

## TW CC Scripting Day-1 V8

*Last Updated 11-6-25*

### Introduction

Hello, good morning and welcome to Student Stories of Climate Change, presented by Pima County Flood Control, Tucson Water and the City of Tucson. My name is XXX, joined here today by my co-presenter XXX.

Today, and again in a few [days/weeks], we'll be exploring climate change — the science behind it and its real-world effects across the globe.

But rather than just talk at you, we want to share stories from young people worldwide who are experiencing climate impacts firsthand and leading research on solutions. Let's start with a quick look at some of them.

### **(Click) Video - Introduction to Program (1 minute 20 seconds)**

As you can see, we have a wide range of countries and stories to share. But before we dive in, we want to hear from all of you! You'll be using participant clickers to share your thoughts and help guide our discussion.

Please handle the clickers carefully. Your teacher, Mr./Ms./Mrs. [Name], is keeping track of who has each one, and we ask that they're returned in good condition so other students around Tucson can use them too.

**(Click)** Great! To kick things off, we'll start with some quick pre-assessment questions. You'll have about 10 seconds for each one, so stay alert and answer fast! If you make a mistake, don't worry—you can change your answer while the question is still open.

*(Quick acknowledgments of answers while going through them.)*

### **Clicker Questions -**

1. Do you believe climate change is real?
  - a. Yes
  - b. No
  - c. Not sure
2. Do you know someone who doesn't believe in climate change?
  - a. Yes
  - b. No
3. Are you concerned about climate change?
  - a. Not Concerned at all
  - b. Concerned a little bit
  - c. Very concerned

4. Do you think climate change will affect you in the future?
  - a. Yes
  - b. No
  - c. Not Sure
5. Are you aware of any effects of climate change here in Tucson?
  - a. Yes
  - b. No
  - c. Not sure
6. Which do you think is the biggest contributor to climate change?
  - a. Burning of Fossil Fuels
  - b. Manufacturing of goods
  - c. Travel
  - d. The Internet
  - e. Agriculture

Very interesting! I can see you already have a range of opinions and interests when it comes to climate change.

### **Climate vs Weather**

So, before we can talk about climate change, I've got a question:

**Clicker Questions** - Is climate the same as weather?

1. Yes
2. No
3. Not Sure

**(Click)** In simplest form: **(Click) Weather** is a specific event—like a rainstorm or hot day—that happens over a few hours, days or weeks. **(Click) Climate** is the average weather conditions in a place over 30 years or more.

**(Click)** Okay, a quick example looking at rain here in Tucson.

A big summer monsoon storm might bring several inches of rain to Tucson over the course of a few days or even hours. – That's weather!

**(Click)** Climate would be analyzing rain gauge, surface water, and satellite data over time. For example, if an area continues to be drier than normal over the course of many summers, then it would likely indicate a change in the climate.

Everyone understand? Weather is what's happening today, climate is what's happening with weather patterns over 30 plus years.

### **No Single Event can be attributed to Climate Change**

Before we move on, it's important to understand that no singular event can be proven to be a direct result of Climate Change.

**(Click)** Natural disasters, such as hurricanes, floods, tornadoes, and forest fires have always happened. But, what the study of climate shows us is that the frequency and intensity of these extreme events is increasing, at an alarming and unprecedented rate.

**(Click)** For example, let's take a quick look at the number of tropical storms, hurricanes and major hurricanes in the Atlantic region since 1851. What does everyone notice? **(Click)** Yeah we can clearly see that the number of named storms is increasing.

**(Click)** There are also more *extreme* hurricanes happening, causing tremendous damage to coastal communities.

**(Click)** This is the aftermath of Hurricane Ian which hit Florida in 2022.

**(Click)** This increasing trend is happening with **(Click)** forest fires, tornadoes, flooding, bomb cyclones, polar vortexes, and atmospheric rivers. **(Click)** Not only are they happening more often, they are also becoming more intense.

**(Click)** Have any of you observed changes in Tucson's climate? — *(pause for nodding)* – Yes, and we'll explore more of those changes later.

Next, let's hear from Professor Kaustub (CAW-stub) and Grad Student Asiya (ah-SEE-ya) about how a changing climate in India is impacting one of the fastest growing populations in the world.

**(Click) Video - India - 1.5 minutes**

#### Clicker Questions After India

1. Do more people live in India or the United States?
  - a. **More People live in India**
  - b. More People live in the United States
2. Around what percentage of people in India live without air conditioning?
  - a. 25%
  - b. 65%
  - c. **85%**
  - d. 99%
3. What was most compelling to you about this climate change story?
  - a. Learning about India
  - b. Seeing the effects of climate change
  - c. I did not find this story compelling

**Credibility NASA / NOAA / NWS**

**(Click)** When it comes to climate change there is a lot of different information and opinions out there, from a lot of different sources. **(Click)** We aren't sharing our opinions with you today, we are just showing you the best available evidence, from peer-reviewed scientific sources.

**Clicker Questions** - Who do you trust MOST when it comes to information about climate change?

1. Friends
2. Family
3. Teachers
4. Political Representatives
5. Religious Leaders
6. News Media
7. Gov Agencies (NASA, NOAA, NWS)
8. Social Media Posts & Videos

*(Quick acknowledgments of answers.)*

*(If they vote NASA for least, something like: Well, I'm sad to see a majority of you don't trust NASA, NOAA, NWS. Maybe after we evaluate some of their research together you'll feel differently.)*

**(Click)** Today, we're going to be looking at information directly from NASA, NOAA, and NWS.

**(Click)**, NASA is the National Aeronautics Space Agency.

**(Click)** NOAA, is the National Oceanic and Atmospheric Administration.

**(Click)** And NWS, is the National Weather Service.

**(Click)** Around the world, thousands of scientists at these agencies use data from satellites, weather balloons, and ground instruments to understand Earth's systems **(Click)**, like temperature, weather patterns, and ocean currents.

### **Climate Change Basics, CO2, Greenhouse Effect**

**(Click)** Today, using data from a variety of scientific disciplines, we'll examine 4 categories of evidence for Climate Change, **(Click)** based on changes in temperature, oceans, ice, and weather.

But, what causes these types of changes? **(Click)** Before we can answer that question, we first need to understand the greenhouse effect.

**Clicker Question** - What is the greenhouse effect?

#### **A. Trapping the Sun's Heat in the Earth's Atmosphere**

- B. Using Greenhouses to Create more Oxygen
- C. Capturing the Sun's Heat in Green Plants

**(Click)** How does the greenhouse effect work and contribute to climate change? **(Click)**

1. Sunlight reaches the Earth
2. Some of the sun's energy is reflected back into space
3. Some of the sun's energy is absorbed and re-radiated as heat
4. Most of the heat from the sun is absorbed by greenhouse gasses and then radiated in all directions, warming the Earth

So, as the concentration of greenhouse gasses in the atmosphere continues to increase, more and more of the sun's heat energy gets trapped and the earth warms more as a result.

**(Click)** Carbon dioxide, or CO<sub>2</sub> is a heat-trapping gas that comes from the extraction and burning of fossil fuels such as coal, oil, and natural gas.

**(Click)** It also comes from wildfires, and from natural processes like volcanic eruptions.

**(Click)** It comes from the burning of fossil fuels in cars and planes.

**(Click)** And from the manufacturing and transportation of nearly everything we buy and use.

Like with temperature, carbon dioxide levels in the atmosphere go up and down over time.

**(Click)** Scientists can measure past CO<sub>2</sub> levels using natural records like ice cores and tree rings. These show that today's levels are much higher than at any point in nearly a million years.

**(Click)** Looking at the level of CO<sub>2</sub> in the atmosphere for the past 800,000 years, we see these natural up-and-down cycles until we get to the 1880s.

**(Click)** The current trend is different because it is clearly the result of human activities since the mid-1800s, and is proceeding at a rate not seen over the past almost million years.

### **The Industrial Revolution to Today**

So what happened in the 1800's that exacerbated climate change?

**(Click)** The industrial revolution, one of the largest global scale changes in the history of human society.

**(Click)** From around 1760 to 1840, manufacturing transitioned from individuals working in small shops and homes into assembly lines of workers at large scale factories.

**(Click)** What powered this advance? Fossil fuels! The widespread use of coal, oil, and natural gas really took off, building the modern world that we know today.

But, industrialization creates challenges as well.

**(Click)** In fact, as far back as the 1850s, scientists like Eunice Foote (YOU-ness FOOT) were already discovering how carbon dioxide traps heat in Earth's atmosphere.

**(Click)** If we fast forward a few hundred years, we see the consequences of the industrial revolution and the accuracy of Eunice Foote's research.

**(Click)** Around one-third of all global forests have been cut down, for larger and larger agricultural farms to grow both livestock and crops for our food.

**(Click)** Millions of acres of land have been destroyed in the mining and refinement of fossil fuels, ores, and minerals that are needed in the manufacturing and transportation of everything.

**(Click)** Let's look at a chart of estimated human population over time. **(Click)** It took thousands of years for the world to reach around 1 billion people in the 1800s. **(Click)** It doubled to 2 billion by the 1920s. **(Click)** It doubled again to 4 billion in the 1970s, and in **(Click)** 2024 it doubled again to 8.2 billion people. Wow, talk about a large-scale change in two hundred years!

This tremendous increase in population over a short period of time has only exacerbated the need for more resources and in turn, produced more and more atmospheric gasses, like CO<sub>2</sub>, that are having tremendous effects on the planet as a whole.

**(Click)** Countries contribute different amounts of CO<sub>2</sub> and other emissions, depending on their size, population, and industrial activities. Let's travel to Kenya to learn about how climate change will affect everyone, even populations that do not contribute a lot of emissions.

**(Click) Video - Kenya - 1.5 minutes**

### Clicker Questions After Kenya

1. Approximately how many people in the world practice pastoralism?
  - a. 200 million
  - b. 600 million**
  - c. 900 million
  - d. 2.4 billion
2. Which of the following applies to Agrivoltaics technology?
  - a. The Doppler Effect
  - b. The Food-Water-Energy Nexus**
  - c. The Casimir Effect
3. What was most compelling to you about this climate change story?
  - a. Learning about Kenya

- b. Seeing the effects of climate change
- c. Diana's research projects
- d. I did not find this story compelling

What stood out to you from that story?

(Take responses, discussion 1-minute max)

### **Evidence of Climate Change - Temperature Change**

When we say "Climate Change" many people think of "global warming".

**(Click)** The data directly from NASA, and other credible international agencies shows us that since **(Click)** 1884, the earth has warmed, on average 1.47° Celsius, that's about 2.65° Fahrenheit.

So, let's back up - where does this data come from? How do we know this? **(Click)** One place is from temperature records from around the world.

As we watch this loop of global temperature change, what do you notice? Blue colors are cooler than average, and orange and red are warmer than average.

*(Points to hit: there are cycles of hot and cold, some areas have gotten warmer than others, the warming has really accelerated since 1980.)*

**(Click)** While the earth has always gone through cycles of warming and cooling, what we are seeing now is unlike anything that has ever happened in the last few 100,000s of years.

**(Click)** This type of rapid warming is having dramatic effects all around the world and right here in Tucson, including: **(Click)** higher temperatures, droughts, increased frequency and severity of forest fires, flooding, and water shortages.

**(Click)** As you may know, the Southwest faces serious drought issues, including in Tucson. A warmer climate worsens droughts while also holding more moisture, making both dry spells longer and storms more intense.

**(Click)** Hotter temperatures make severe wildfires more common, like those that ravaged Mt. Lemmon in the summer of 2020.

Temperature increases are affecting billions of people around the world. Like we mentioned, one consequence of global temperature increase is increased flooding.

[\(Click\)](#) Thankfully, Pima County's Regional Flood Control District is preparing for the future by partnering with University of Arizona scientists to model how rainfall and runoff may behave in the coming decades.

[\(Click\)](#) Some models are one-dimensional, used for places like the Santa Cruz River or Rillito Creek, where water flows mostly in one direction. [\(Click\)](#) Others are two-dimensional, looking at flood depth in the affected areas like Avra Valley where the floodplain is more complex and water spreads out across the landscape.

[\(Click\)](#) When flood engineers talk about how water moves, they use two branches of science.

[\(Click\)](#) **Hydrology** asks: *How much water is falling?*

[\(Click\)](#) **Hydraulics** asks: *Where does that water go once it hits the ground?*

[\(Click\)](#) For example, hydrology is measuring rainfall, like in a raingauge.

[\(Click\)](#) and Hydraulics, is mapping flood plains, or where that water will go, to understand risks.

Both are critical to modeling floods, designing basins, and making sure future development stays safe.

[\(Click\)](#)

Flooding affects people in Pima County, and all over the world. Next, let's hear from some high school students in Spain.

[\(Click\)](#) **Video - Spain - 1.5 minutes (Inma, Carlos, Paz, Lucia)**

### Clicker Questions After Spain

1. What is the approximate population of Spain?
  - a. 27 million
  - b. 47 million**
  - c. 67 million
  - d. 87 million
2. What are some noticeable effects of climate change that have impacted Spain?
  - a. Freezing, hurricanes, fog
  - b. Tornadoes, dust storms, sleet
  - c. Flooding, heat waves, drought**
  - d. Blizzards, ice storms, cyclones
3. What was most compelling to you about this climate change story?
  - a. Learning about Spain
  - b. Seeing the effects of climate change
  - c. Hearing directly from high school students
  - d. I did not find this story compelling

A lot of effects of Climate Change are happening in Spain - what stood out to you from their story?



(Take responses, discussion 1-minute max)

### **Evidence of Climate Change - Oceans & Ice**

**(Click)** Next, let's explore what climate change evidence we can find in the world's oceans and ice.

**(Click)** We might not think much about the oceans here in Arizona, but they cover 71% of Earth's surface and are home to incredible biodiversity.

**(Click)** That's why it's important to understand that **(Click)** Ocean surface temperatures have warmed about 1.5°F, **(Click)** acidity has increased by 30%, and **(Click)** sea levels have risen about 10 inches since 1880.

**(Click)** These oceanographic changes are causing major impacts — more coastal flooding, coral reef loss, declining fish populations, stronger hurricanes, and faster melting of Earth's ice sheets.

**(Click)** This NASA visualization of arctic sea ice size from 1979-2022 shows the massive increase in sea ice melting. *(Pause for graphic).*

**(Click)** Glaciers on land are retreating almost everywhere in the world at an alarming rate, as seen in these photos over time from Glacier National Park in Montana. *(brief discussion)*

**(Click)** All this melting only further increases sea level rise, which by 2050, is projected to be between 12-18 inches higher around the US coastline.

**(Click)** And on the global scale, an additional 1 foot of sea level rise threatens over a billion of people who live in coastal areas. That would be the red colors that you see on this map.

Time for our next Student Story of Climate Change, to hear about how a student in Turkey is already thinking about how to protect his community

**(Click) Video - Turkey - 1.5 Minutes - Atakan (At-Uh-Can)**

### **Clicker Questions After Turkey**

1. What was the goal of Atakan's science project?
  - a. To divert flood water to drought-stricken regions
  - b. To monitor migration of local fish populations
  - c. **To provide an early warning for river floods**
2. What is the approximate percentage of Turkey's global emissions?
  - a. **1%**
  - b. 5%
  - c. 10%

- d. 15%
- 3. What was most compelling to you about this climate change story?
  - a. Learning about Turkey
  - b. Seeing the effects of climate change
  - c. Hearing directly from a high school student
  - d. I did not find this story compelling

What stood out to you from that story?

(Take responses, discussion 1-minute max)

### Evidence of Climate Change - Weather Events

**(Click)** Around the world, extreme weather events are becoming more frequent and severe—what were once “once-in-a-century” events now happen several times a year.

**(Click)** Even though the Earth is warming, climate change also brings more extreme and unpredictable winter weather, like bomb cyclones, blizzards, and massive storms.

Quantity has a quality all its own. **(Click)** We often hear these big numbers, like: Hurricane Ian damaged 30,000 homes in Florida, or last year **(Click)** California wildfires burned 400,000 acres of land, **(Click)** or how a tornado caused billions of dollars worth of damage in the town Arabi (*EH-ruh-bee*), Louisiana in 2022.

It’s important to remember that these statistics reflect the lives and suffering of real people. Understanding our changing climate helps us prepare for extreme weather, reducing damage and loss of life.

**(Click)** For example, we just heard about flooding in Turkey, but we’ve seen this kind of flash flooding here in Pima County, too. Tucson may be dry most of the year, but that dryness actually makes flash floods more dangerous. The desert soil doesn’t soak up water quickly, so when a heavy storm hits, the rain runs off rapidly—filling washes, roads, and low-lying areas in minutes.

**(Click)** Some of the most tragic examples happen at places like Tanque Verde Falls, where dozens of people have died after being swept away by fast-moving water. Groups like the **Southern Arizona Rescue Association**, or SARA, respond to emergencies caused by sudden flooding, especially in dangerous areas like Tanque Verde Falls.

**(Click)** In 2024, search and rescue teams responded to over 1,100 incidents. Many were caused by people underestimating how fast and powerful flood water can be. That’s why Pima County installed a system of **(Click)** rain and streamflow gauges across the region.

These tools monitor storm conditions in real time and help emergency services respond faster, [\(Click\)](#) and they power a public alert system called MyAlerts, which you and your family can sign up for. It's just one way we're using technology to adapt to a changing climate and stay safe.

To be prepared for all kinds of weather events, we can help our families make an Emergency Response Plan. [\(Click\)](#) This is kind of like a cheat sheet that can help us stay organized and stick to a plan in an emergency situation. This includes knowing where you'd go in a flood or wildfire, how to communicate if cell service goes down, and what to pack in a "Go Bag" or disaster kit. We're sending everyone home with more information on making these plans and putting together "Go Bags," with essential supplies.

And guess what? When you complete the form linked at the end of your plan, you will be entered in a raffle to win a free iPad next summer!

Next let's hear about what happened to one ASU student's family in our next Student Story of Climate Change.

[\(Click\) Video - Pakistan - 2 Minutes - Mehreen \(May-reen\)](#)

### Clicker Questions After Pakistan

1. Why was Mehreen's family attacked?
  - a. **Because she was being taught to read and write**
  - b. Because of a farmland boundary dispute
  - c. Because of a water rights dispute
2. Approximately how many people in Pakistan were affected by the 2022 summer floods?
  - a. 3 million
  - b. 13 million
  - c. **30 million**
  - d. 300 million
3. What was most compelling to you about this climate change story?
  - a. Learning about Pakistan
  - b. Seeing the effects of climate change
  - c. Hearing Mehreen's story
  - d. I did not find this story compelling

What stood out to you from that story?

(Take responses, discussion 1-minute max)

### Climate Change Refugees

[\(Click\)](#) Millions are already affected by extreme weather, forced to leave their homes and livelihoods behind — becoming climate change refugees.

**(Click)** By 2050, an estimated 1.2 billion people could be displaced by climate change, mostly from poorer countries lacking the resources and infrastructure to cope. **(Click)** And, many of these countries don't even contribute a lot of CO2 emissions that are causing climate change.

**(Click)** Many people, both globally and in the U.S., don't have the privilege of ignoring climate change — it will affect all of us in some way.

## **Climate Change in Tucson**

**(Click)** Today, we've gone around the world and heard about how climate change is affecting other countries. On Day-2, we're going to look much more at how Climate Change is affecting Tucson.

**(Click)** For today, a quick overview of three things to know about Tucson and Climate Change: **(Click)** temperature change, rainfall and water supply, and our plans for the future.

**(Click)** Let's look at Tucson's average annual temperature from 1948 to 2024 with data from NOAA and NWS. What do you notice?

(Very brief discussion)

**(Click)** Yes, as we can see from this chart the average annual temperature in Tucson has increased by around 4° F, with some years being higher or lower than others.

One climate model projection for Tucson indicates that by 2050 we may experience temperatures of 105° for more than one third of the year, which is 120 days!

**(Click)** That will really affect all of us here in Tucson - it may become even more hazardous for people to be outside for prolonged periods of time.

**(Click)** Now, let's look quickly at Tucson's rainfall from 1949 to 2024. **(Click)** we used to get around 12 inches of rain a year, and now we're down to less than 11 inches on average.

**(Click)** This lack of rain has caused a massive drought throughout the desert southwest. Tucson has been in a severe drought for over twenty years - your whole lives!

**(Click)** This has tremendous consequences for our Sonoran Desert ecosystem, and can lead to increased wildfires. Who remembers seeing, or smelling the fires on Mt Lemmon in 2020?

**(Click)** We're seeing fewer rainy days overall, but when storms do come, they're more intense. These heavy bursts cause flash floods as desert soil can't absorb water well, leading to dangerous runoff — a pattern scientists call "wetter wets and drier dries."

**(Click)** Turn around - don't drown!

Please don't be like the person taking this video - DO NOT go in washes during rainfall or flood events!

**(Click)** So, we're getting longer stretches of dry, hot weather, interrupted by extreme rainfall that can overwhelm both natural and built systems.

**(Click)** Pima County works with scientists at the University of Arizona researching how rainfall patterns will shift in our region. **(Click)** They can use historical data and modeling to simulate how climate change might affect flood risk 30 years into the future. **(Click)** Their work directly informs how Pima County plans stormwater systems and decides where to build them.

Another way that we plan for Tucson's future is by managing our drinking water. **(Click)** Over 90% of Tucson's drinking water comes from the Colorado River, delivered via the Central Arizona Project (C-A-P) Canal.

**(Click)** In many areas, drinking water is stored in reservoirs, like those at Lake Mead. But, water levels in these reservoirs have dropped dramatically over the last 20 years.

**(Click)** Thankfully, Tucson is preparing by storing more C-A-P water than we use, recharging our aquifer, recycling wastewater, and harvesting rainwater. On Day 2, we'll explore Tucson's Water and Climate future—but for now, remember: **(Click)** use water wisely! Fix leaks, turn off the tap, and never waste this precious desert resource.

## Hope for the Future

**(Click)**

It's okay to feel worried about climate change. But the most important thing is not to get stuck in fear. Instead, we can turn that concern into action. Let's hear how Diana is staying hopeful

**(Click)** [Video - Hope for the future - Diana - 22 seconds](#)

## Final Clicker Questions, Collect Clickers and Goodbye!

Time for some final questions!

### Final Clicker Questions

1. Since 1880, global sea levels have risen approximately:
  - a. 3 inches
  - b. 7 inches
  - c. **10 inches**
  - d. 24 inches

2. Since 1948 Tucson's average temperature has increased by how much?
  - a. 1° F
  - b. 4° F**
  - c. 5° F
  - d. 7° F
3. What was the global population in 2024?
  - a. 5.2 billion
  - b. 8.2 billion**
  - c. 12.2 billion
  - d. 15.2 billion
4. Climate Change is affecting people around the world and in Tucson.
  - a. I agree
  - b. I disagree
5. Are you now more or less concerned about climate change?
  - a. More Concerned
  - b. Less Concerned
  - c. Same
6. Which video story was MOST compelling to you?
  - a. India - Kau & Asiya
  - b. Kenya - Diana
  - c. Spain - Group of Students
  - d. Turkey - Atakan
  - e. Pakistan - Mehreen

That was our last clicker question, we are going to start collecting clickers while we say goodbye. Thanks for being such a good audience today!

*(Tech presenter collecting clickers)*

**(Click)** We hope you've learned a lot about the scientific evidence for climate change and how it is already affecting people in Tucson and around the world.

We're looking forward to coming back to your class in a few (weeks/month) to present Day-2 of our program. We'll hear from students in Tucson, Mexico and across America about their experiences with Climate Change, as well as learn what the City of Tucson, Pima County Flood Control, and Tucson Water are doing to mitigate the effects of climate change, and how students can help.

(IF TIME, ask students if they have any questions or comments.)