consequences
2. Assess physical characteristics and exposure
3. Consider adaptive capacities
4. Develop scenarios and simulate change
5. Summarize vulnerability and identify focus areas

Risk is a combination of:

1. Likelihood of an event occurring
2. Level of consequence if the event occurs

Chicago's risk assessment chart.

Identifying our adaptation priorities

Analyze impacts to calculate priorities

To calculate priorities, consider:

1. How many municipal activities would be affected by each risk?
2. How soon are the impacts likely to be realized?

Table 3.1 (cont)

Impact	Risk	Timing **	Construction, Buildings & Property	Tourism	Environment	Fire	Fleet Management	Housing	Human Services	Emergency Management	Police	Public Health	Streets and Sanitation	Transportation	Water Management	Parks and Open Space	Storm Water Management
Increase in heat related deaths	High	Now	x	x		x		x	x	x	x	x		x		x	
Increase in heat related hospitalization	High	Now				x			x	x	x	x					
Increase in health impacts due to "water-in-basement" incidents	High	Near	x			x				x		x	x		x		

<u>Sample of Chicago's Prioritization</u>

Now = 2010

Near = 2035

Mid = 2040-2069

Identifying our adaptation priorities

Identify impacts and consequences

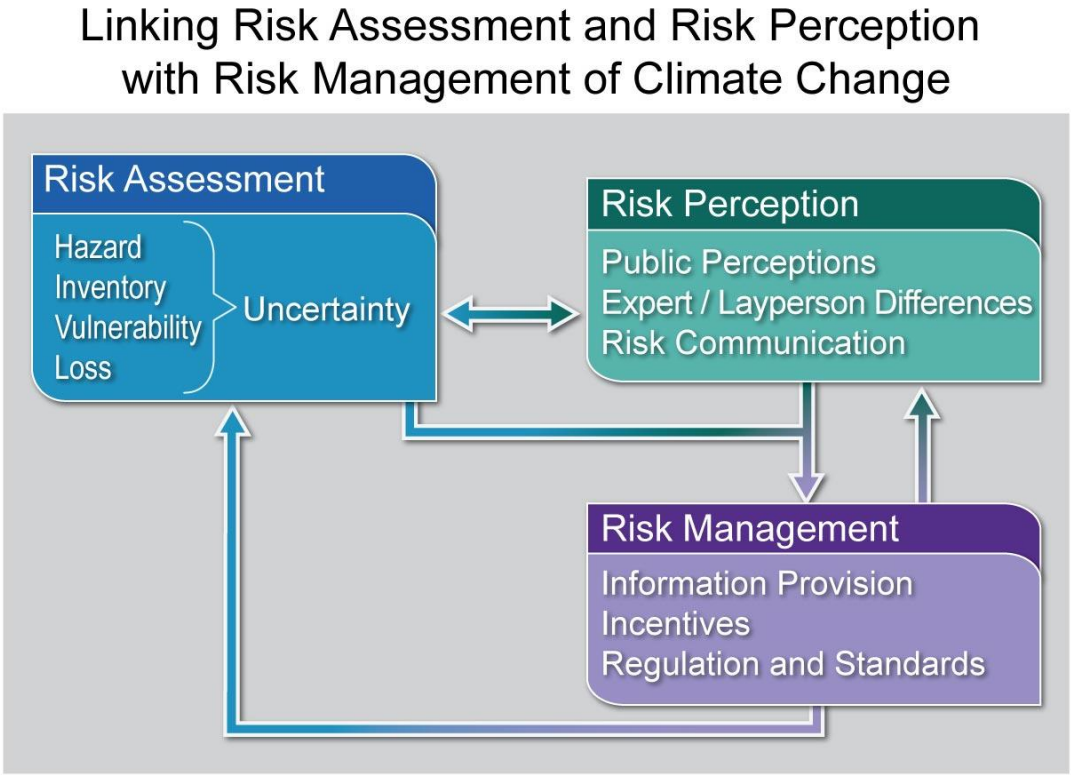
	Performance Response											Climate Parameters																						
Infrastructure Component	Structural Dersign	Functionality	Watershed, Surface Water and Groundwater	Operations, Maintenance, Materials Performance	Emergency Response	Insurance Considerations	Policy Considerations	Social Effects	Water Quality	Economic Considerations	*Other*	High Temperature	Heat Wave	Heavy Rain	5 day Total Rain	Freezing Rain	Ice Storm	Hurricane / Tropical Storm	Drought / Dry Period	Heavy Snow	Snow Accumulation	Freeze Thaw Cycles	Winter Rain	Blowing Snow / Blizzard	Lightning	Hailstorm	High Winds	Tornado	Heavy Fog	Low Temperature	Cold Wave	Extreme Diurnal Temperature	Flooding (100 year) (aka Regulatory)
Administration																																	
Personnel		Y		Y	Y	Y	Y	Y				16	16	20	10	15	12	8		25	6	6	10		20	12	12						
Storm Collection System																																	
Catchbasins	Y	Y	Y	Y		Y		Y	Y					20	15	10	6	10					10					2					1
Manholes	Y	Y	Y	Y		Y		Y						10	10	10	6	4					5					2					1
Pipes	Y	Y	Y	Y			Y							15	15			6					15							3			
Outfalls	Y	Y	Y	Y			Y	Y						25	25			10					25							3			
SWM Ponds	Y	Y	Y	Y	Y	Y	Y	Y				16	20	25							6							12					
Oil Grit Separator	Y	Y	Y	Y			Y							15	20																		
Major System - Old	Y	Y		Y	Y	Y	Y	Y				12	16	20	10	10	9	10		10	6		25					10					
Major System - New	Y	Y		Y	Y	Y	Y	Y				12	16	20		5	6	8		10	6		25					10					

Identifying our adaptation priorities

Public feedback on risk assessment

Public discussion of the assessment is important because:

- Issues may have been overlooked
- People may disagree about the priorities or want to help determine priorities
- Private sector programs may offer opportunities for partnership in implementing adaptation plans



Identifying our adaptation priorities

Evaluate, select, and prioritize actions

1. What strategy can help reduce or prevent the impact? *How* does it reduce the problem?
2. What other climate impacts does this strategy address?
3. What data do you need to determine how effective this strategy would be in your area?
4. What agencies or organizations would be responsible for implementing this strategy?
5. Are there ways to share costs? (e.g. through joint projects?)

Sample strategies:

- green infrastructure
- stream buffers
- tree planting
- water conservation
- zoning
- regulatory changes
- energy distribution
- light-colored roofing
- ecosystem restoration

Identifying our adaptation priorities

Tools & guides

1. EcoAdapt's Climate Vulnerability Assessment Quick Guide

2. Guide to Climate Change Adaptation in Cities

Adaptation Models

PATHS TO BUILDING ADAPTIVE CAPACITY

Adaptation models

Write adaptation actions into sustainability plans (example: Chicago)

- 2006 Mayor Daley established Climate Change Task Force (CCTF)
- CCTF evaluated potential climate impacts, economic costs, and risk assessments
- 2008 CCTF released **Chicago Climate Action Plan (CCAP)**, which included nine adaptation actions
- Implemented adaptation actions thus far include:
  - Tree canopy expansion
  - Integration of future climate scenarios into stormwater management
  - Development of green urban design projects
  - Extreme Weather Operations Plan

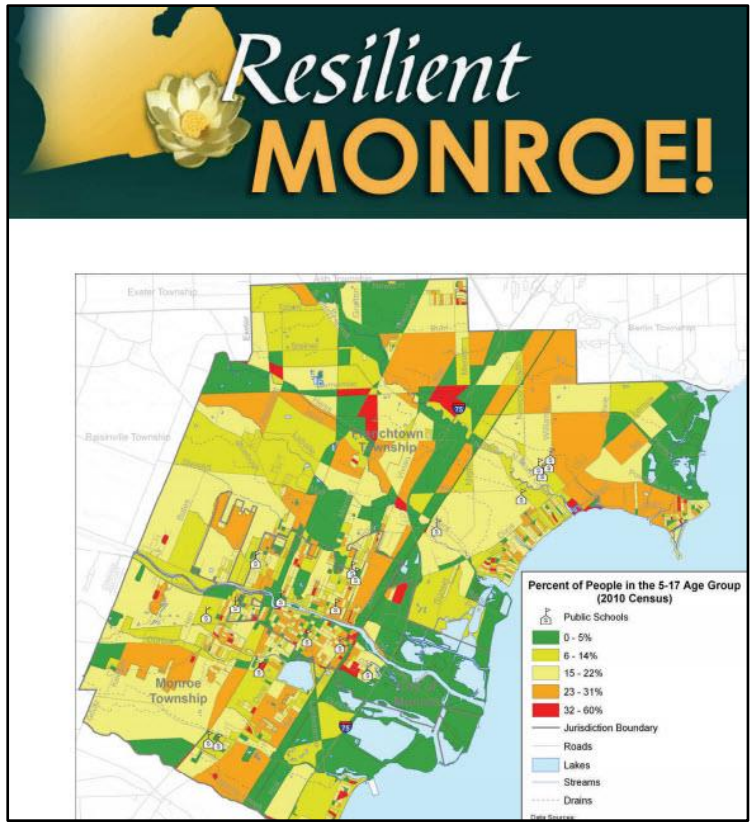
The Chicago Planning Commission adopted a green urban design document after the CCAP's release

CHICAGO TREES INITIATIVE
www.chicagotrees.net

Source: CakeX, http://www.cakex.org/case-studies/6661; Chicago Climate Action Plan: http://www.chicagoclimateaction.org/filebin/pdf/finalreport/CCAPREPORTFINALv2.pdf

Adaptation models

Integrate climate adaptation into land-use planning



Resilient Monroe Project

2013: City of Monroe and two nearby townships pooled resources to revise master plans and form joined Community Planning Committee

Refined land use and development plans to adapt to unpredictable circumstances

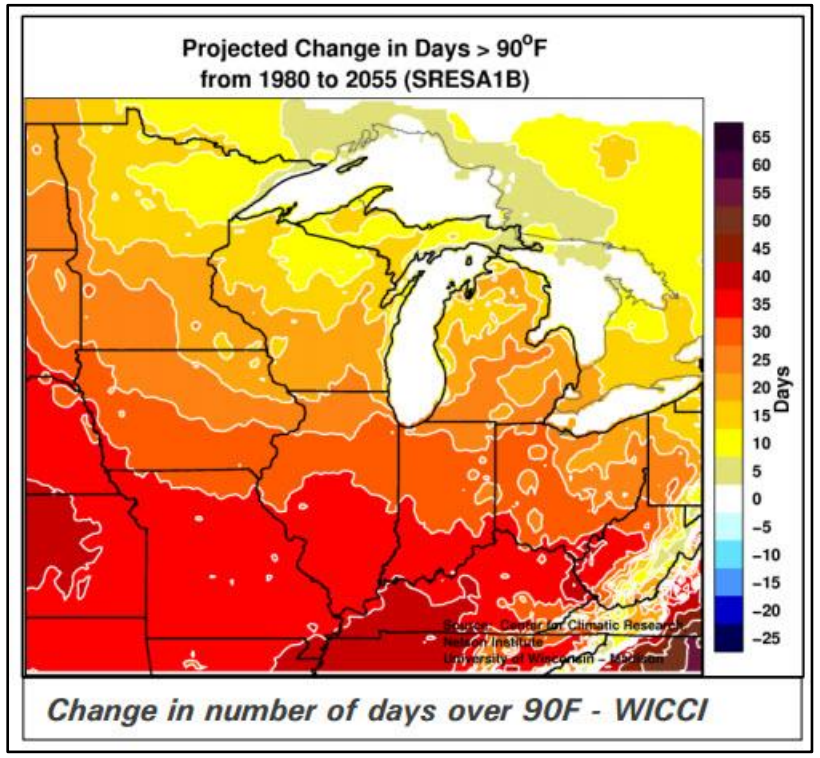
Resilient Monroe Resource Atlas includes chapter on climate vulnerabilities, including:

- Historic climate data
- Climate trends & concerns
- Vulnerability mapping

Source: CakeX http://www.cakex.org/case-studies/resilient-monroe-resource-atlas; Resilient Monroe Resource Atlas: http://www.resilientmonroe.org/resourceatlas.asp

Adaptation models

Create independent adaptation plan



Report includes WICCI info about projected climate change

Dane County Climate Change Preparedness Plan

In 2013, Dane County Climate Action Council was created to ensure county preparedness for weather extremes

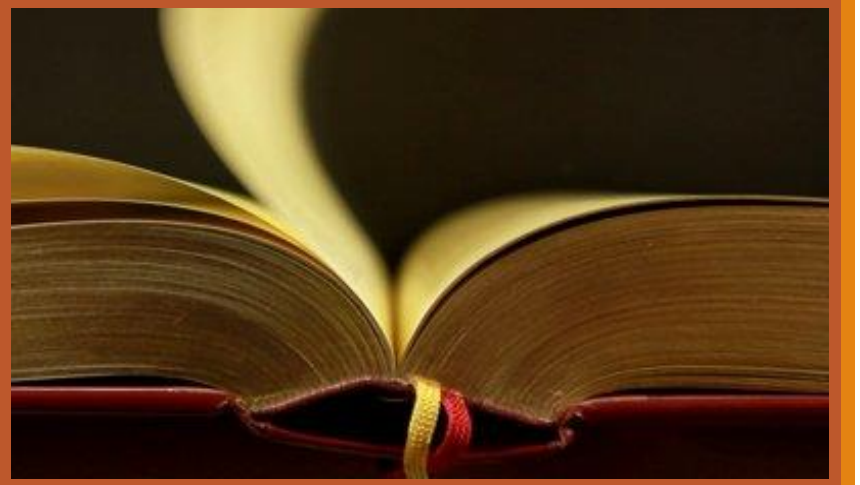
Council facilitated internal review of preparations and potential modifications to operations and capital investments

Report identifies vulnerabilities and sector-based near-term and long-term strategies:

- Public health
- Public safety
- Emergency management

Source: Georgetown Climate Center: http://www.georgetownclimate.org/resources/dane-county-wisconsin-climate-change-and-emergency-preparedness-plan; Count of Dane: http://danedocs.countyofdane.com/webdocs/pdf/press/9_-_30_Climate_Change_and_Emergency_Preparedness.pdf

Additional Resources:



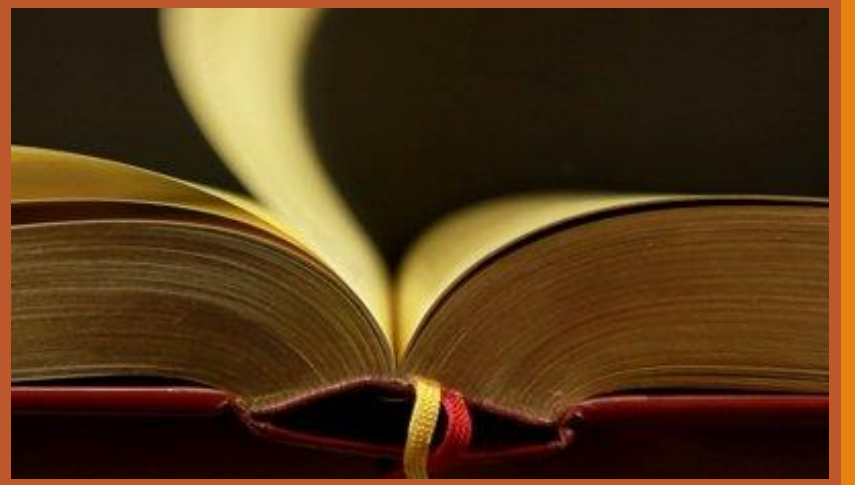
Freshwater Future & EcoAdapt: Consider Climate Change Adaptation

Helpful primer on climate adaptation in the GL region, including an overview of impacts and tips to getting started

US EPA: Climate Change Impacts and Adapting to Change

Evaluation of Climate Change by sectors, public use tools and federal and EPA programs.

Additional Resources:



Roadmap for Adapting to Coastal Risk

NOAA online training and resources that help communities address climate hazards and vulnerabilities. Includes link to 1-hour recorded introduction, resources, and case studies

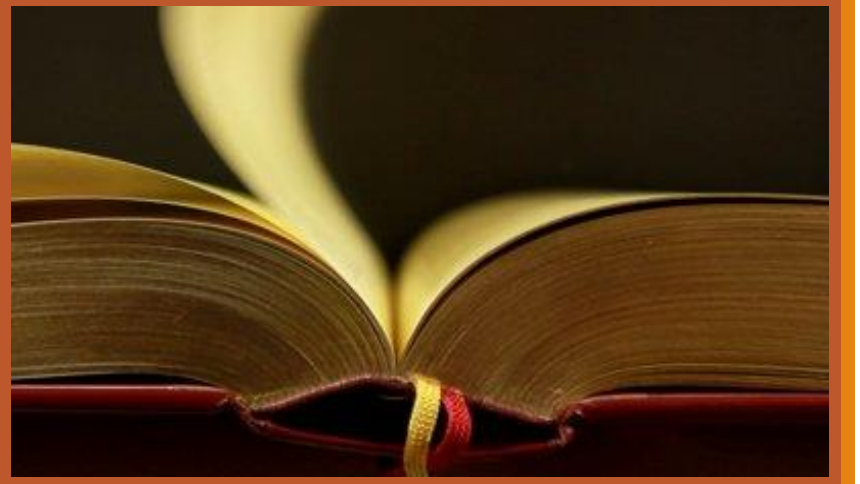
Adopting to Coastal Climate Change

A guidebook for development planners in US coastal regions by USAID.

A Coastal Community Resilience Evaluation Tool

A non-regulatory tool to assist local decision-makers in the identification of planning, mitigation and adaptation opportunities to build capacity for coastal community resilience.

Additional Resources:



US State and Local Adaptation Plans

Georgetown Climate Center map and table that highlight the status of adaptation plans at the state and local levels.

Federal and EPA Adaptation Plans

Including adaptation plans at national level at EPA and other government agencies such as USAID, USDA, DOD, DOE, HHS, DHS, etc.