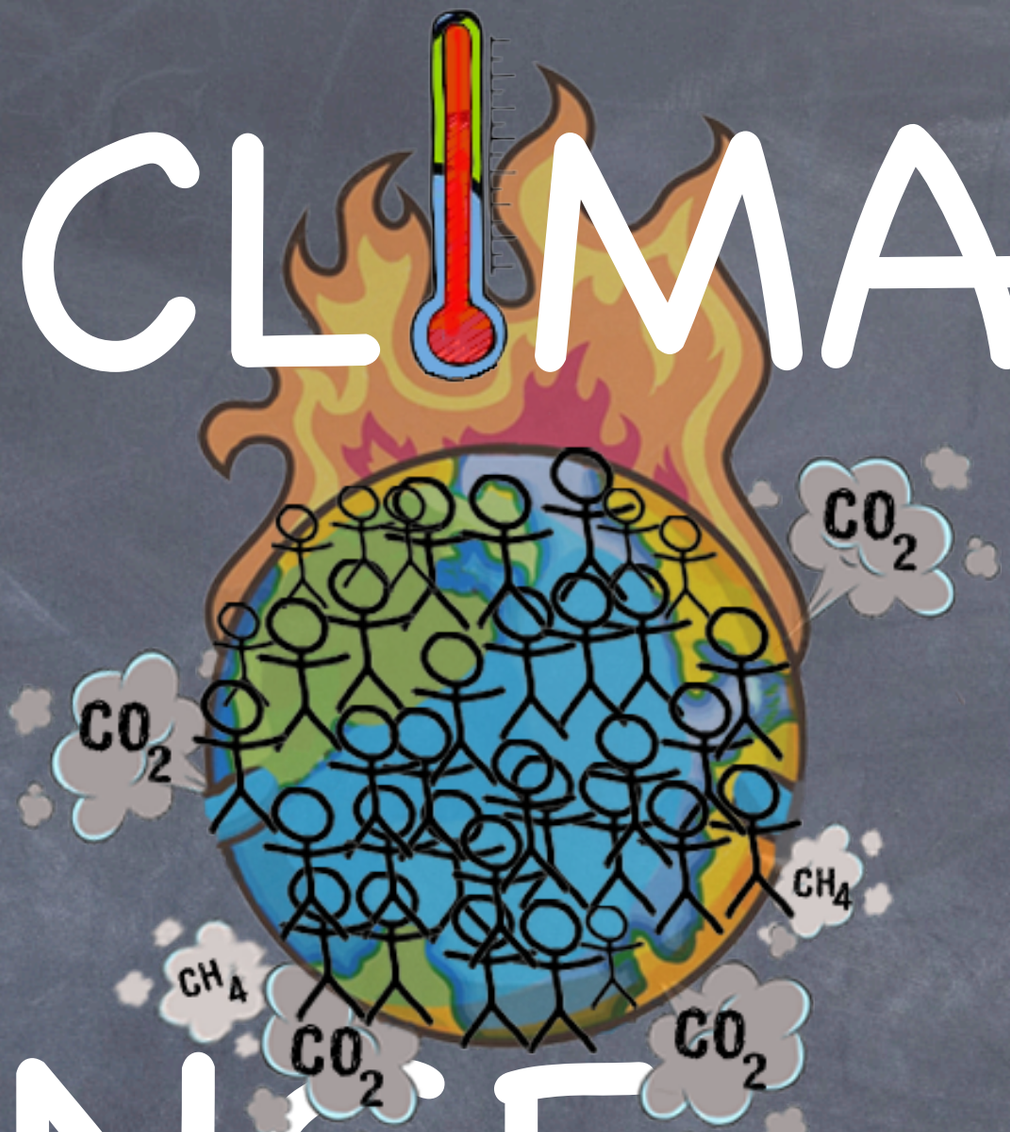
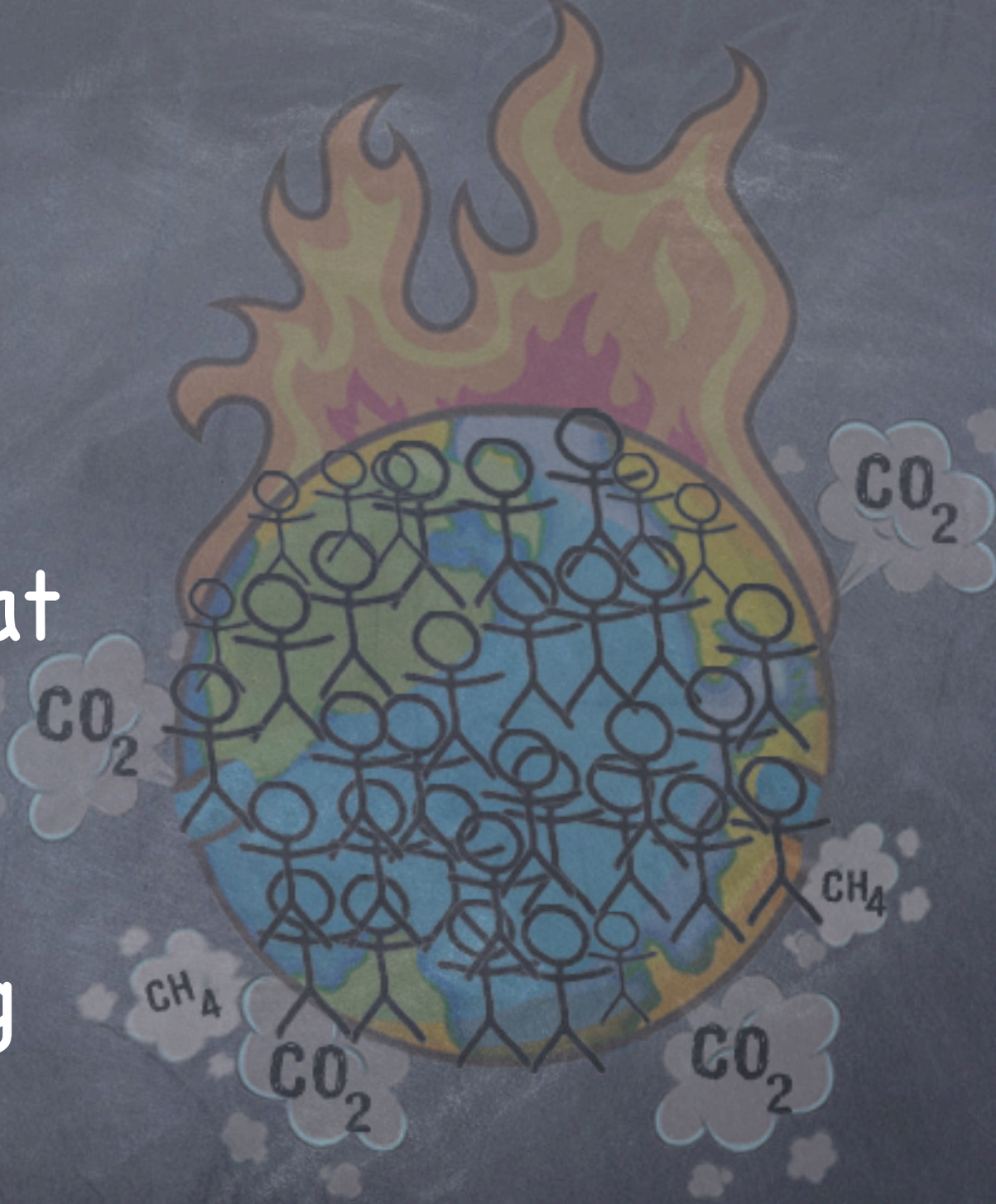
CLIMATE



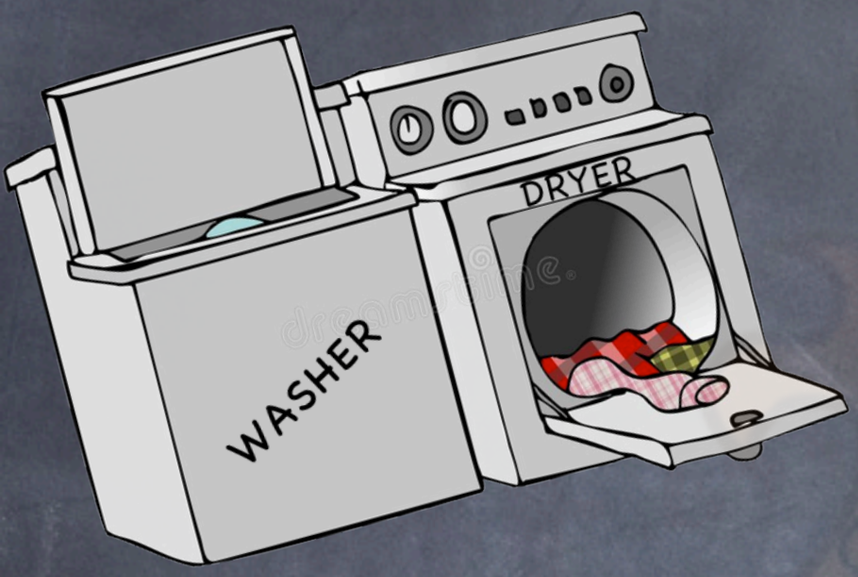
CHANGE EXPLAINED

A brief presentation for members of the community to gain a better understanding of the changes taking place in our climate and why

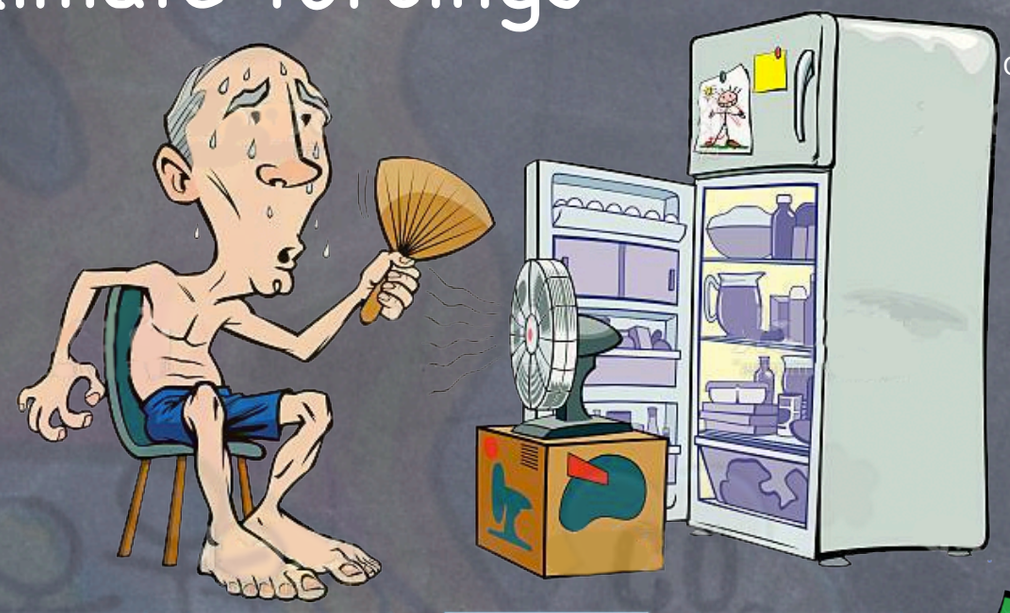
It has been well established in the scientific community that **we** are one hundred percent, influencing the changes that are taking place within our climate system[1]



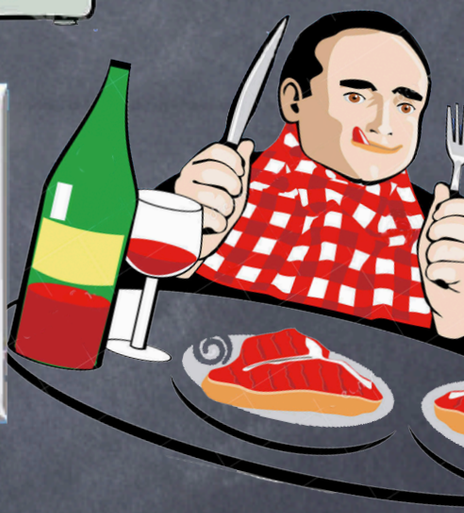
Everyday behavior we practice in our lifestyle is initiating climate forcings[2]



Credit: Adapted from Cox, Dennis, n.d.



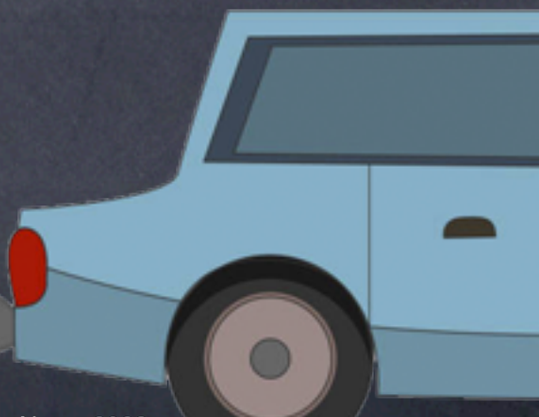
Credit: StellrGraphic, 2010



Credit: Davidrey, n.d.

Credit: Airtafolo, 2021

Credit: sanlas, 2021



Credit: Adapted from Nasa, 2022

The F words

Forcings= Initiate a change to the climate

Air pollution is a climate forcing

Solar radiation is a climate forcing

Greenhouse gas is a forcing agent

Aerosol is a forcing agent

Land use changes are a forcing agent

The F words

Forcings= Initiate a change to the climate

Unknown, n.d.

Our use of aerosols causes changes in the clouds which effects moisture and vapor[3]

The F words

+ Ice-Albedo (the ice is melting)

+ Wildfires

+ Water vapor

+ Carbon release

Feedback= AMPLIFIES or DECREASES an initial warming
(responds to the changes in temperature)

pos **+** feedback intensifies the initial warming

neg **–** feedback reduces the initial warming & slows it down

– Clouds & evaporation

– lapse-rate

The F words

pos +

WATER VAPOR

Feedback=

Credit: Barreto, n.d.

When we increase the amount of water vapor, we amplify what is already warming, creating a more potent greenhouse gas[4]

The F words

neg

CLOUDS & EVAPORATION

Feedback=

ONYXprj, n.d.

Cloud cover serves as a cooling, reducing the initial warming[4]

Historical Context of Climate

Credit: Adapted from Sasek, 2020

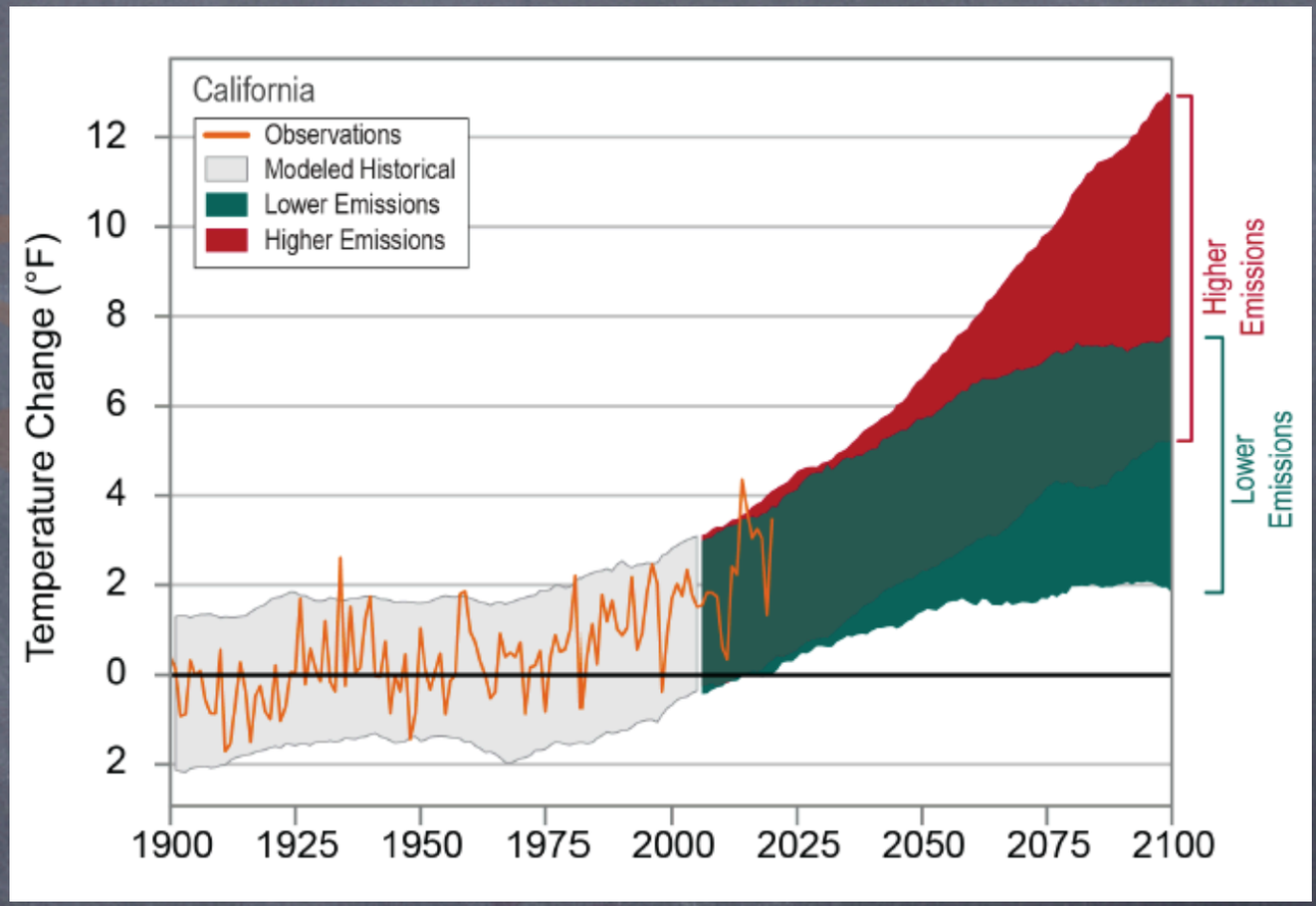
California

- Since 1895, Southern California temperature has risen about 3 degrees [5, 7]

- Since 2014, California has experienced six of the warmest years on record [5,6,7]

- Warming trends are historically most distinct in urban areas due to the heat islands [7, 8]

- Southern California is warming quicker than the rest of the U.S. [9]

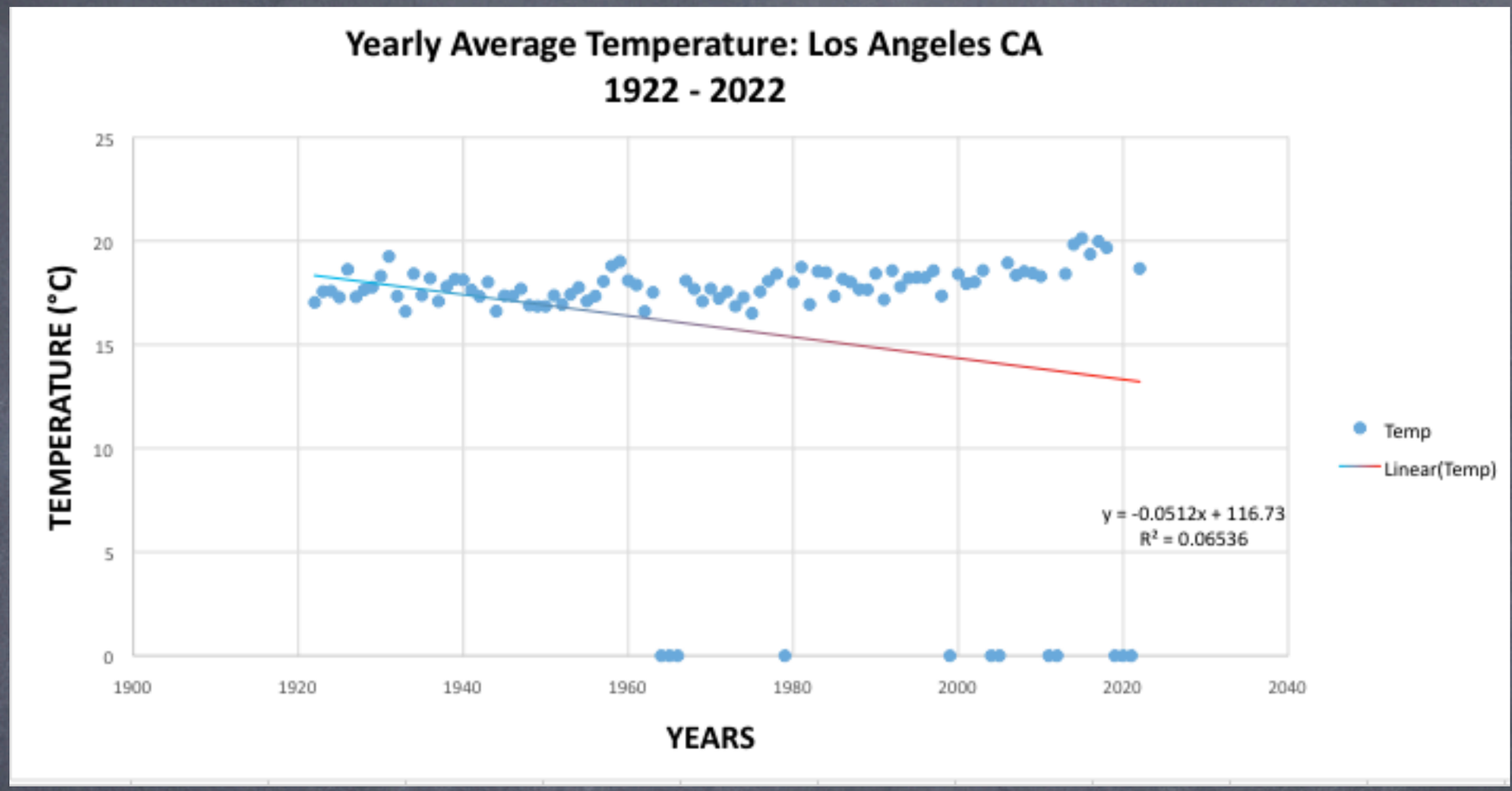


Credit: Adapted from NOAA, 2022

- As warming increases in the LA region (with a projected temperature increase of 4-7°F or 7-10°F by the late- 21st century, larger numbers of wildfires will occur, soils will become drier, droughts will occur more frequently, and we will see significant impacts to California's numerous and diverse ecosystems.[10]

Credit: Adapted from Normal Greetings, n.d.

California



https://data.giss.nasa.gov/cgi-bin/gistemp/stdata_show_v4.cgi?id=USW00093134&ds=14&dt=1

Above we can see a graph of temperature changes in Los Angeles California, dating back to 1922. The numbers appear pretty consistent and steady between 17 and 18 °C over the last hundred years, with only one instance of a 19 °C reading in 1931. We don't see a temperature of 19 °C or higher again until 1959 (28 years later), and after that, not for another 55 years later in 2014. Since then, California has experienced six of the warmest years on ever recorded.[5,6,7]

1816

In the year 1816 of the Common Era, a climatic event called **Year Without Summer** (YWS) covered Europe and North America with clouds, rainfall and an average decrease in global temperature by 0.4–0.7 °C (Brohan et al., 2016; Stothers, 1984).

Major human impacts resulted from this event including agricultural disaster, failed harvests, famine, disease, and social distress (Brohan et al., 2016; Stothers, 1984).

Research suggests the erupting of the Tambora volcano in Indonesia from the year prior (1815), was the proximate cause of the YWS event. Mount Tambora was the largest, deadliest and most violent volcanic eruption in recorded history (Stothers, 1984; Heidorn, 2004) responsible for lifting 150 to 180 cubic kilometres of material into the atmosphere (Heidorn, 2004) along with massive amounts of sulfur that were so significnat, they were capable of altering global climate (Auchmann et al., 2012).

The YWS was one of the coldest of the past six centuries (Oppenheimer, 2003; UCD, 2008) and an event that has been described as one of the clearest examples of a climate forcing because of the how the Tambora eruption led to severe weather with major human impacts (Brohan et al., 2016).

image: jemastock, n.d.

305 Million Years Ago (Mya)

The Carboniferous Rainforest Collapse...

was a mass extinction event that led to multiple species of plants and tetrapods disappearance (University of Birmingham, 2018). What was once a flourishing habitat of humid rainforests for diversified species, became a dry and uninhabitable environment (University of Birmingham, 2018).

As tetrapods scattered the globe in search of wet grounds, their vast dispersal later included several species of amniotes (a Clade of Tetrapods; e.g., reptiles and birds) whose evolution not only led to species diversification, but adapting to new climatic environments they could survive and later thrive (University of Birmingham, 2018).

Image credit: 'Carboniferous forest' by Mark Ryan

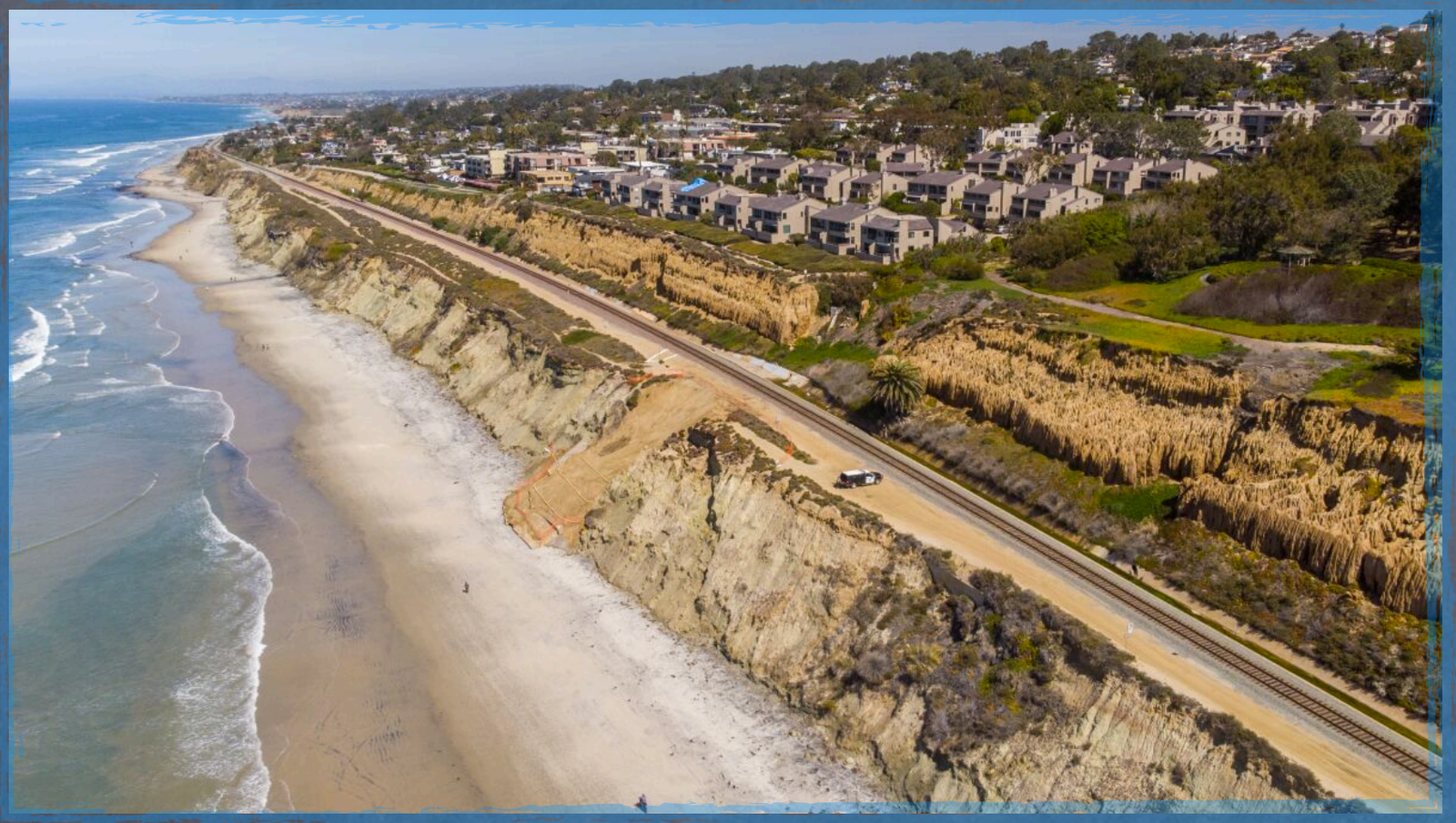
Socio-Economic Impact

Credit: Adapted from Normal Greetings, n.d.

Local

California

Some of the impacts arising out of climate change in California include:



Credit: Jarrod Valliere / San Diego Union-Tribune, 2022

COASTAL EROSION:

Research shows cliff collapse throughout California was recently reported at "**more than 16 feet per year**" (Xia, 2022).

Coastal areas throughout the state are inhabited by about 85% of Californians (DOJ, n.d.). In the last century, local sea levels have risen about 8 inches with no signs of stopping any time soon. An estimated "$100 billion in property and infrastructure" accompanied by "half a million people at risk of flooding" is foreseen by the year 2100 if a 55-inch rise to sea level occurs (DOJ, n.d.). There are significant impacts which seriously threaten California's $46 billion a year self-proclaimed "ocean-dependent economy" (DOJ, n.d.).

California

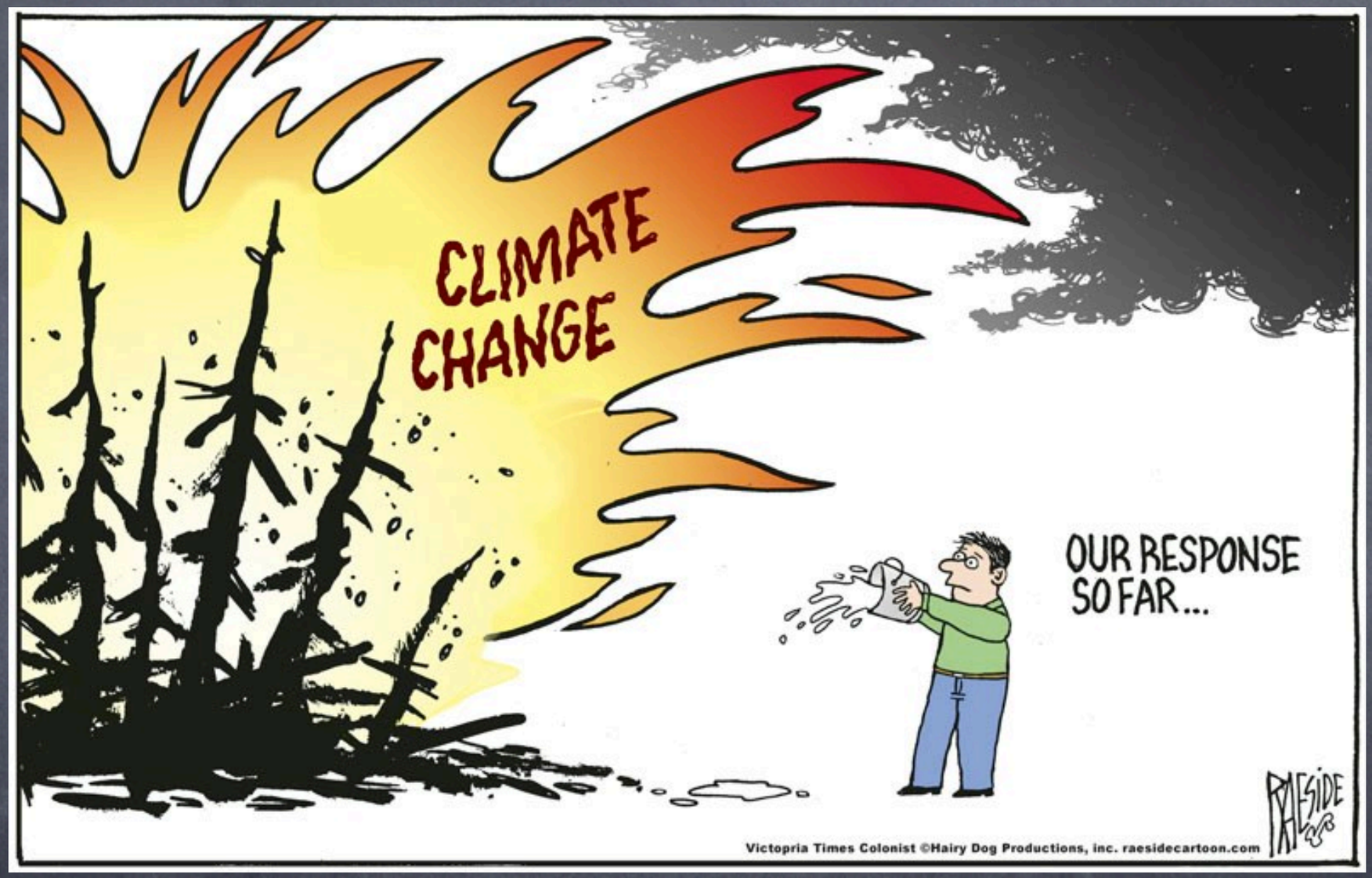
Some of the impacts arising out of climate change in California include:

Credit: Getty Images/iStockphoto, n.d.

AGRICULTURE: California is the nation's largest agricultural sector (DOJ, n.d.).

The creeks and wetlands of California are maxed out (Shimek, 2020). "Over a third of the country's vegetables and three-quarters of the country's fruits and nuts are grown in California" (CDFA, 2022). But the agricultural system in California is also highly unsustainable, facing challenges that are only exacerbated by climate change (Shimek, 2020). The use of synthetic pesticides and fertilizers, water pollution generated by the agricultural sector, the over application of chemicals are to name a few of the state's current practices creating additional forcings leading to climate change (Shimek, 2020).

Mitigation



Credit: Adrian Raeside, 2021

Measures we take to lessen the damage our actions are causing the world.

Mitigation measures can sometimes refer to policies, or they can be measures YOU take to help reduce your household footprint.

Mitigation

GEOENGINEERING

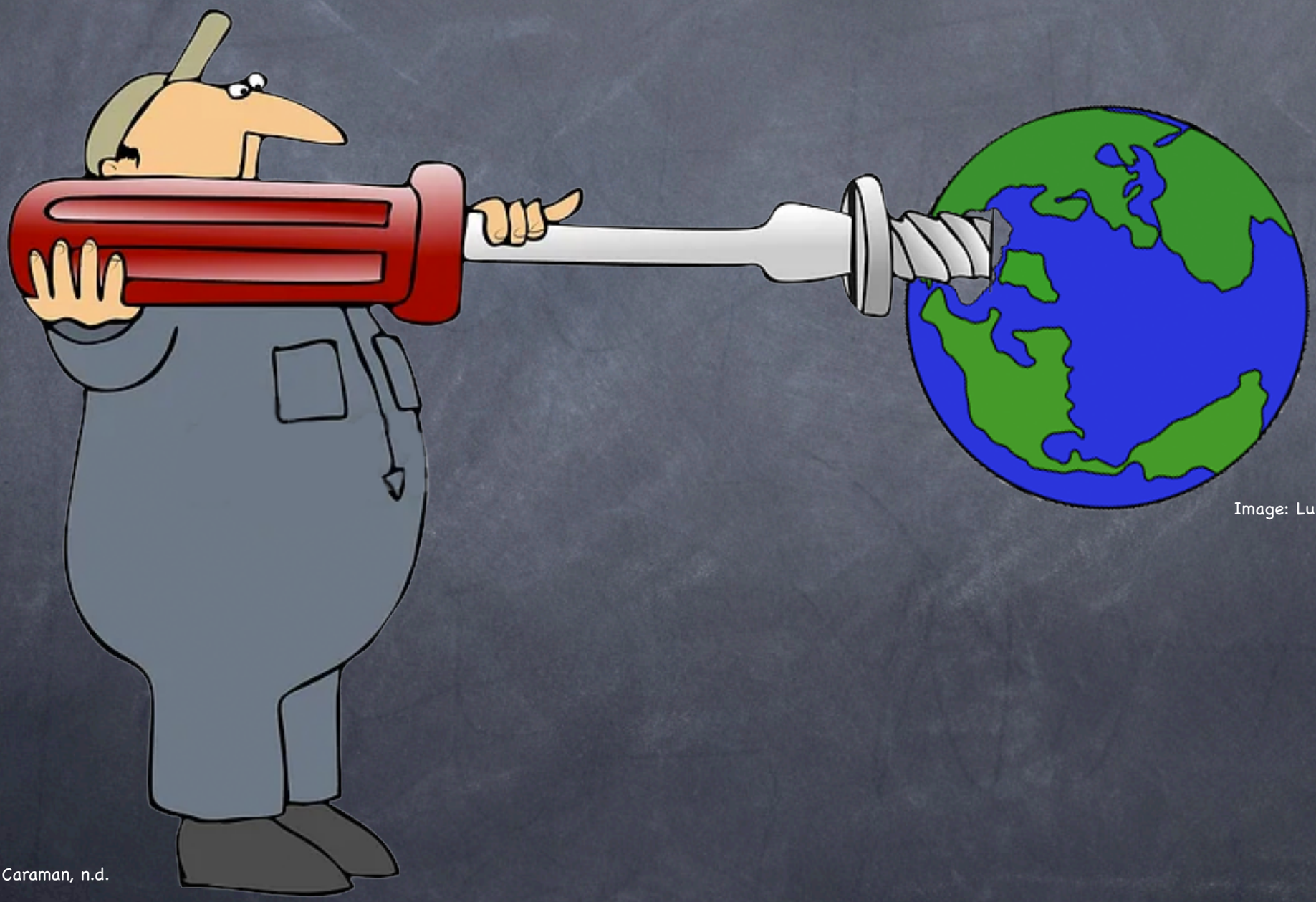


Image: Caraman, n.d.

Image: Lunanaut, n.d.

Mitigation

GEOENGINEERING

Solar Radiation Management (SRM)

Space-Based Mirrors

Image: Adapted from Esfir Dzhyshkariani / Alamy Stock Vector, Sun vector cartoon, 2018

Image: Badrus, Space background, n.d.

Image: Adapted from Piratecraft, Mirror Cartoon, 2017

Image: Jiro, Hand clipart, n.d.

Global

Mitigation

GEOENGINEERING

Carbon Dioxide Removal (CDR)

Direct Air Capture (DAC)

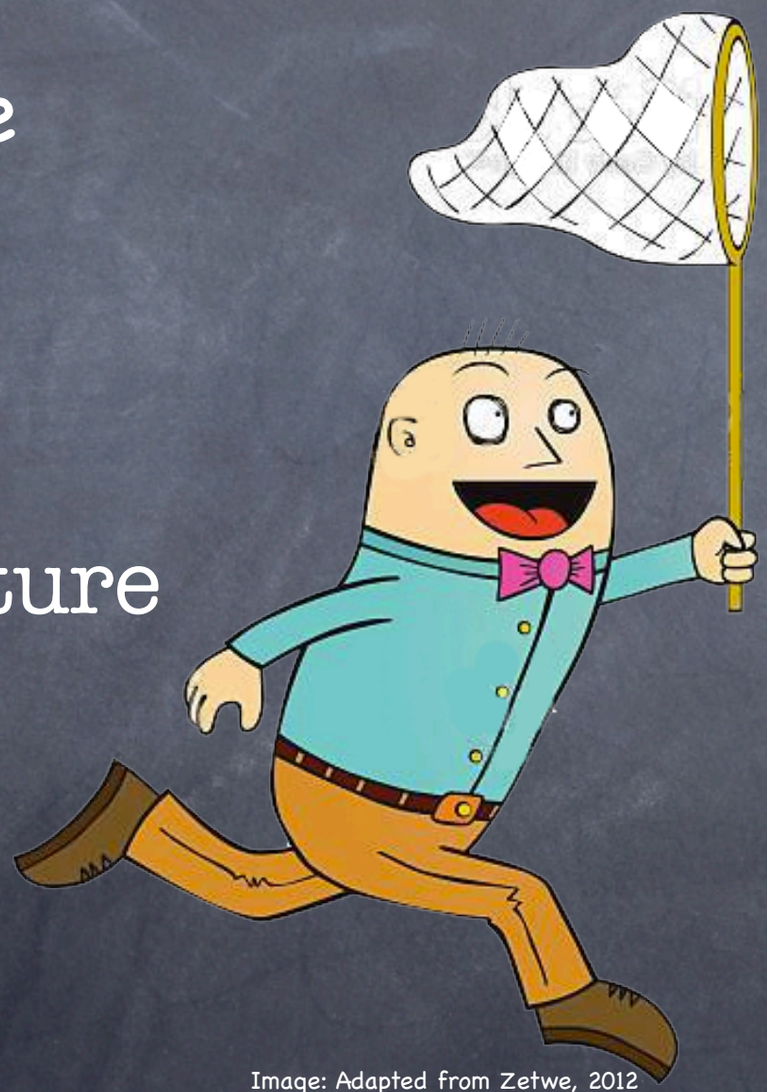


Image: Adapted from Zetwe, 2012

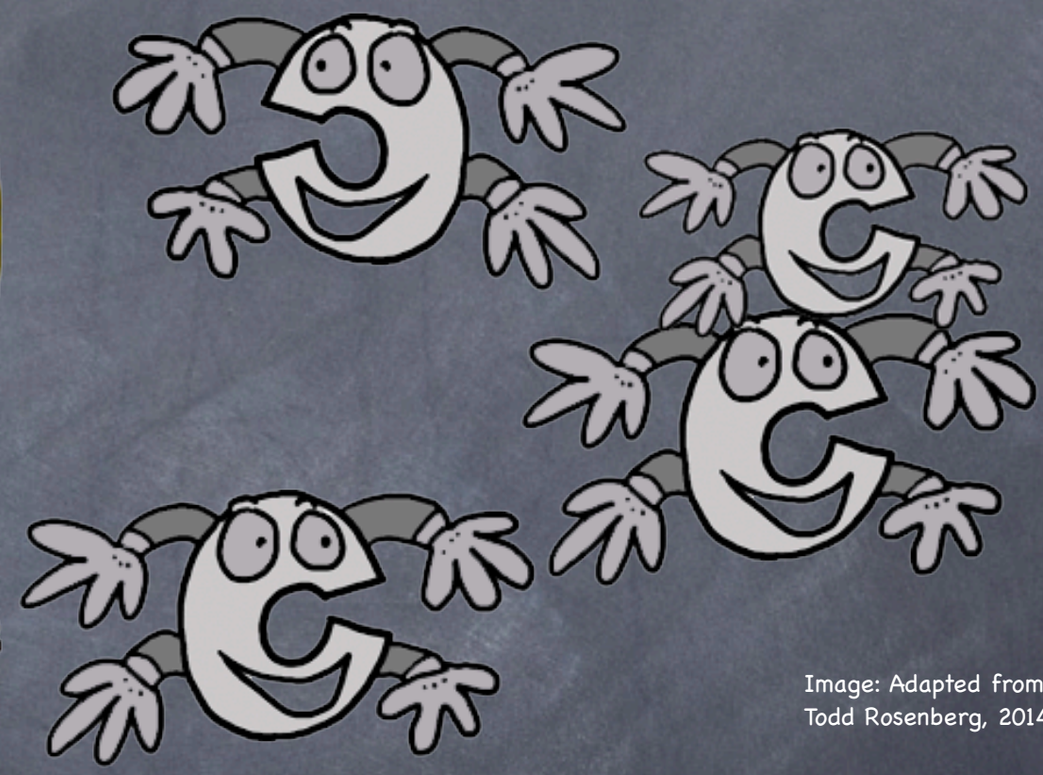


Image: Adapted from Todd Rosenberg, 2014

Local

Mitigation

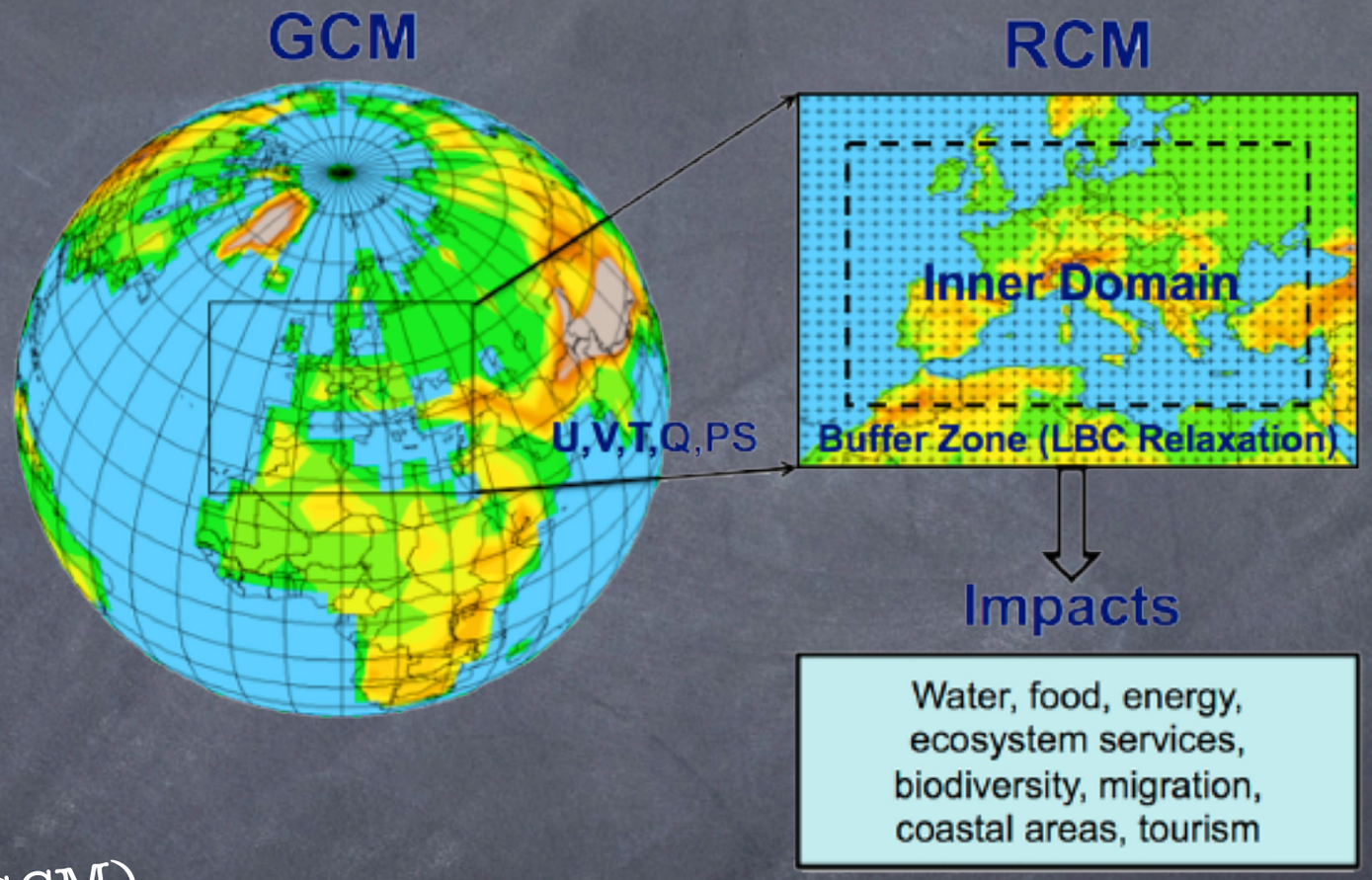
STATE LAW

Image: CEJA, n.d.

California
Environmental
Quality
Act

Climate Models

Computer simulations used to predict the behavior of our climate system in the future



Credit: Giorgi, 2019

Global Climate Models (GCM)
OR
General Circulation Models (GCM)

Energy Balance Models (EBM)

Local

Climate Model PREDICTIONS

Between 2010 - 2015 local researchers from the Center for Climate Science Faculty conducted a comprehensive study known as the '**Climate Change in the Los Angeles Region Project**'[11]

Credit: American Stock Archive, Getty Images, 2019

Local

Climate Model PREDICTIONS

Credit: American Stock Archive, Getty Images, 2019

Some of their key findings include:

Left: The spatial resolution of a higher-resolution global climate model. This resolution is too coarse to represent the region's microclimates.

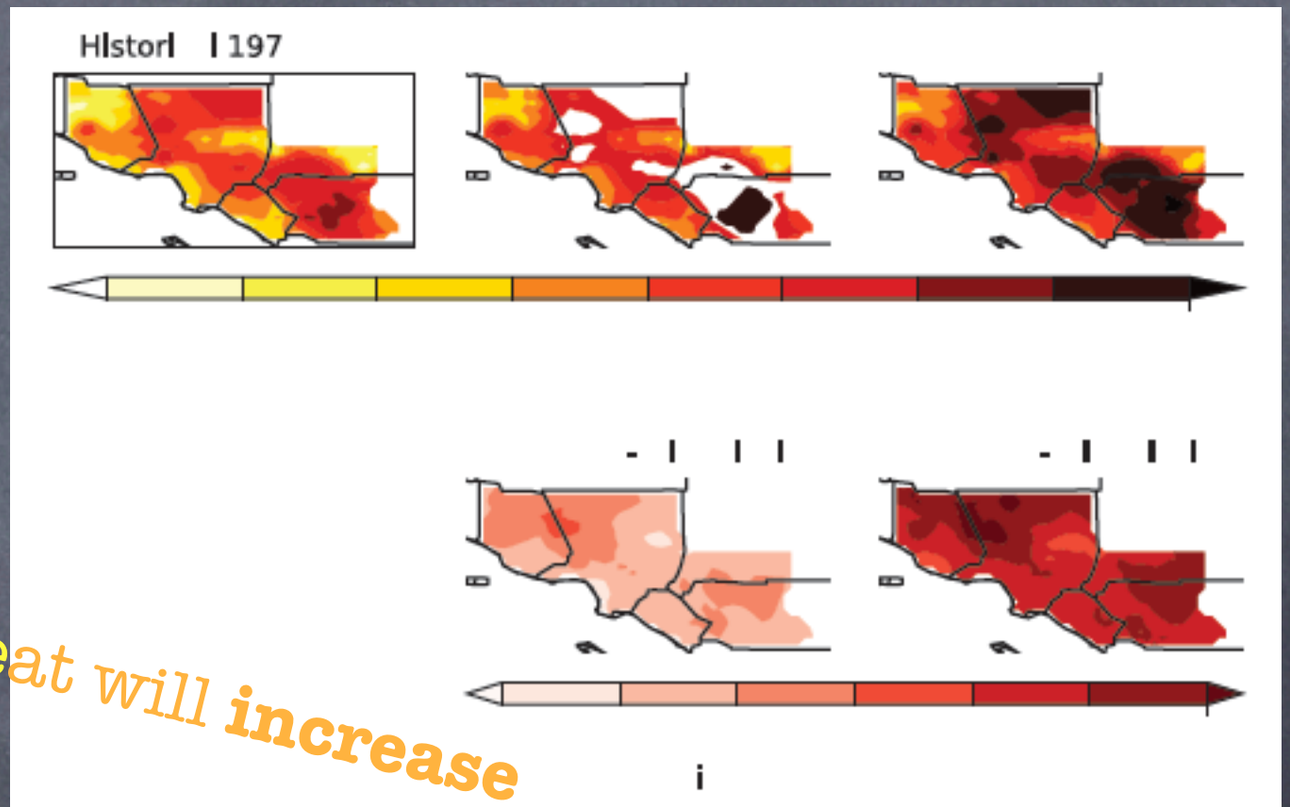
Right: The 1.2-mile resolution achieved in the Climate Change in the Los Angeles Region Project. This resolution provides neighborhood-by-neighborhood data.

- Land area average temperatures **rise by 4.3°F**
- Days having a temperature **above 95°F increase**
- **Reduced snow** in the mountains

Climate Model PREDICTIONS

Other climate models created for the Los Angeles region found:

- Intensity & frequency of extreme heat will **increase**
- Sea levels **WILL rise**
- More **wildfires will burn**
- The future brings **significantly drier soils**



Top row: Average hottest day of the year in the historical (1976-2005) period, and in the late-21st century (2070-2100) under RCP4.5 and RCP8.5. Bottom row: change (late-21st century minus historical) in the hottest day of the year under RCP4.5 and RCP8.5. Unit is °F.

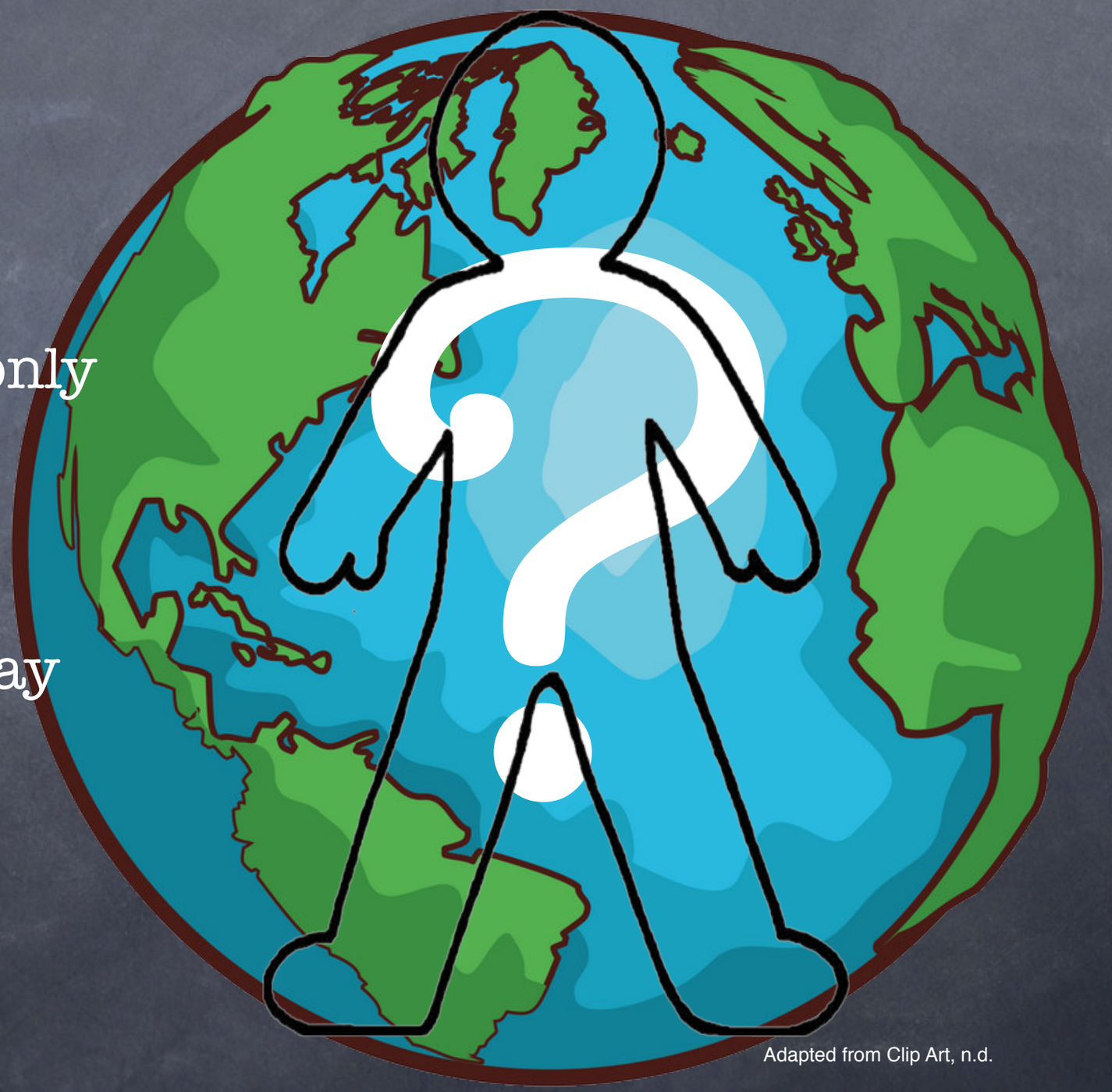
Credit: Hall, Alex (2018). Figure 2

Climate Model LIMITATIONS

- The future is unknown

- Computer modeling can only go so far

- What we do with the information will lead the way



Adapted from Clip Art, n.d.

Summary / Conclusions

TREES

Don’t just plant trees - -

FIGHT FOR THE TREES THAT WE ALREADY HAVE

“The best time to plant a tree is twenty years ago”
(Turner-Skoff et al., 2019).

STUFF

Local

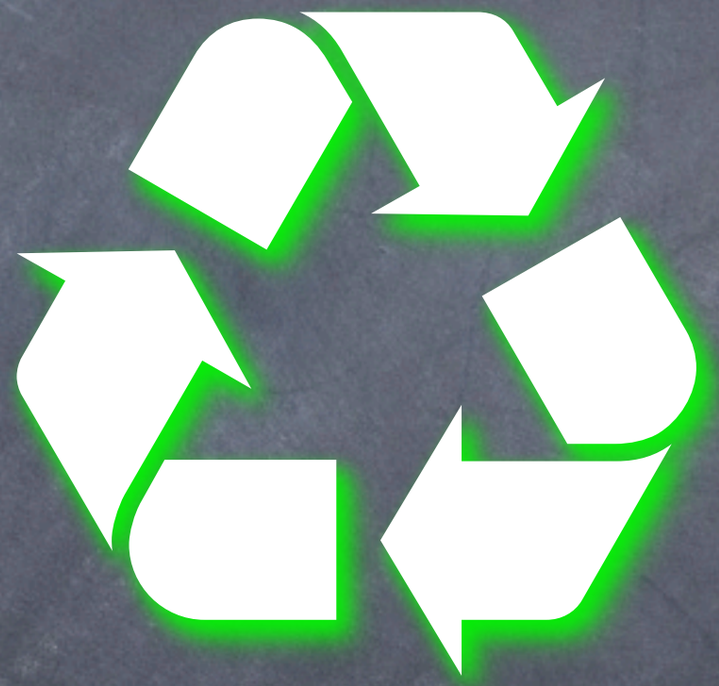
Global

45% of Greenhouse Gases comes from the making of the **stuff you buy**

- Use **less** stuff
- Buy **used**
- Buy **less** from big companies
- REuse
- Recycle
- Share
- Donate

Credit: DARRYLSHOP01, n.d.

RECYCLE



Local

MEAT

Global

- Sparing the animals reduces methane
    - Do you NEED to eat meat?

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