

**Towards a
Climate-Resilient Austin**

**Response to City Council
Resolution 20131121-060**

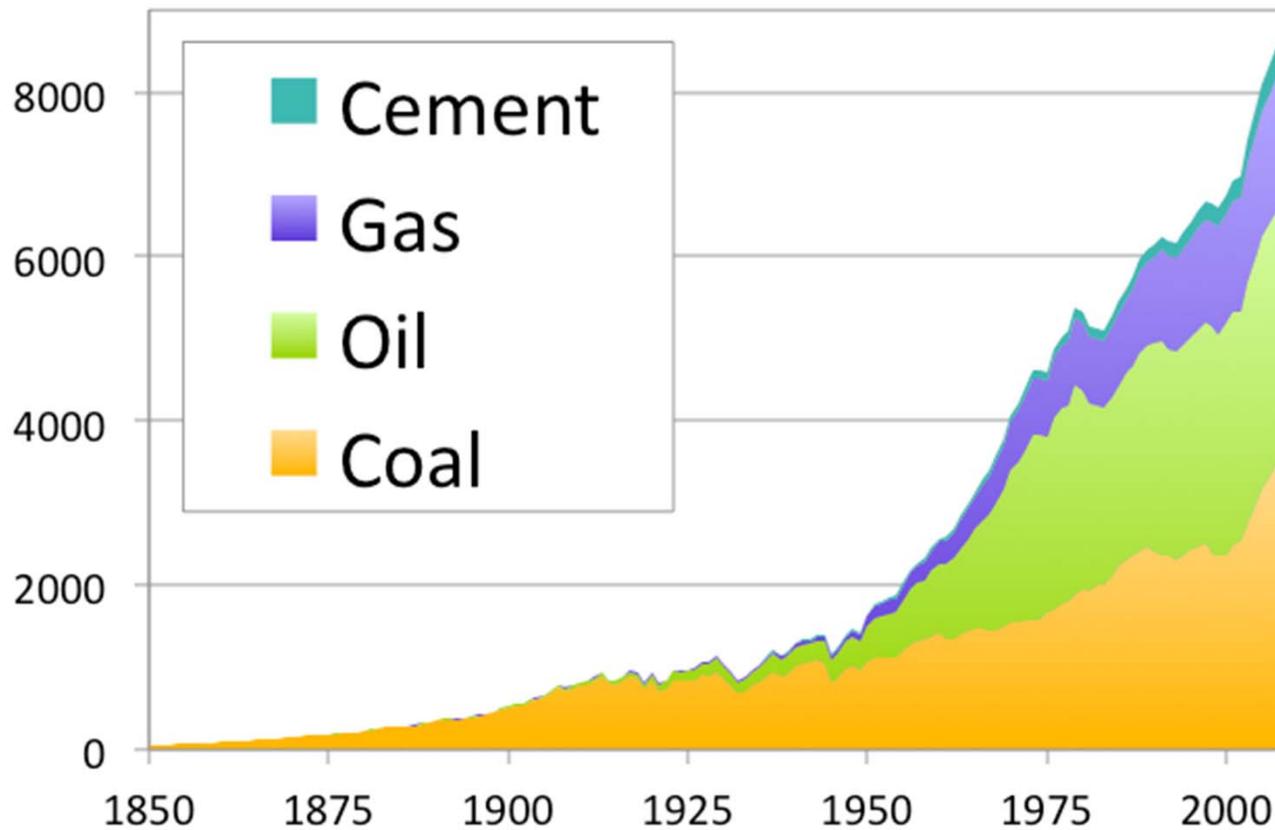
2015

Topics to be covered

- Introduction and Resolution 20131121-060
- Climate Projections
- Impacts on our City
- Summary and Recommendations

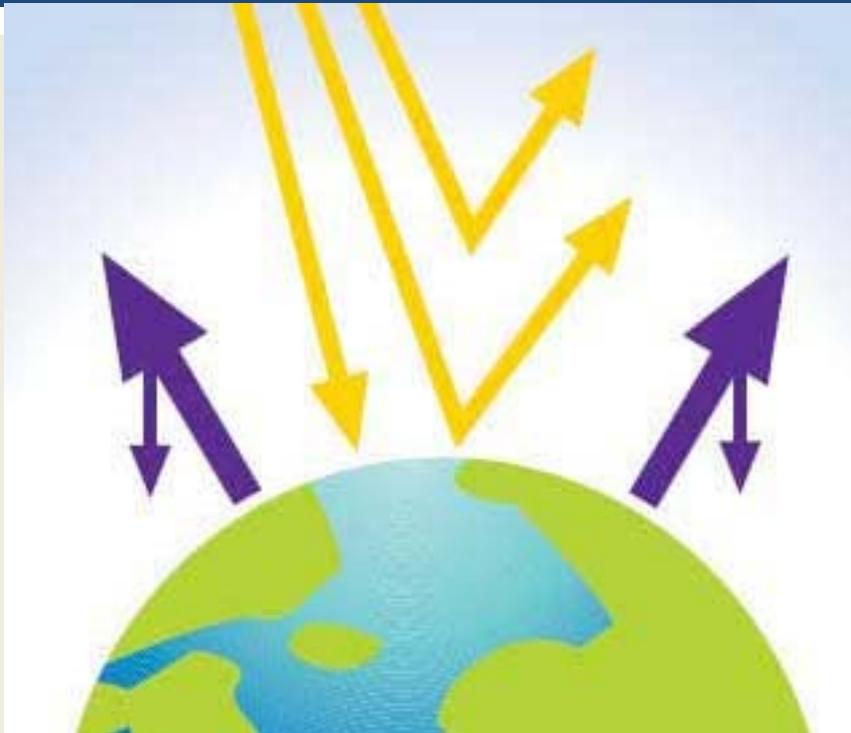
Our activities produce heat-trapping gases

Carbon Emissions (million metric tons)



Source: K. Hayhoe for 2014 U.S. National Climate Assessment

... that are building
up in the atmosphere



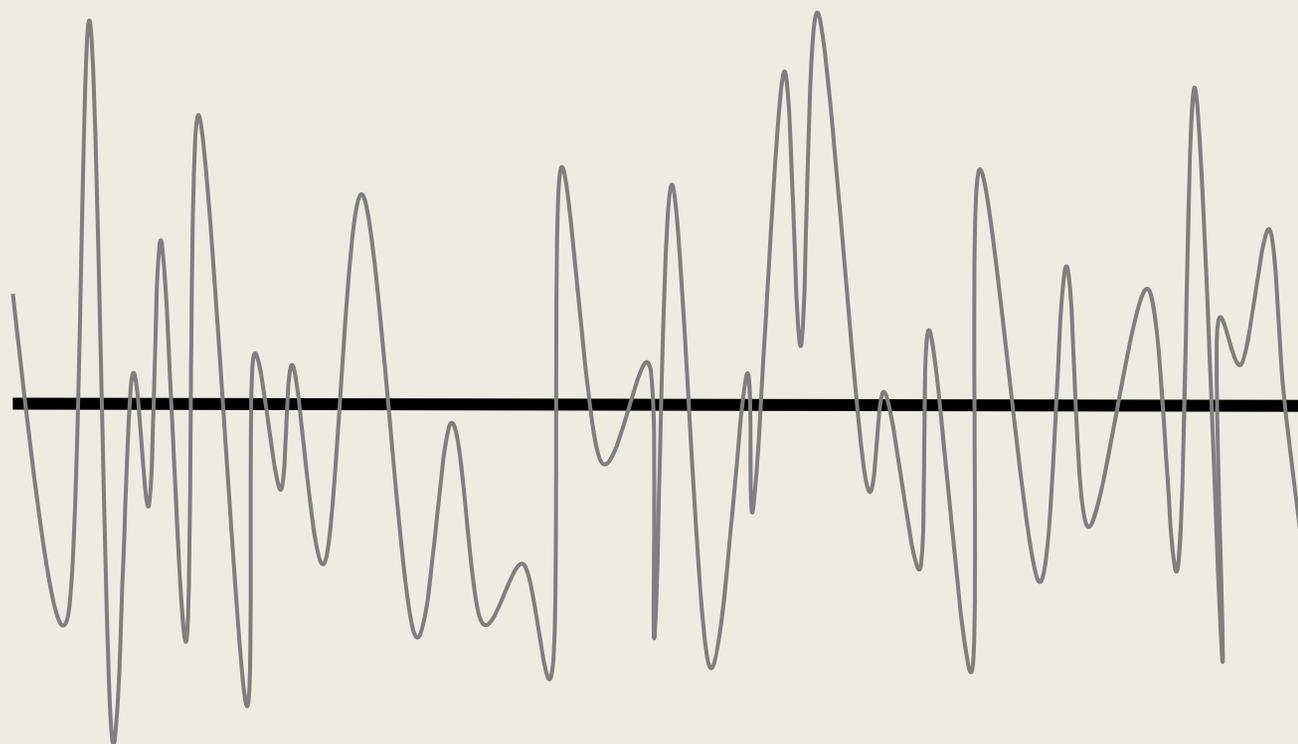
**THE NATURAL
GREENHOUSE EFFECT**



**THE ARTIFICIAL HUMAN
GREENHOUSE EFFECT**

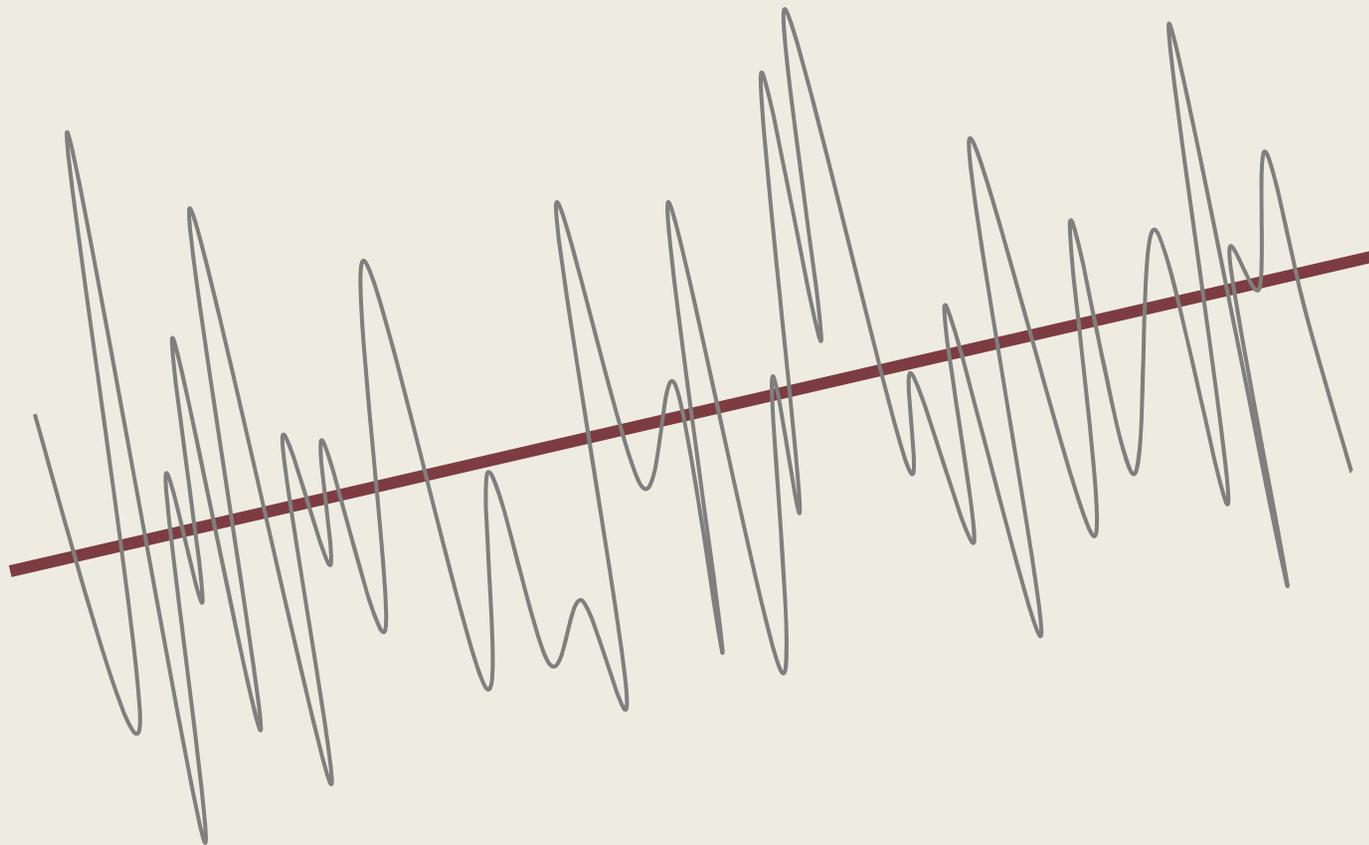
Why is this a problem?

Our civilization is built on a key assumption



A STABLE CLIMATE

What happens if that climate isn't stable any more?

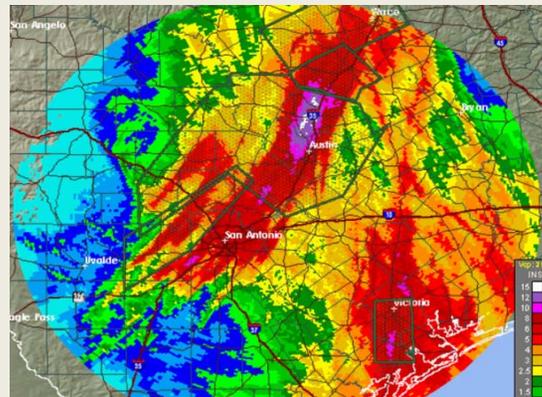


Extreme weather in Central Texas

Bastrop Wildfire, 2011



Lake Travis, 2013



Tropical Storm Hermine, 2010



Snow, 2011

Climate Change mitigation & resilience

Mitigation

- Actions that limit the magnitude and / or rate of climate change
 - Energy conservation
 - Renewable energy
 - Sustainable transportation
 - Reforestation
 - Methane capture and use

Resilience

- Actions taken to manage the unavoidable impacts of climate change
 - Infrastructure protection
 - Flood mitigation
 - Wildfire preparation
 - Emergency response
 - Business continuity plans

Benchmarking from leading cities

- **New York City – Heat, Sea level rise, and Storms**
 - Sea level rise is measurable, imminent, and extreme
 - Keeping residents cool and safe during the summer
 - Stormwater management and protection of infrastructure
- **Chicago: Heat, Stormwater, and Changing Hardiness Zones**
 - Strong correlation to co-benefits of mitigation
 - Keeping residents cool and safe during the summer
 - Focus on green urban design to mitigate multiple impacts
- **Flagstaff – Extreme Heat and Reduced Snowpack**
 - Vulnerability assessment across 115 areas of city operations
 - Focused on all key infrastructure areas
 - Detailed risk ranking of all stressors and infrastructure types

Climate resilience planning steps

1. Data Collection

- a) Climate projections
- b) Identify potential departmental impacts
- c) Determine next steps

Resolution 20131121-060

2. Vulnerability Assessment

- a) Identify Climate Thresholds
- b) Rank Vulnerable Assets
- c) Risk Analysis

3. Climate Resiliency Action Planning and Implementation

- a) Goals/Targets
- b) Develop action plan(s)
- c) Implement and Monitor

Climate Projections

Dr. Katharine Hayhoe
Texas Tech University
Atmos Research

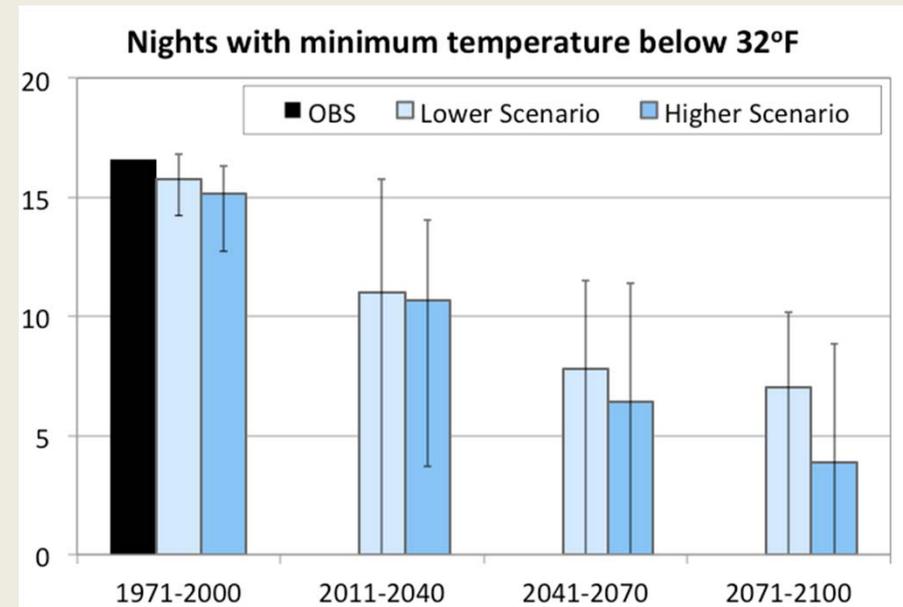
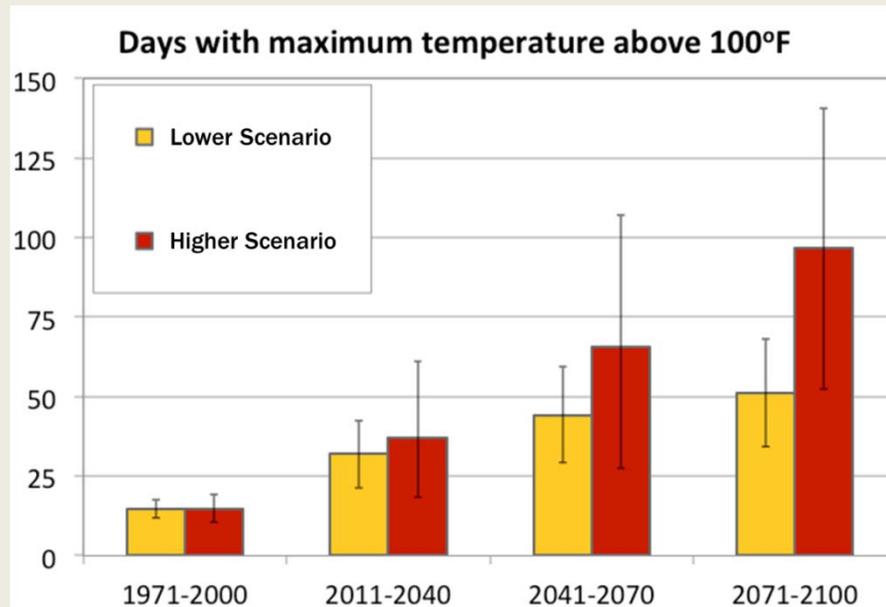
Lead Author of the
2014 National Climate Assessment

Austin specific climate data

- **Global Climate Models & the National Assessment return quality information, but too general for specific use**

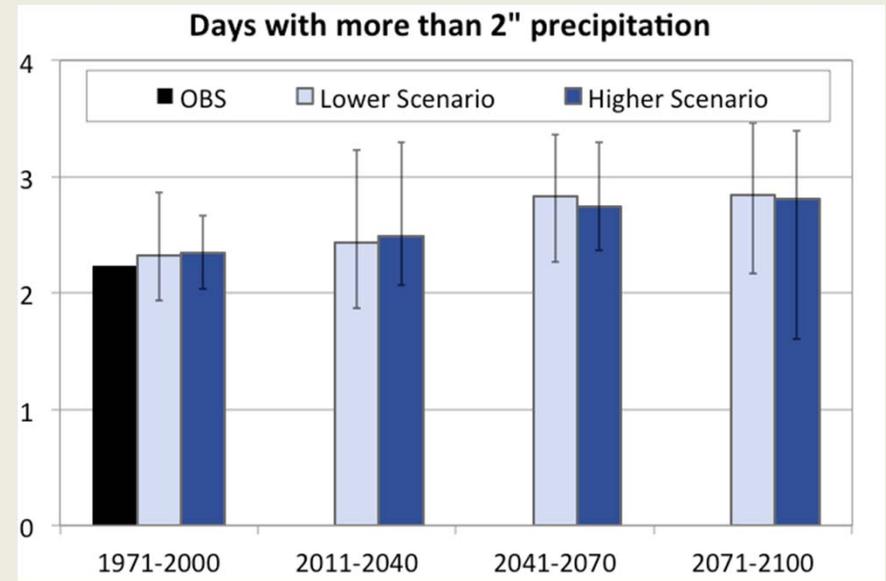
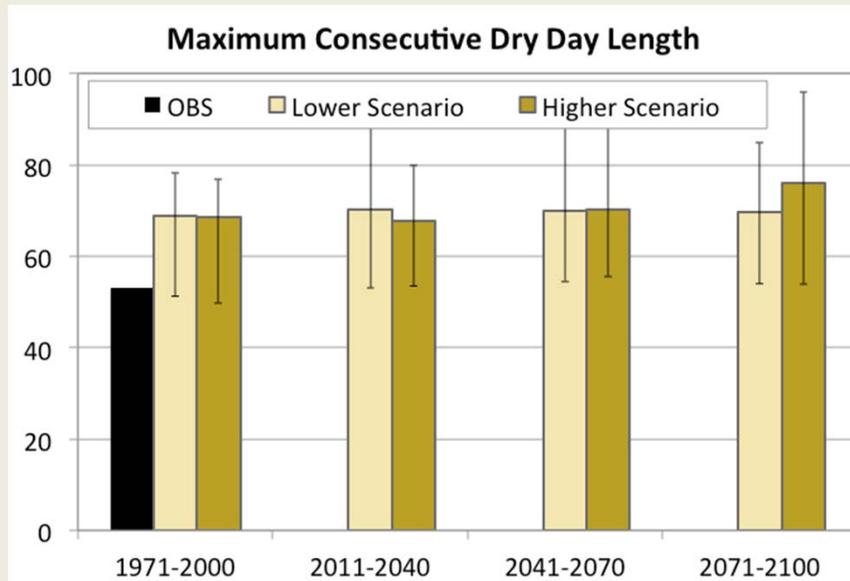
- **Downscaled climate modeling for the Austin area**
 - Preliminary analysis
 - Latest generation of global climate model simulations
 - Camp Mabry weather station
 - Higher and lower emission scenarios
 - Lower Scenario = Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway 4.5 (RCP 4.5) scenario where global carbon emissions peak and decline by the end of the century
 - Higher Scenario = IPCC RCP 8.5 where continued dependence on fossil fuels drives continued growth of emissions through the end of the century
 - Daily temperature & precipitation
 - 10 other secondary climate indicators
 - Timeframe: 1960 – 2100

Climate change projections: Higher temperature averages and extremes



- **OBS = Historical observations**
- **Bars = Average annual values from nine climate models over a 30 year time period**
- **Whiskers = Range in values projected by nine different climate models**

Climate change projections: More extreme precipitation & drought conditions



Summary of climate projections

The science is certain that we will see:

- Increases in annual and seasonal average and extreme temperatures
- More frequent extreme precipitation
- More frequent drought conditions in summer due to hotter weather

The science is less certain that we will see:

- Change in annual average precipitation
- Increase in humidity and heat index
- Increase in the strength (but not frequency) of hurricanes

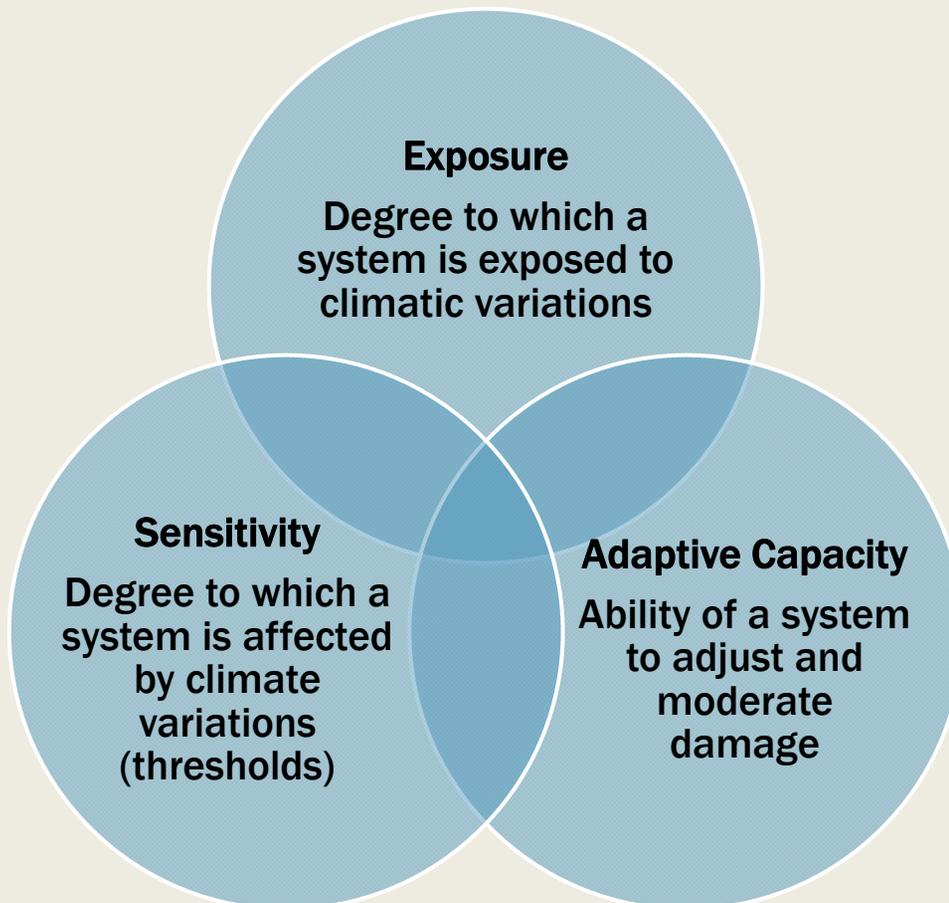
More data needed:

- More weather stations, 100 and 500 year floods, soil moisture, seasonal rainfall, hardness zones, and heat index

Impacts on our City

Understanding risk and vulnerability to climate change

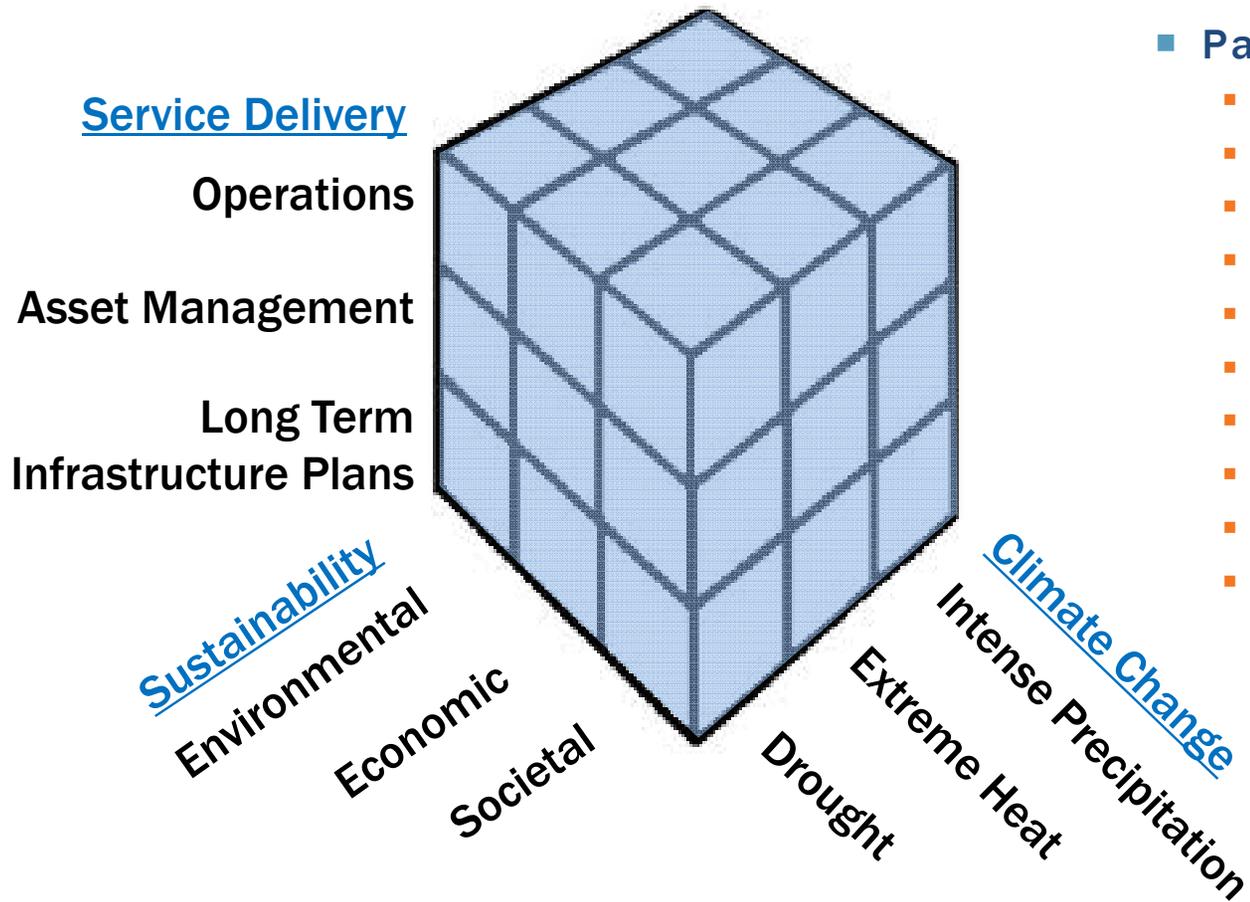
- **Vulnerability = Exposure, Sensitivity, Adaptive Capacity**



Minimizing Risk

- Reducing exposure
- Reducing sensitivity
- Increasing adaptive capacity

Complex interrelated impacts



■ Participating Departments

- Austin Energy
- Austin Water Utility
- Transportation Department
- Public Works
- Watershed Protection
- Parks and Recreation
- Homeland Security and
- Emergency Management
- Fire Department
- Health and Human Services

Increased summer heat

Important Thresholds

Days over 100°F, Days over 110°F, Nights over 80°F

Economic Impacts

- Increased energy operating costs
- Increased cost of infrastructure maintenance
- Loss of field staff productivity

Environmental Impacts

- Vegetation change and loss
- Water supply availability
- Air quality impacts
- Decreased local food production

Societal Impacts

- Increased heat stress at home on vulnerable populations
- Worker safety
- Increased utility usage/cost of living

More frequent drought

Important Thresholds

Duration with 0.0" rainfall, Frequency of dry spells, KBDI - Fire risk

Economic Impacts

- Increased water cost
- Increased vegetation maintenance cost
- Increased pavement maintenance
- Solutions to power plant cooling water scarcity
- Agricultural and tourism losses

Environmental Impacts

- Reduced stream, spring, and river flows
- Water quality protection land viability
- Vegetation, tree, and ecosystem loss

Societal Impacts

- Increased wildfire hazards
- Increased utility usage / cost of living
- Increase in vector borne diseases

More frequent extreme precipitation

Important Thresholds

Days with more than 2in. of rain, 2+ days in a row with extreme rainfall

Economic Impacts

- Property damage and rebuilding
- Increased cost of maintenance of infrastructure systems
- Increased emergency response cost
- Business economic losses

Environmental Impacts

- Vegetation damage
- Debris cleanup
- Groundwater and surface water quality

Societal Impacts

- Evacuee social services & temporary housing
- Need for continuity of service
- Increase in water borne diseases
- Emergency stress on communities

We are already moving in the right direction

- **Austin Water**
 - Water efficiency programs
 - Reclaimed water
 - Drought contingency plan
 - Analysis of future water source options
- **Fire, Health, and Emergency Management**
 - Emergency operations plan
 - Cooling and warming centers
 - Disease surveillance
 - Hazard mitigation plan
 - Community Wildfire Protection Plan
 - Comprehensive Wildfire Risk Assessment
- **Watershed and Parks and Recreation**
 - Flood Risk Mitigation including:
 - Pre-flood design solutions and buyouts
 - Flood Early Warning System operations and upgrades to gages and software
 - Austin's Urban Forest Plan
 - Green Roof and Heat Island Initiatives
- **Transportation and Public Works**
 - FHWA Vulnerability Assessment
 - Alternative transportation infrastructure
- **Austin Energy**
 - Efficiency, renewable energy, and demand response programs
 - Drought contingency and water resource planning for power plants

Imagine Austin

Priority Programs		How implementation increases climate resiliency
1: Invest In a Compact and Connected Austin		Creates a more energy and water efficient community; less development in rural areas helps mitigate the depletion of natural systems.
2: Sustainably Manage Our Water Resources		Provides an increasingly dependable and resilient water and wastewater systems.
3: Continue to Grow Austin's Economy by Investing in Our Workforce, Education Systems, Entrepreneurs, and Local Businesses		Develops a skilled workforce able to mitigate, respond and adapt to climate impacts and extreme weather events.
4: Use Green Infrastructure to Protect Environmentally Sensitive Areas and Integrate Nature Into the City		Reduces the heat island effect; reduces stormwater amounts and velocity.
5: Grow and Invest in Austin's Creative Economy		Provides a diverse employment base for shifting job markets.
6: Develop and Maintain Household Affordability Throughout Austin		Locates affordable housing near jobs, grocery stores, transit, and other community resources, increasing adaptive capacity.
7: Create a Healthy Austin		Reduces vector and water-borne diseases and heat related stress.
8: Revise Austin's Development Regulations and Processes to Promote a Compact and Connected City		Creates infrastructure that is resilient to drought, heat, and flooding.

Summary and Recommendations

Takeaways

1. Recent extreme events are likely to be the new normal
2. Vulnerable populations are likely to be disproportionately impacted due to limited ability to adapt
3. Infrastructure design and construction standards will change
4. Some very important issues are out of our direct control:
 - Grid-wide energy capacity
 - Basin-wide water availability
 - Food supply
 - Evacuees from other cities

Recommendations

- **Develop more detailed climate projections**
- **Detailed vulnerability assessments, where necessary and cost effective**
- **Integration with current departmental planning efforts**
 - Enterprise Risk Management
 - Business Continuity Plans
 - Long Term Plans
 - Capital Plans
- **Regional coordination on climate issues:**
 - LCRA & ERCOT
 - CAPCOG, CAMPO & TXDOT
 - Travis and surrounding counties