



# ***Climate Change Issues and Overview***

Mary M. Matthews



# ***What is Climate Change?***

**“In the past, everyone  
talked about the  
weather...”**

**Now everyone talks about  
how the weather was, in  
the past...”**



# ***What is Climate Change?***

Climate

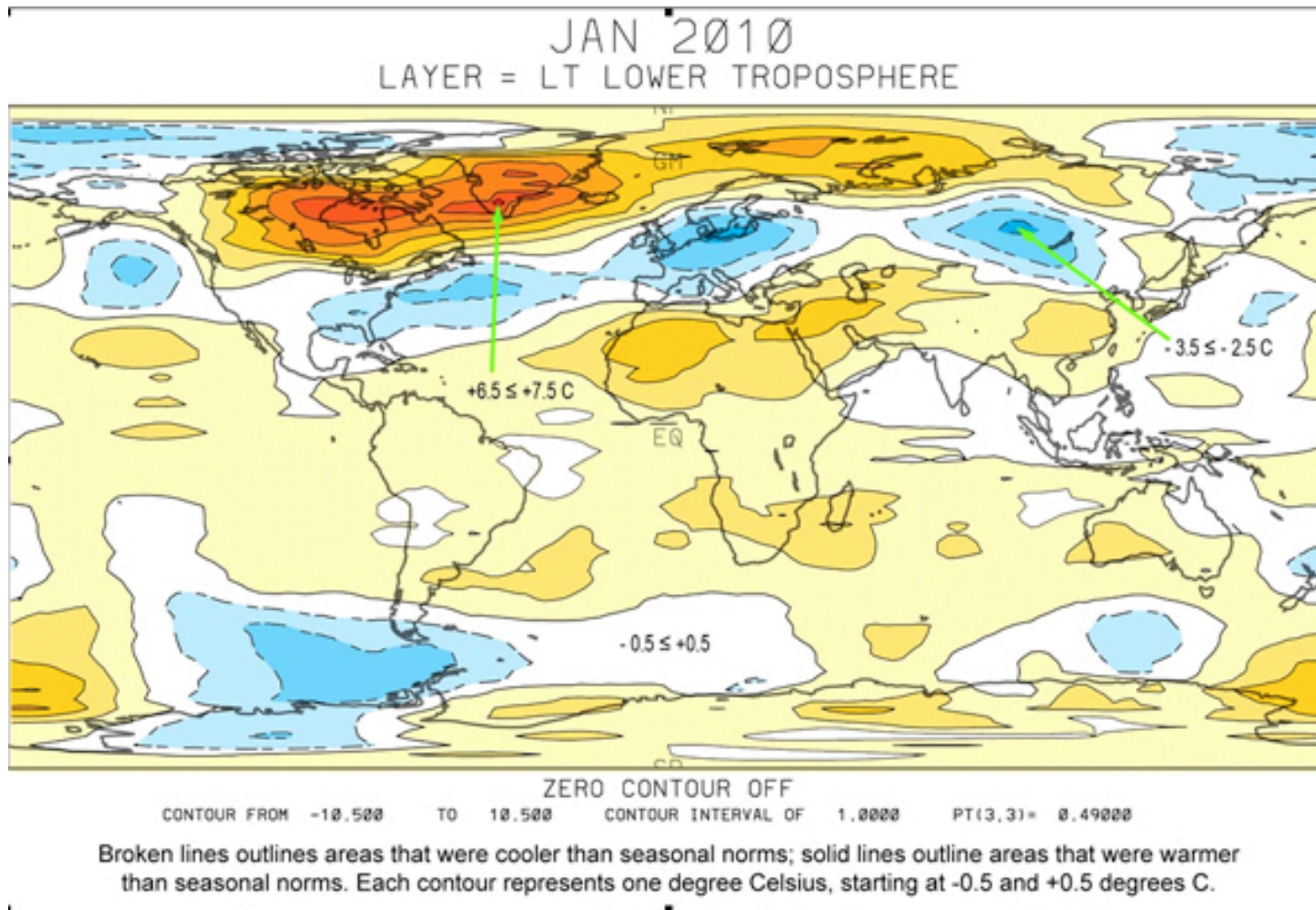
# **CHANGE**

- more SEVERE weather events
- more FREQUENT severe weather events
- And **CHANGING CLIMATES**



# What is Climate Change?

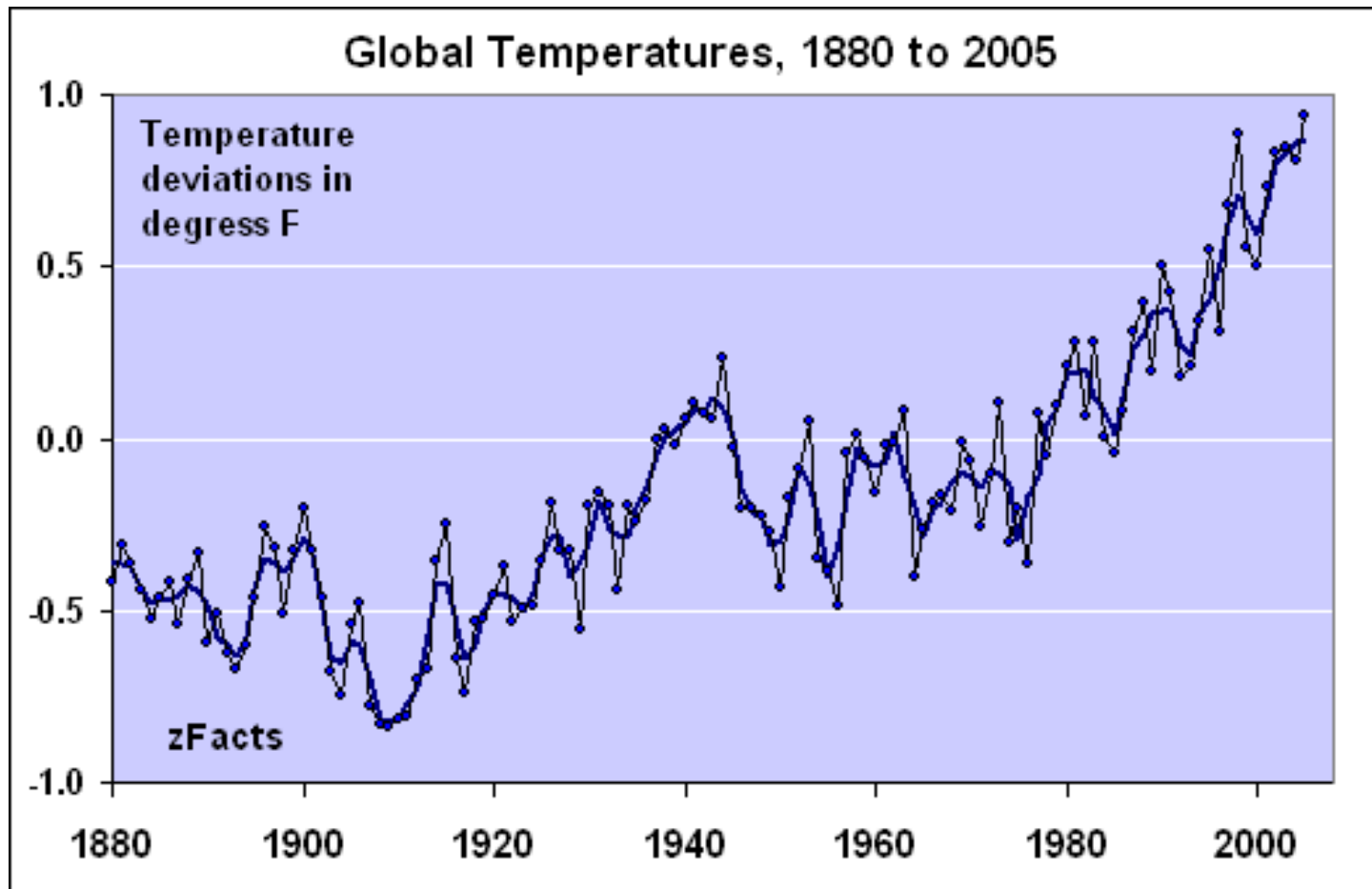
- 1) *It is a change in basic weather patterns and ambient weather conditions, globally and locally.*





# ***What is Climate Change?***

***2) It is driven by a rise in global temperature.***



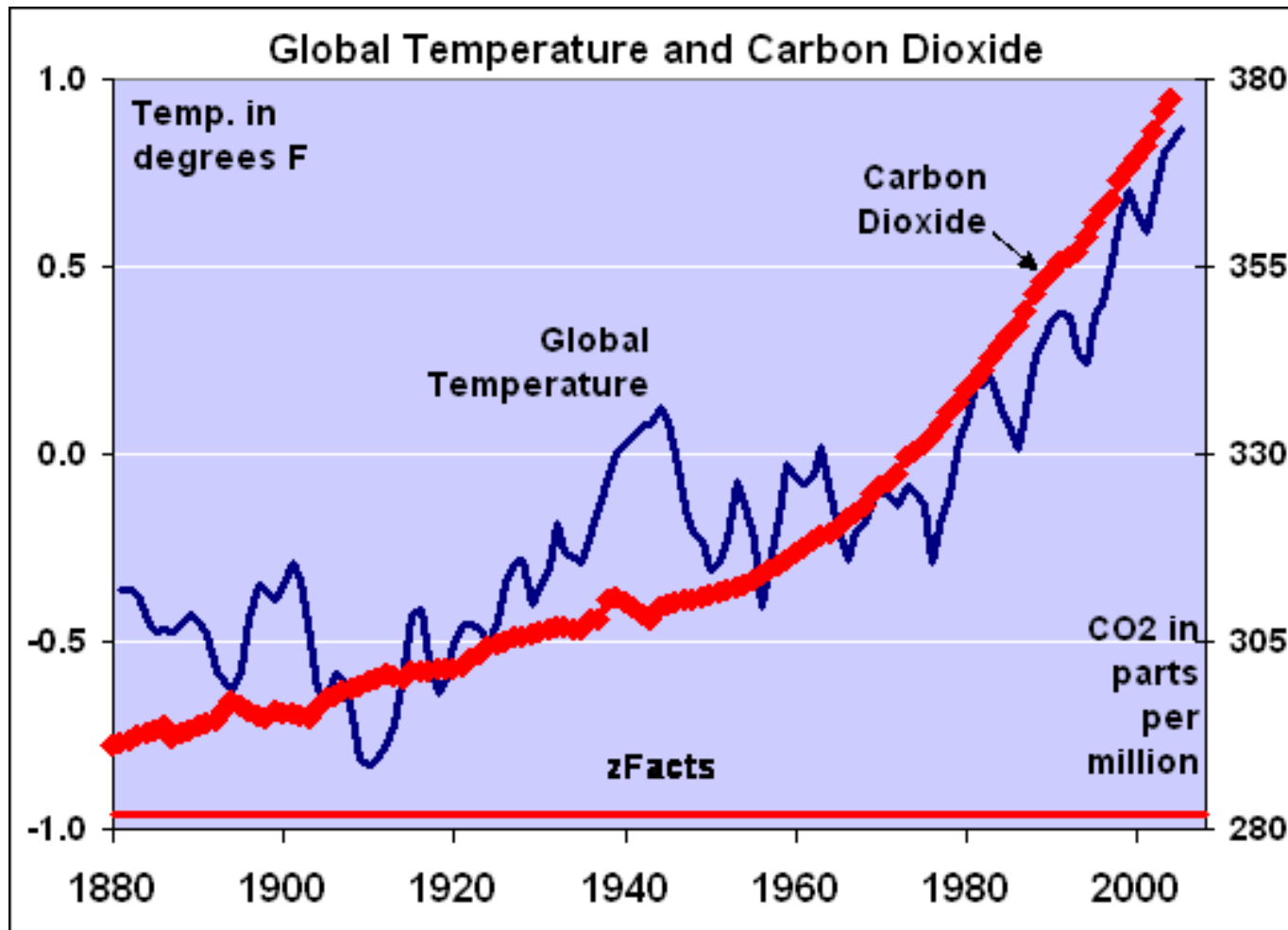
<http://zfacts.com/book/export/html/88>





# What is Climate Change?

***3) Global temperature is rising because the natural concentration of GHGs (mainly CO<sub>2</sub>) in the atmosphere is out of balance.***



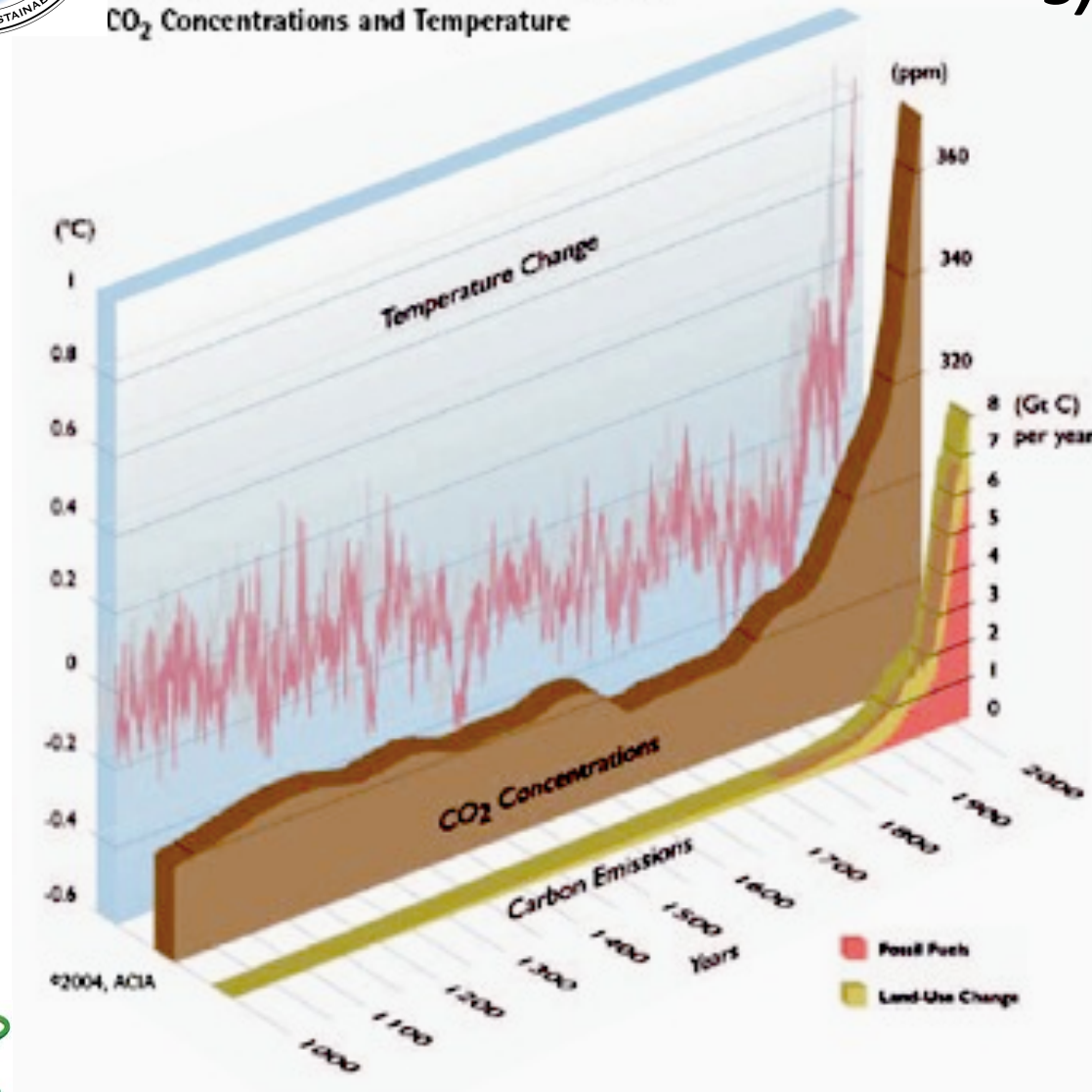
<http://zfacts.com/book/export/html/88>





# What is Climate Change?

1000 Years of Changes in Carbon Emissions, CO<sub>2</sub> Concentrations and Temperature



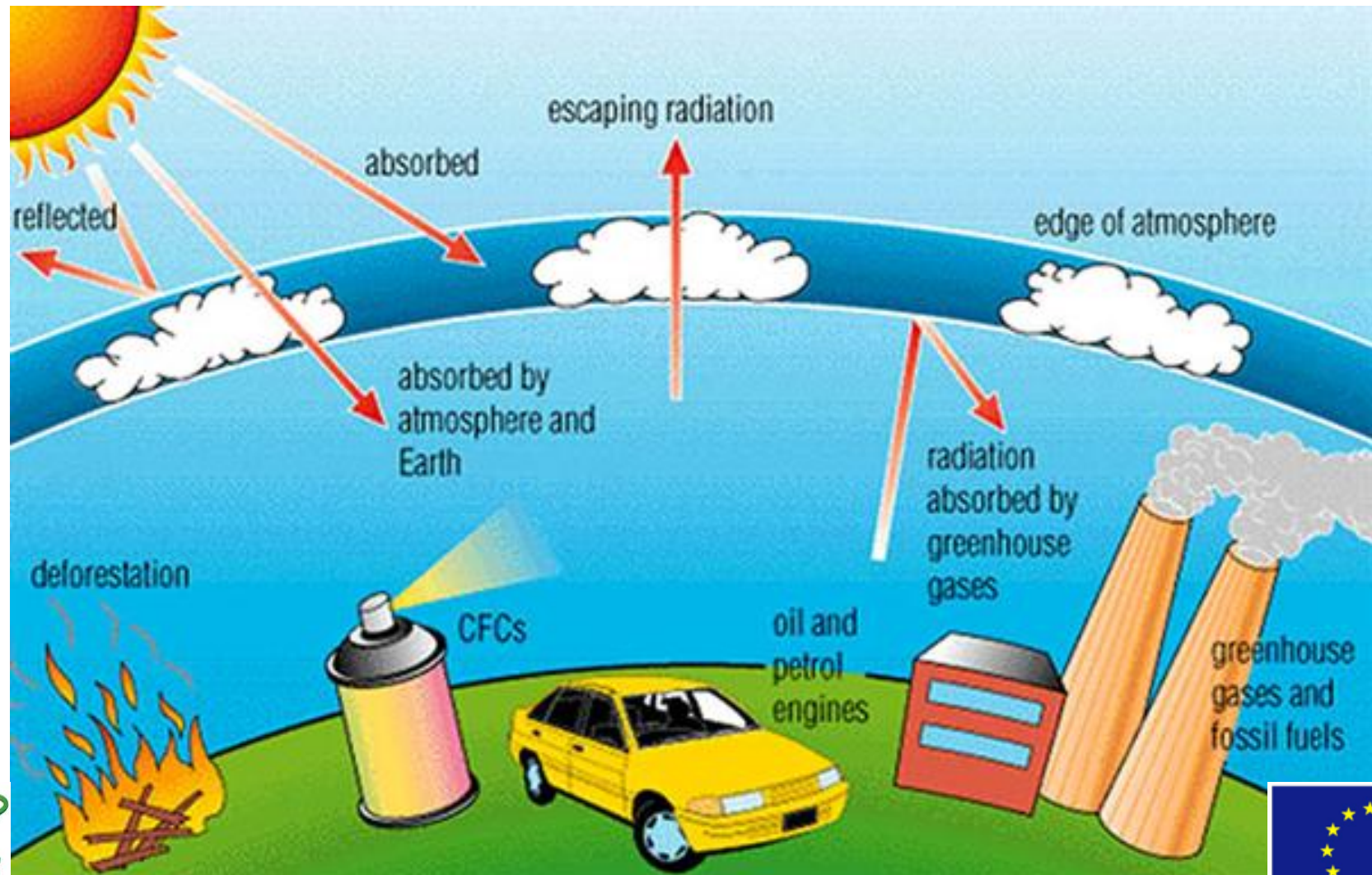
**3) Global temperature is rising because the natural concentration of GHGs (mainly CO<sub>2</sub>) in the atmosphere is out of balance.**

This 1000-year record tracks the rise in carbon emissions due to human activities (fossil fuel burning and land clearing) and the subsequent increase in atmospheric carbon dioxide concentrations, and air temperatures. The earlier parts of this Northern Hemisphere temperature reconstruction are derived from historical data, tree rings, and corals, while the later parts were directly measured. Measurements of carbon dioxide (CO<sub>2</sub>) in air bubbles trapped in ice cores form the earlier part of the CO<sub>2</sub> record; direct atmospheric measurements of CO<sub>2</sub> concentration began in 1957.



# ***What is Climate Change?***

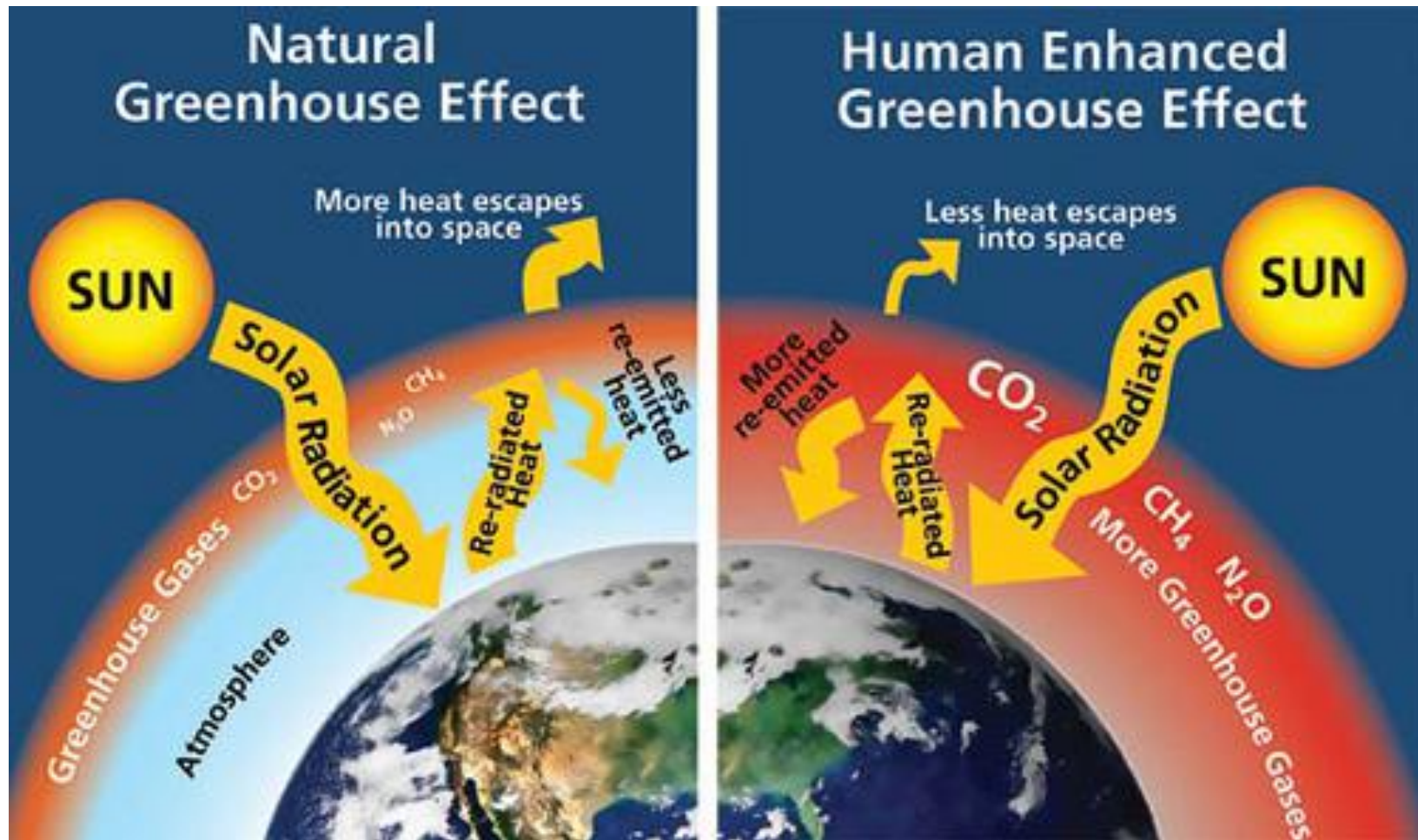
***4) Concentration of GHGs is out of balance because we put too many GHGs into our air.***





# What is Climate Change?

**4) Concentration of GHGs is out of balance because we put too many GHGs into our air.**

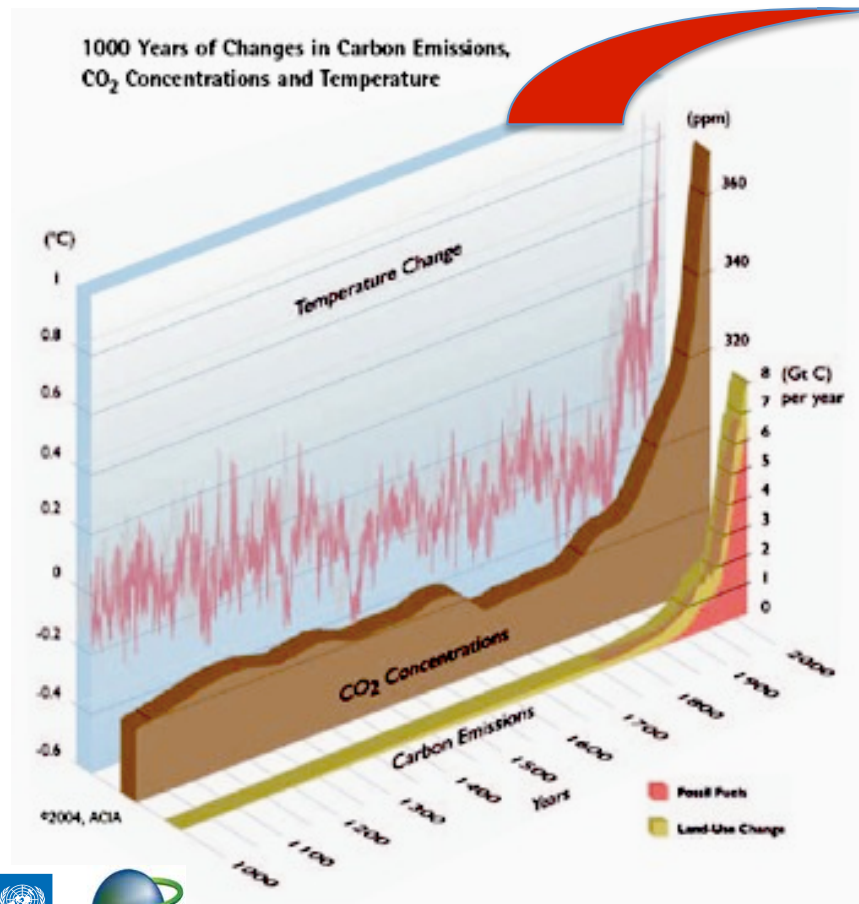




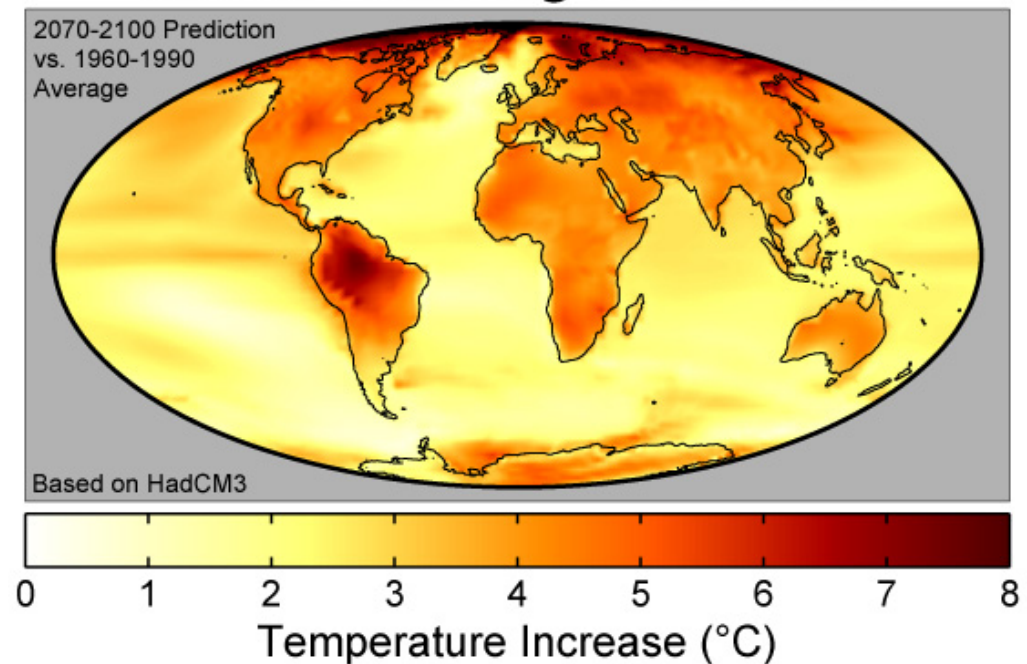
# What is Climate Change?

*Driven by a rise in global temperatures, causing:*

global changes in weather causing: regional and local rise in temperature



## Global Warming Predictions



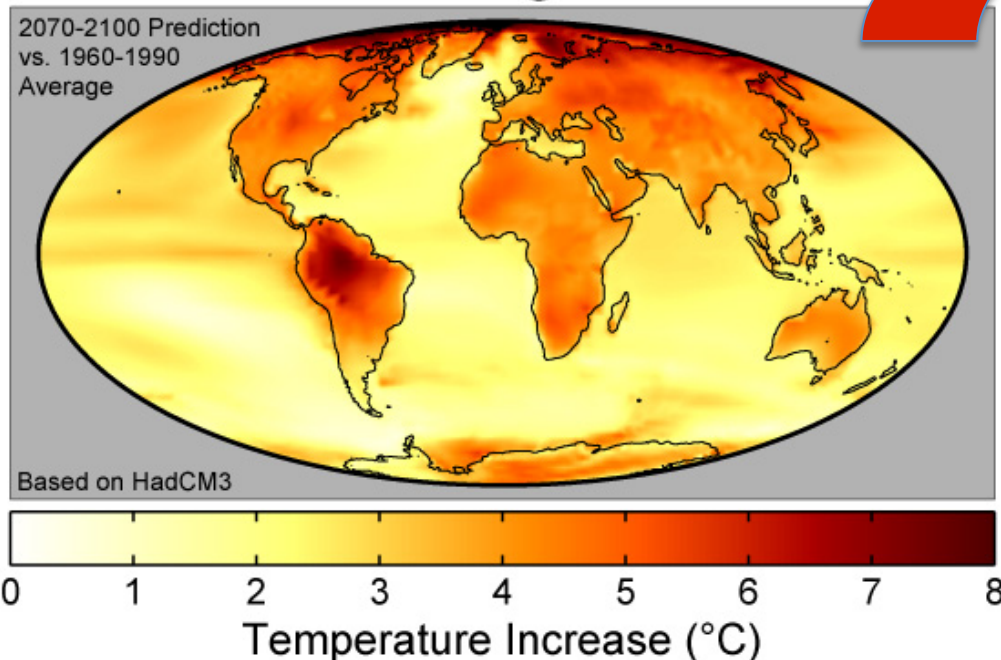


# What is Climate Change?

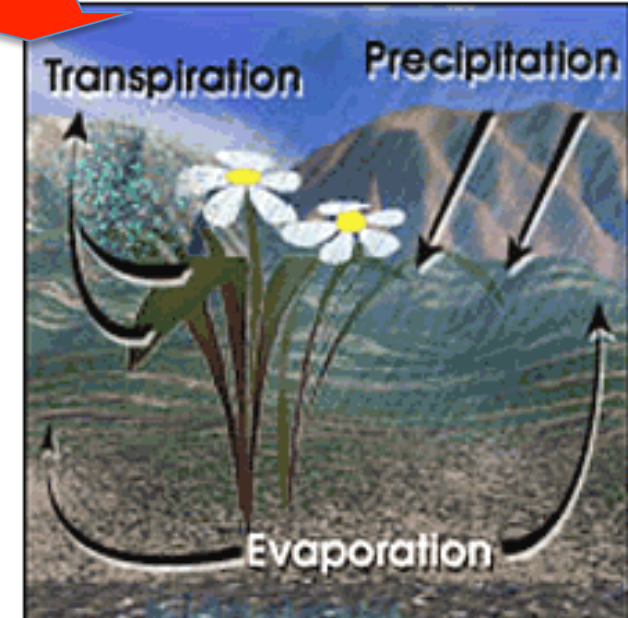
***Driven by a rise in global temperatures, causing:***

- ❖ global changes in weather causing:
- regional and local rise in temperature causing:
- ✓ higher evapotranspiration rates

## Global Warming Predictions



## What is evapotranspiration?



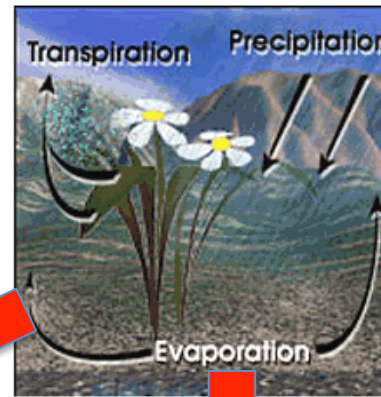
Hailey King, NASA, GFSC



# What is Climate Change?

***Driven by a rise in global temperatures, causing:***  
higher evapotranspiration rates causing:

What is evapotranspiration?



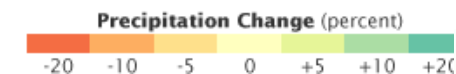
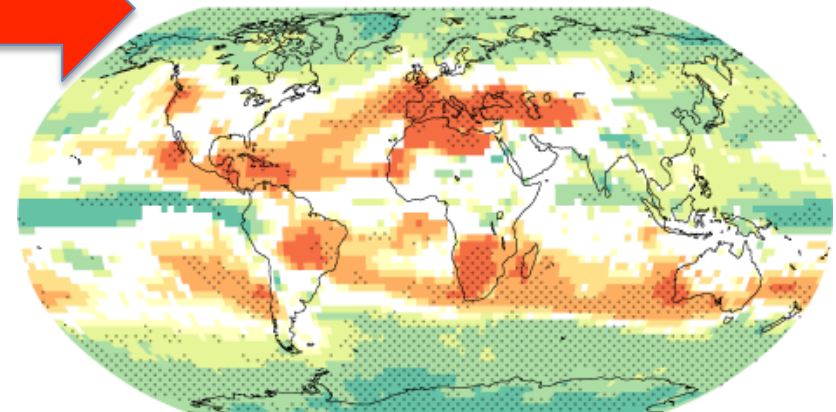
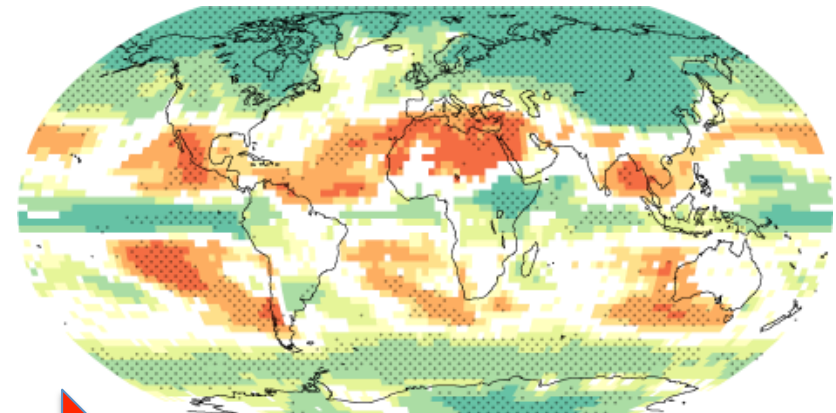
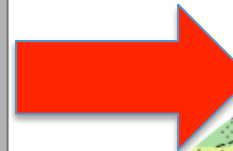
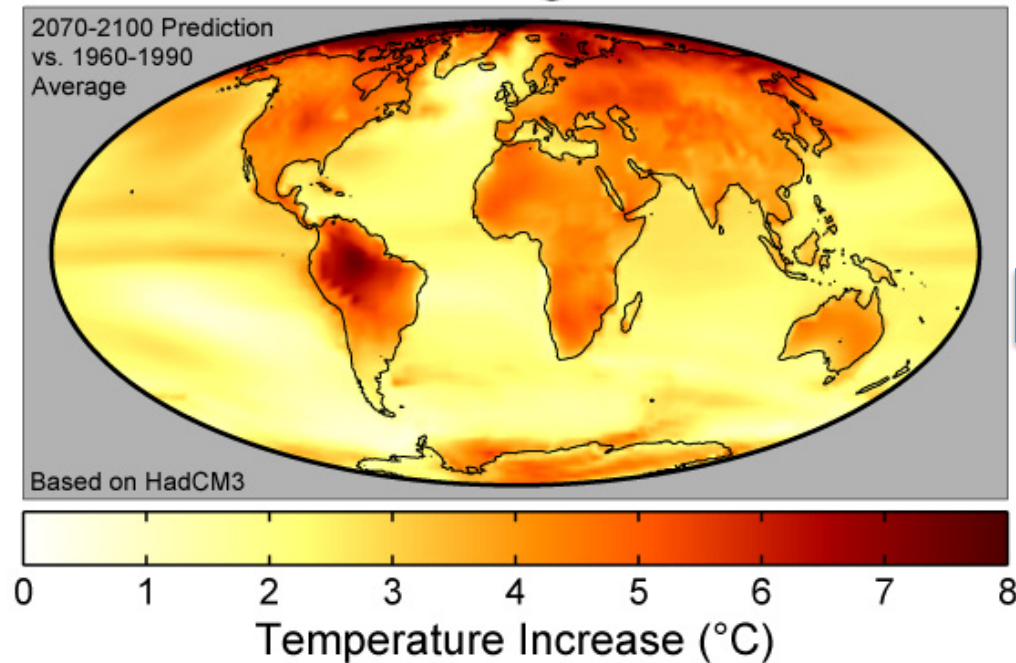




# What is Climate Change?

***Driven by a rise in global temperatures, causing:***  
regional and local change in rainfall patterns

## Global Warming Predictions

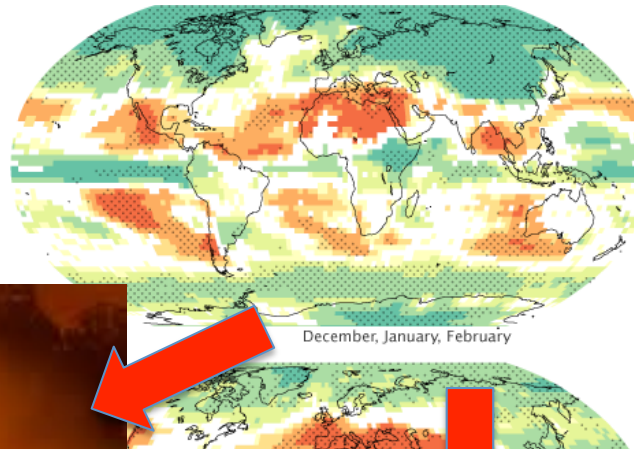






# What is Climate Change?

*Driven by a rise in global temperatures, causing:*  
regional and local change in rainfall patterns





# What is Climate Change?

***Driven by a rise in global temperatures, causing:***  
regional and local change in rainfall patterns causing  
frequency and intensity of extreme weather causing:





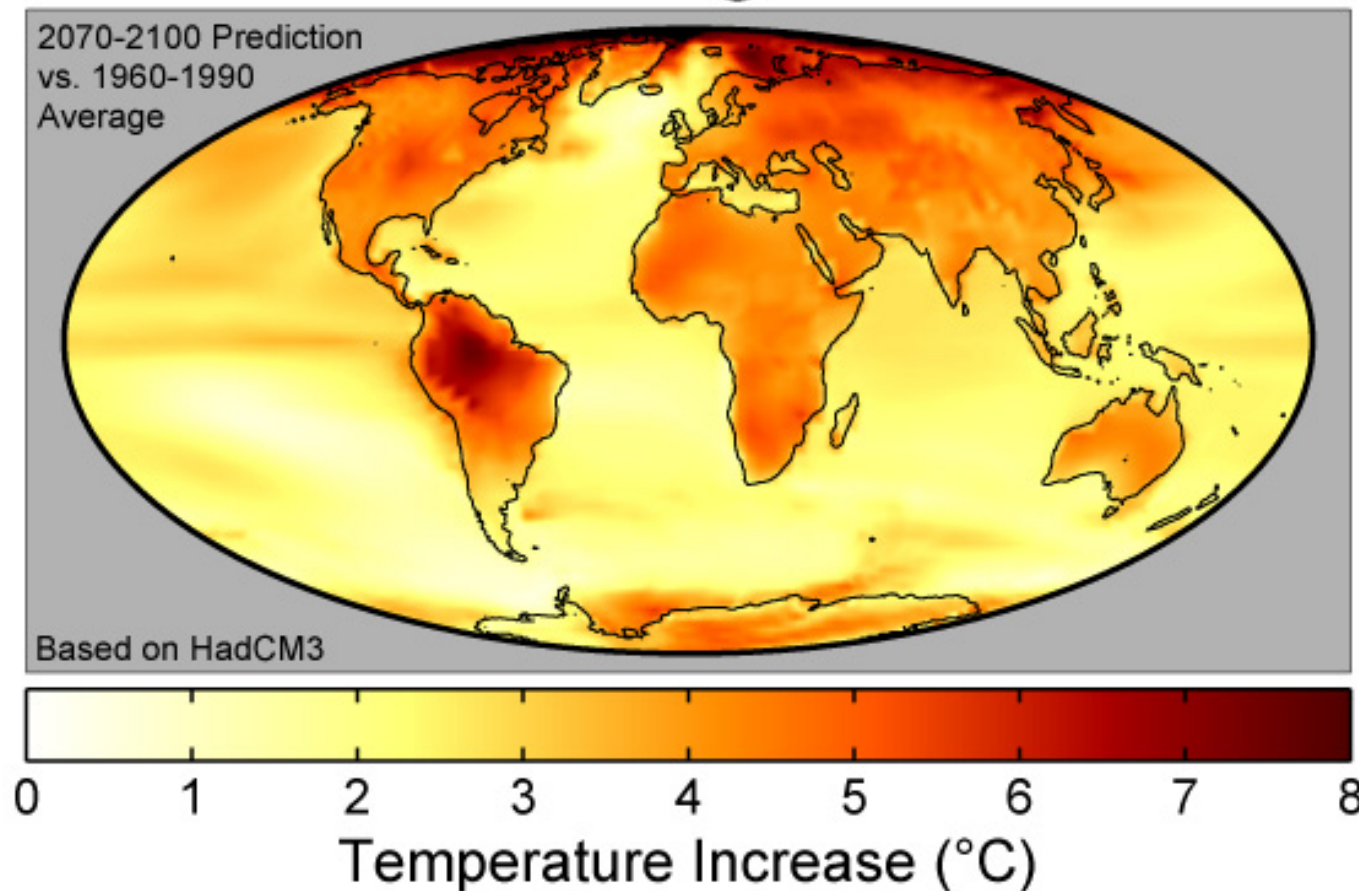


# *Direct Impacts of Climate Change*

## Change in temperature

- most areas show a marked increase

## Global Warming Predictions

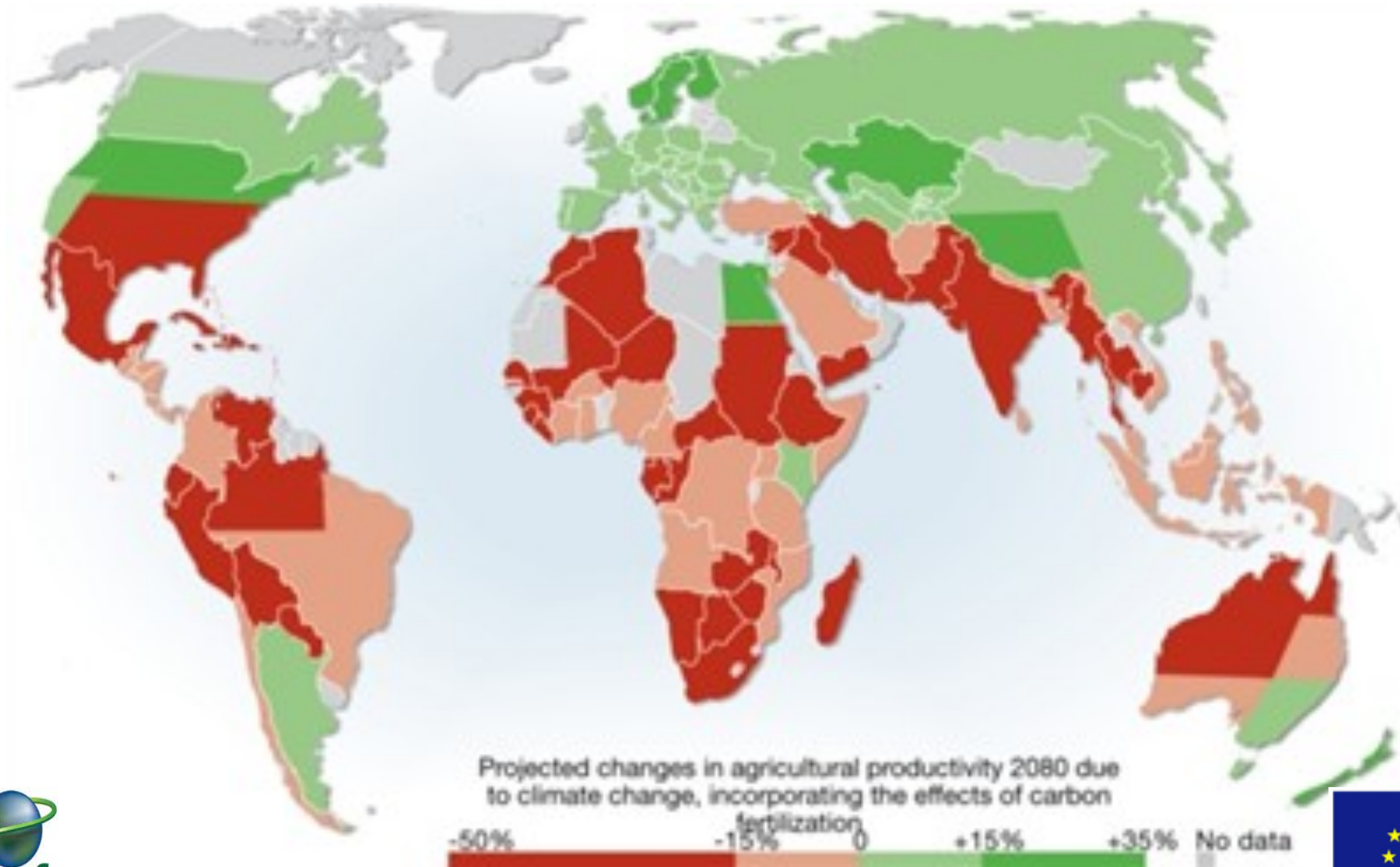




# *Direct Impacts of Climate Change*

## Change in temperature

- most crop types stressed – lower yield

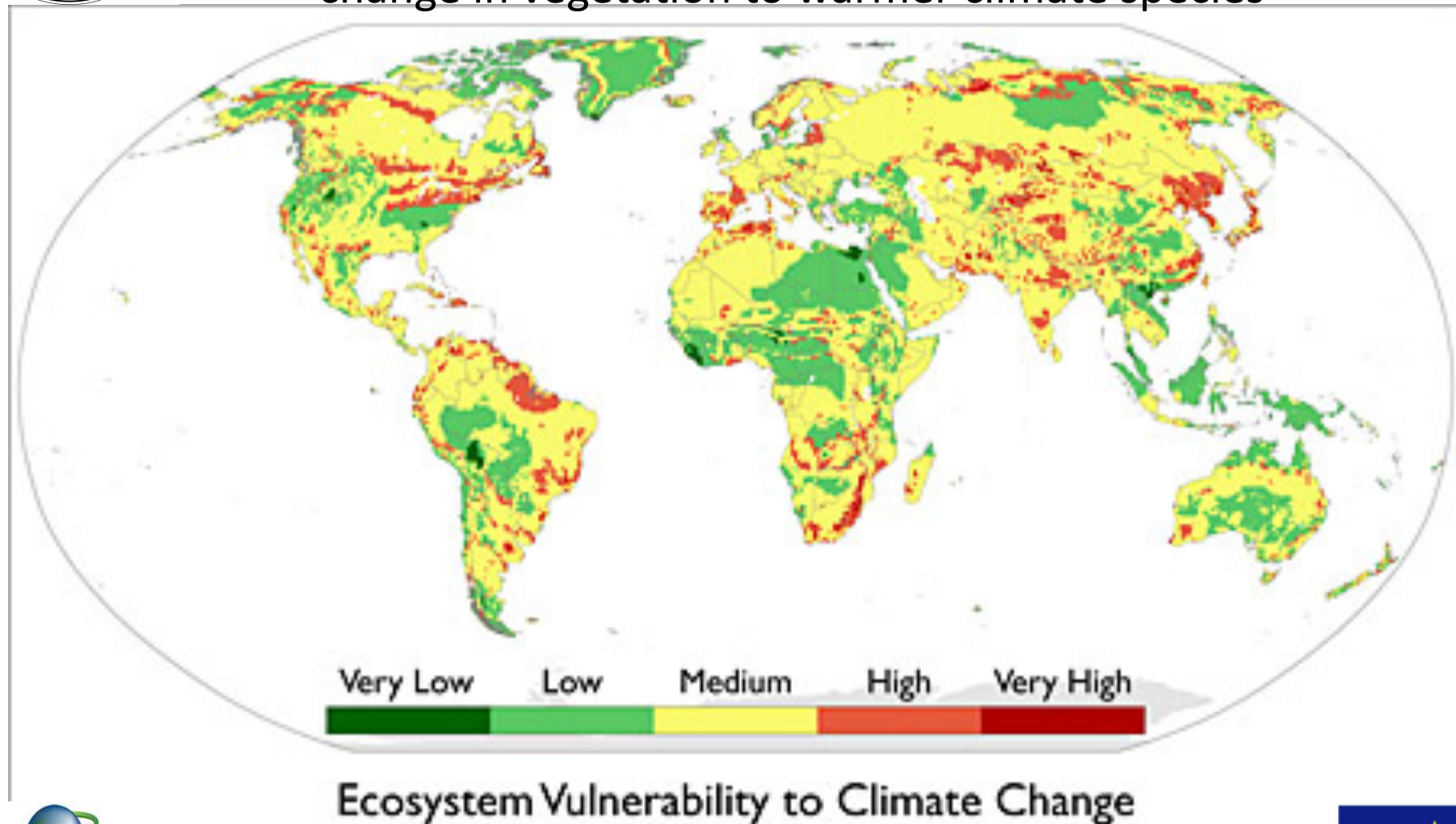




# *Direct Impacts of Climate Change*

## Change in temperature

- change in vegetation to warmer climate species



Ecosystem Vulnerability to Climate Change

Gonzalez et al. 2010



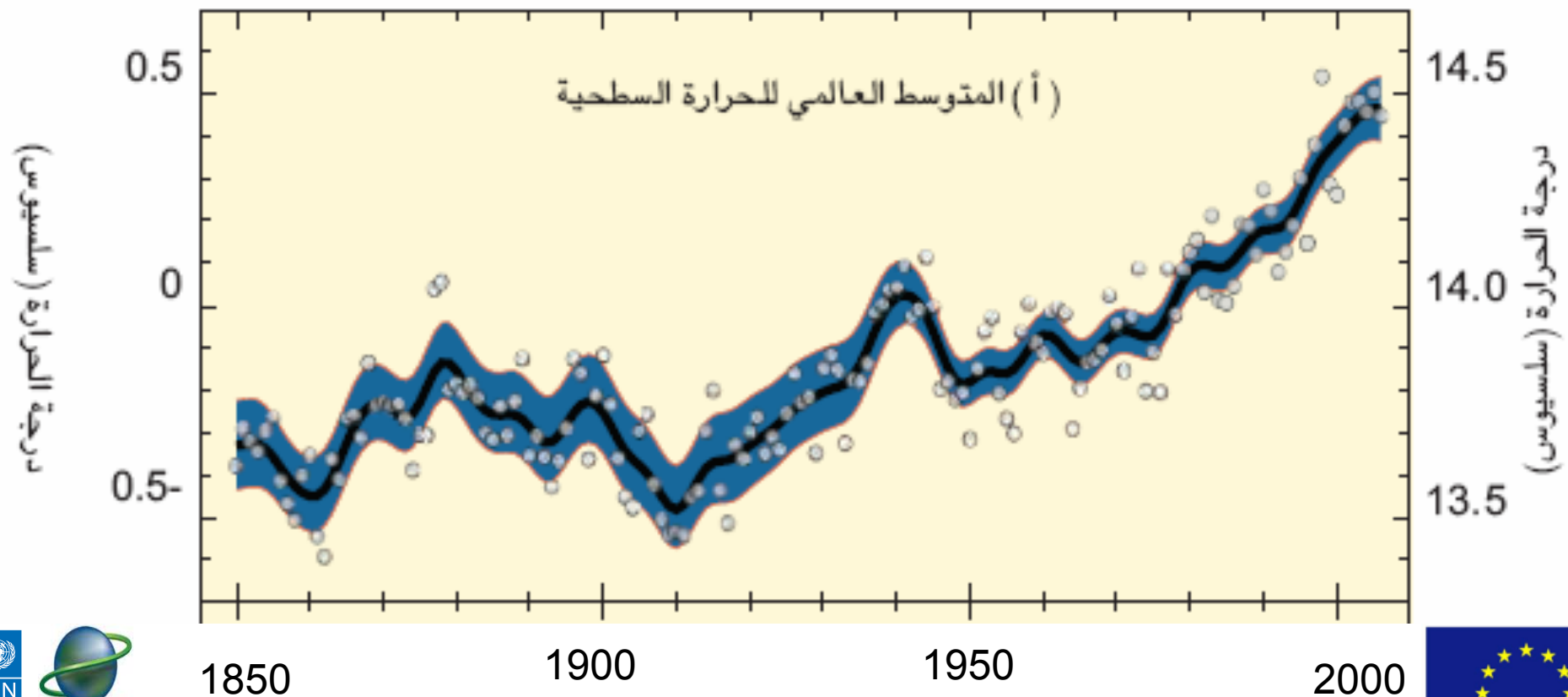




# Direct Impacts of Climate Change

## Change in temperature

- water temperatures increase changing habitat conditions

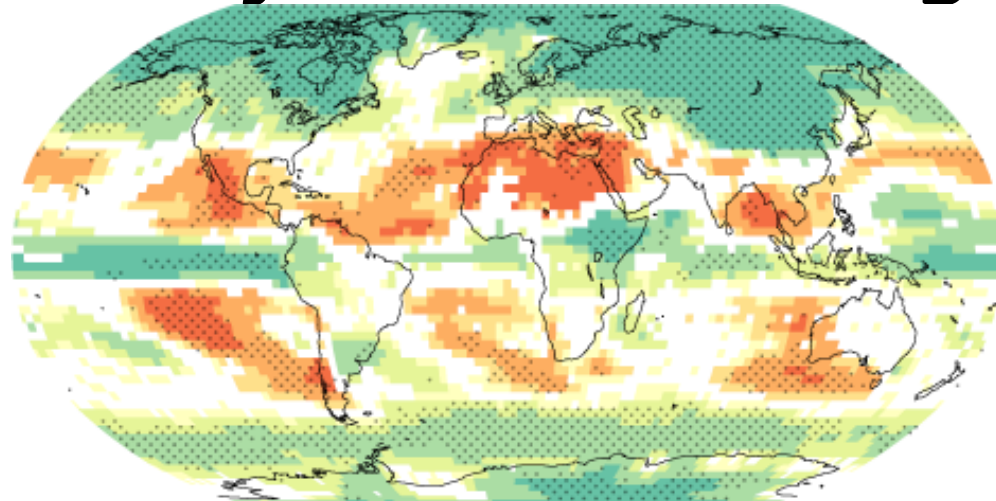




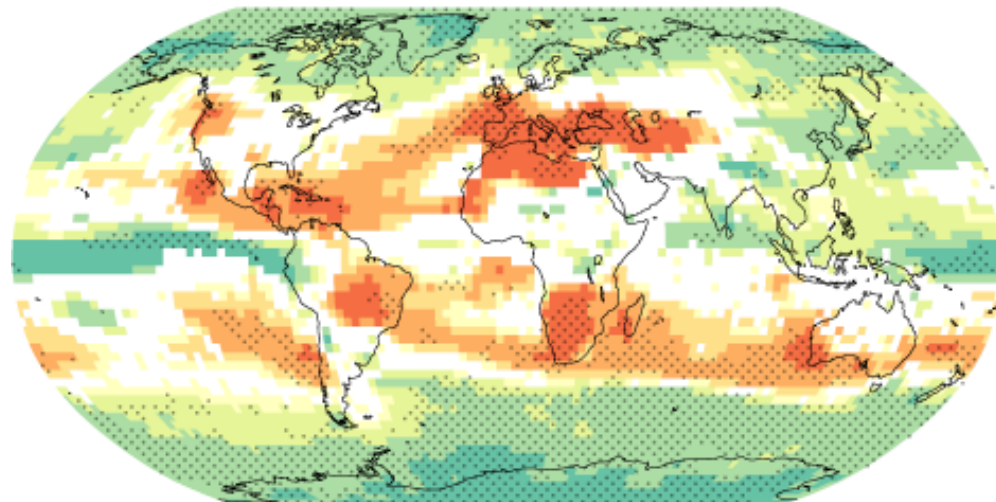
# Direct Impacts of Climate Change

## Change in rainfall patterns

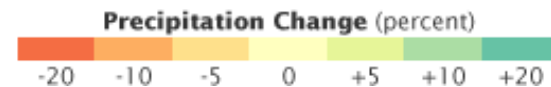
- decrease in mean rainfall in dry areas
- small increase in mean rainfall in temperate / wet areas
- increase in extreme weather (storms)
- tornados and hurricanes
- intense rain / flash floods



December, January, February



June, July, August

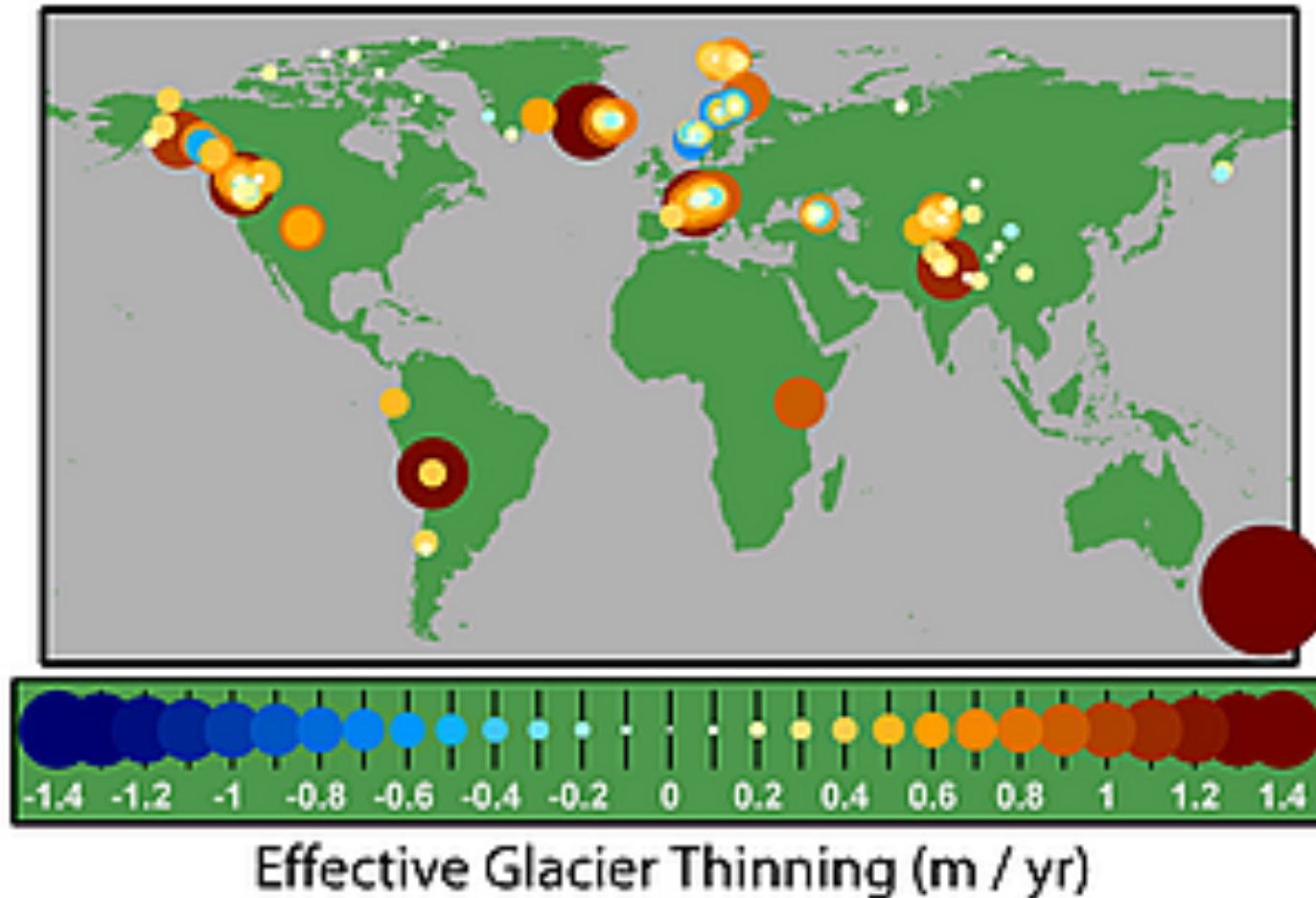




# *Direct Impacts of Climate Change*

## Melting glaciers

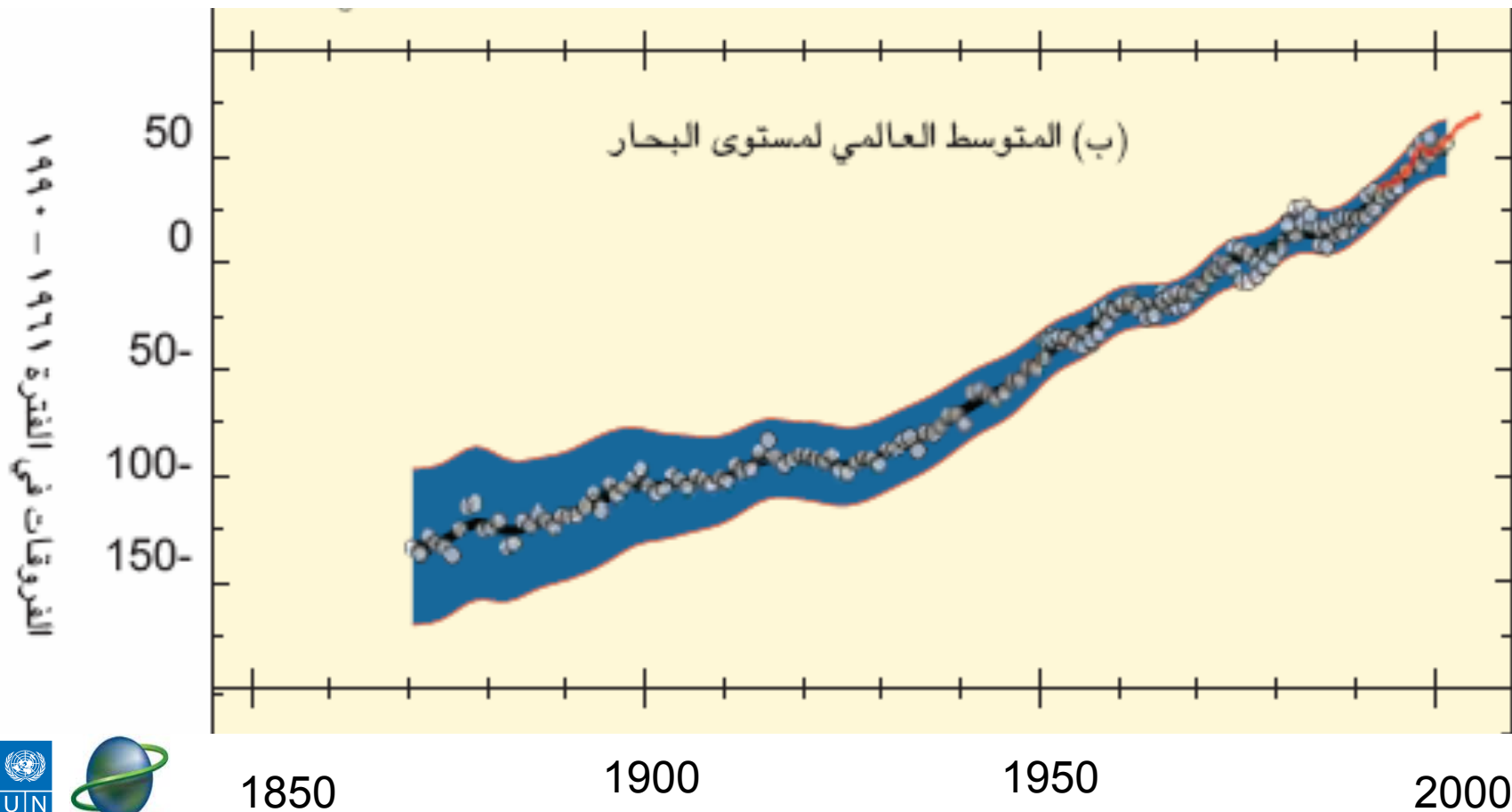
### Mountain Glacier Changes Since 1970





# *Direct Impacts of Climate Change*

## Sea level rise







# ***Why does Climate Change Matter?***

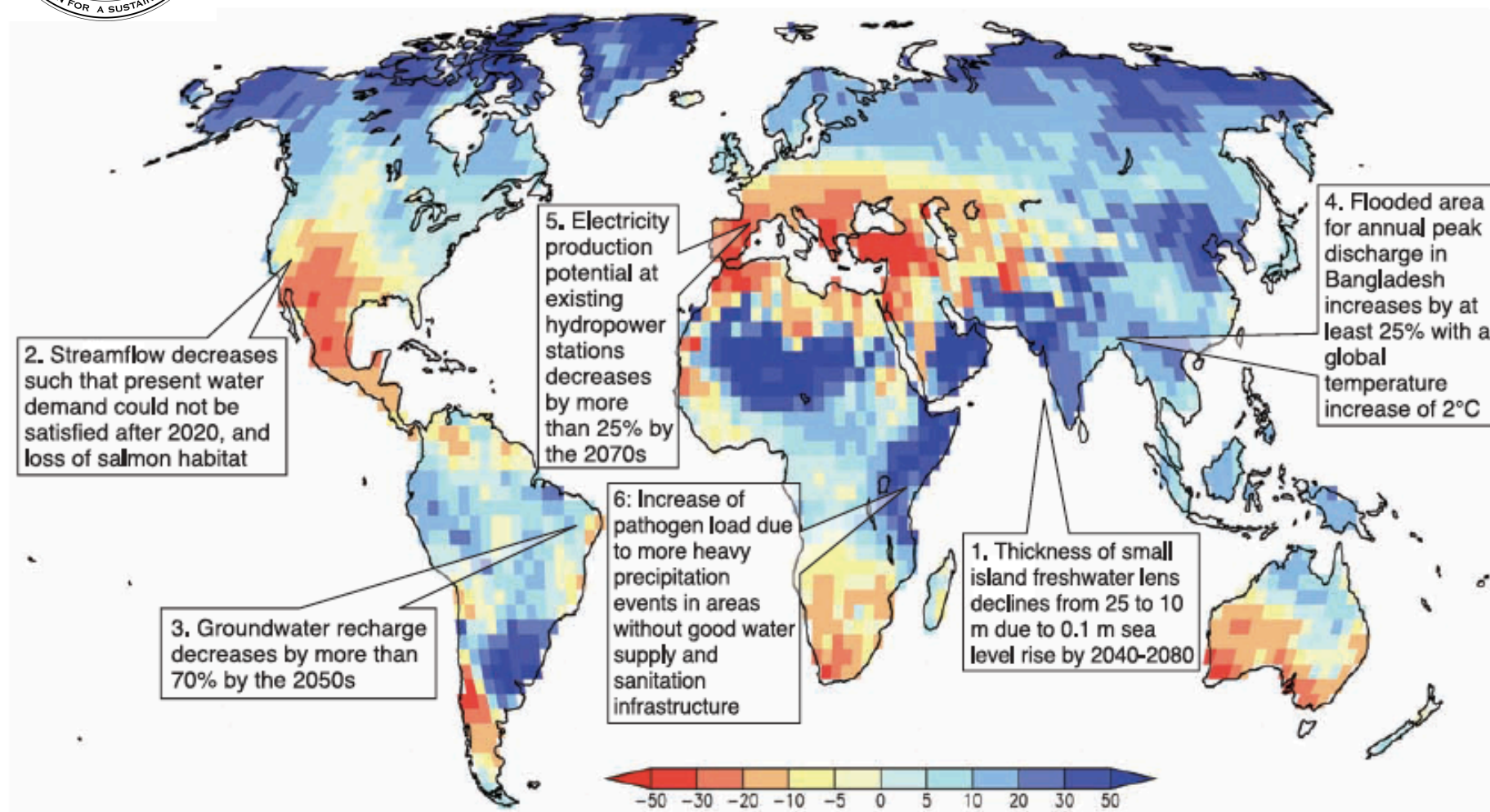
Reduced food security





# Why does Climate Change Matter?

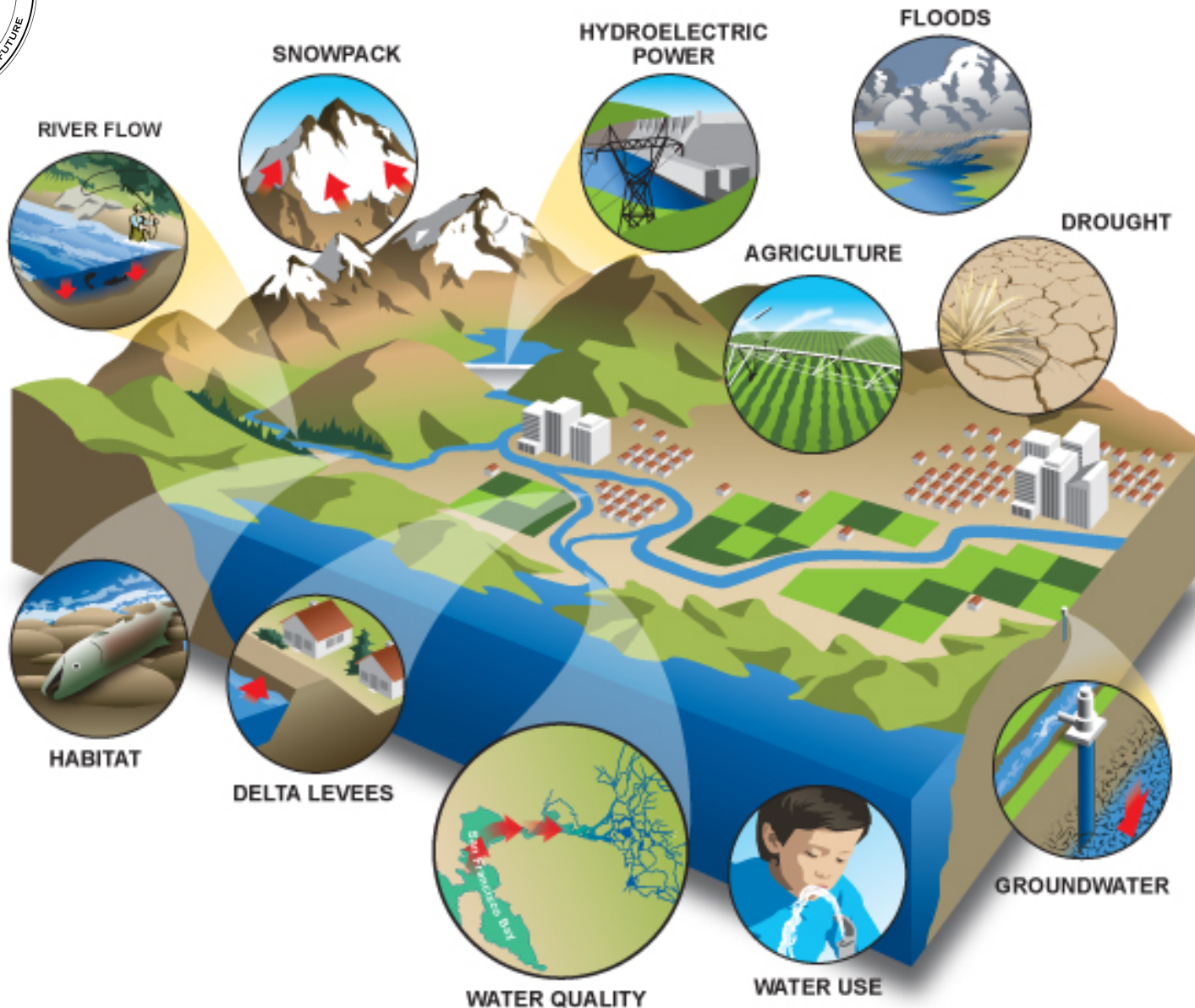
## Lower water availability



**Figure TS.5.** Illustrative map of future climate change impacts on freshwater which are a threat to the sustainable development of the affected Background shows ensemble mean change of annual runoff, in percent, between the present (1981-2000) and 2081-2100 for the SSSP emissions scenario; blue denotes increased runoff, red denotes decreased runoff. Underlying map from Nohara et al. (2006) [F3.8].



# *Direct Impacts of Climate Change*





## Progress from Kyoto

Dark Green: Annex I & II Ratified

Light Green: Ratified

Brown: Not ratified

Dark Brown: Withdrawn



Kyoto Protocol vs. Montreal Protocol  
Climate Change vs. Ozone



# ***Climate Change Adaptation***

## Policy of “No Regrets”

*“Adaptation actions should prioritize those interventions which are beneficial even without climate change.”*





# *Climate Change Issues and Overview*

# THANK YOU!