



Oct 6: Major Consequences of Climate Change

Update

Assessment (lectures from last week): be constructive

Foci of the Day

Climate changes occur across both time and space, producing:

- **Direct impacts**
- **Indirect impacts**
- **Positive feedback loops** driven by human behavior and climate interactions

All of these must be considered from a **global perspective**.



Update

- Quiz #3 on Oct 8
- Midterm on Oct 15
- Field excursion on Oct 22 — May Be Affected by Weather
- Grades updated on D2L
- Visit from the MSU film crew today!



Assessment (lectures from last week)

- Be constructive
- Anonymous (no name please)
- Texts not shared with Dr. Moore
- For class improvement (now and in the future)



Climate Change: Disrupting the Norms

Temperature-Dependent Sex Determination (TSD)

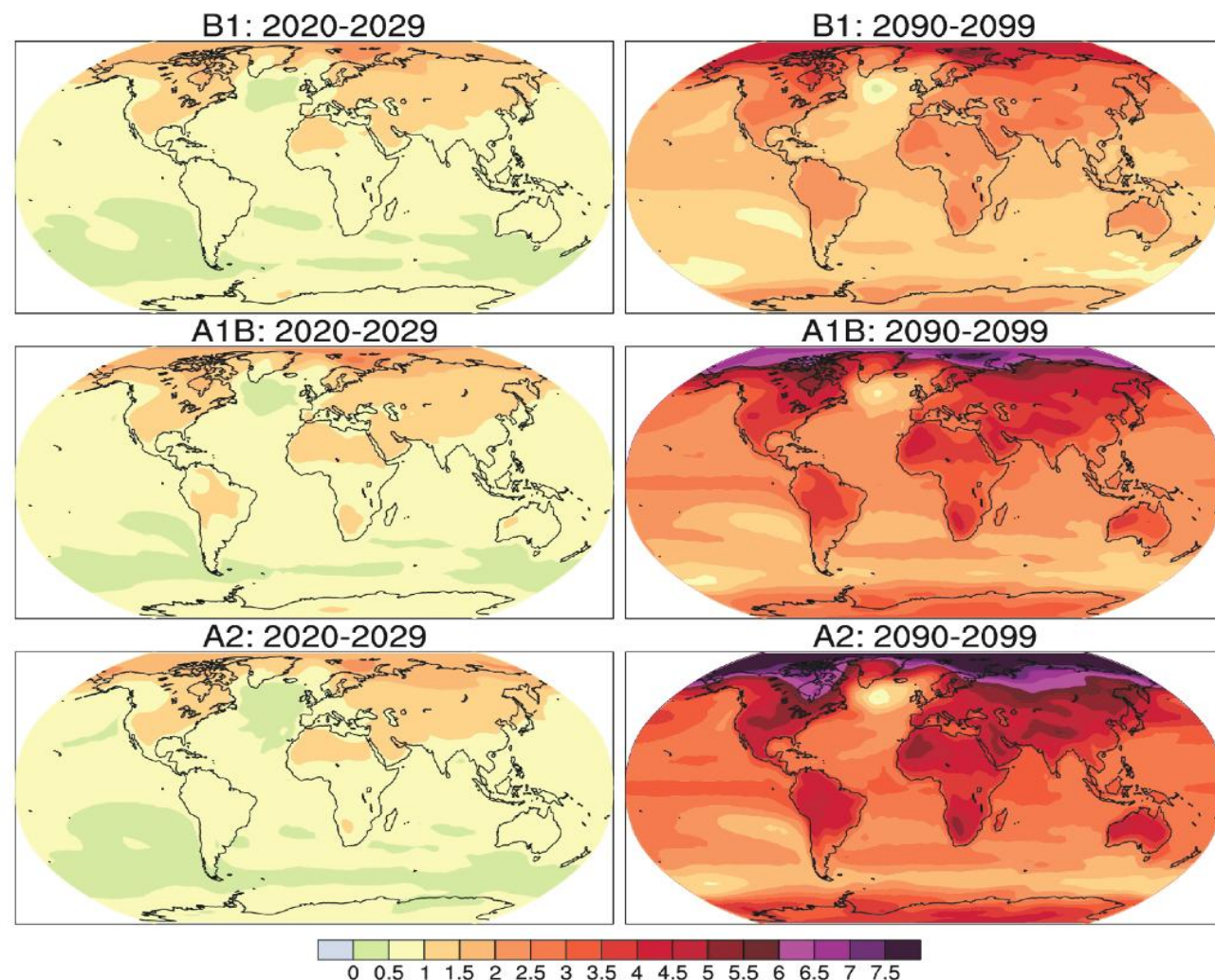


- The sex of most turtles, alligators, and crocodiles is determined after fertilization.
- Most turtles are subject to **TSD**.
- If a turtle's eggs incubate below 27.7°C (81.86°F), the turtle hatchlings will be male.
- If the eggs incubate above 31°C (88.8°F), the hatchlings will be female.
- A slight increase in temperature can lead to a skewed **sex ratio**, thereby elevating the risk of extinction.



Projections of Future Changes in Climate

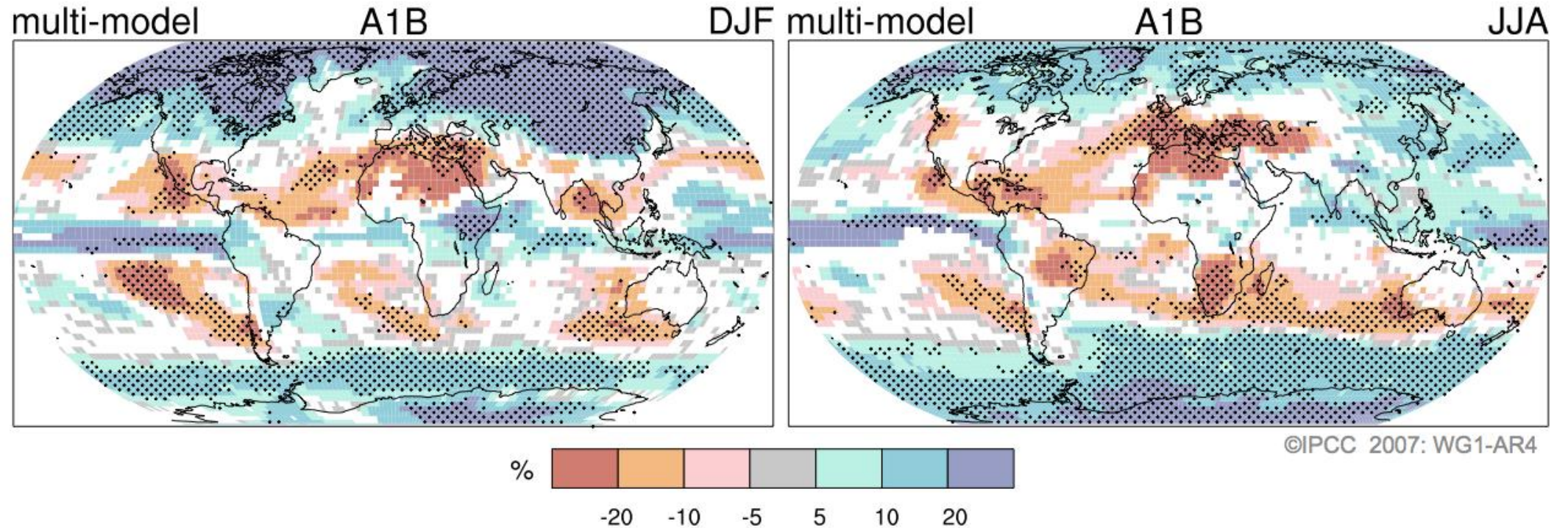
- Projected warming in the 21st century is expected to be most pronounced over land areas and in the high northern latitudes.
- and least over the Southern Ocean and parts of the North Atlantic Ocean





Projections of Future Changes in Climate

Projected Patterns of Precipitation Changes

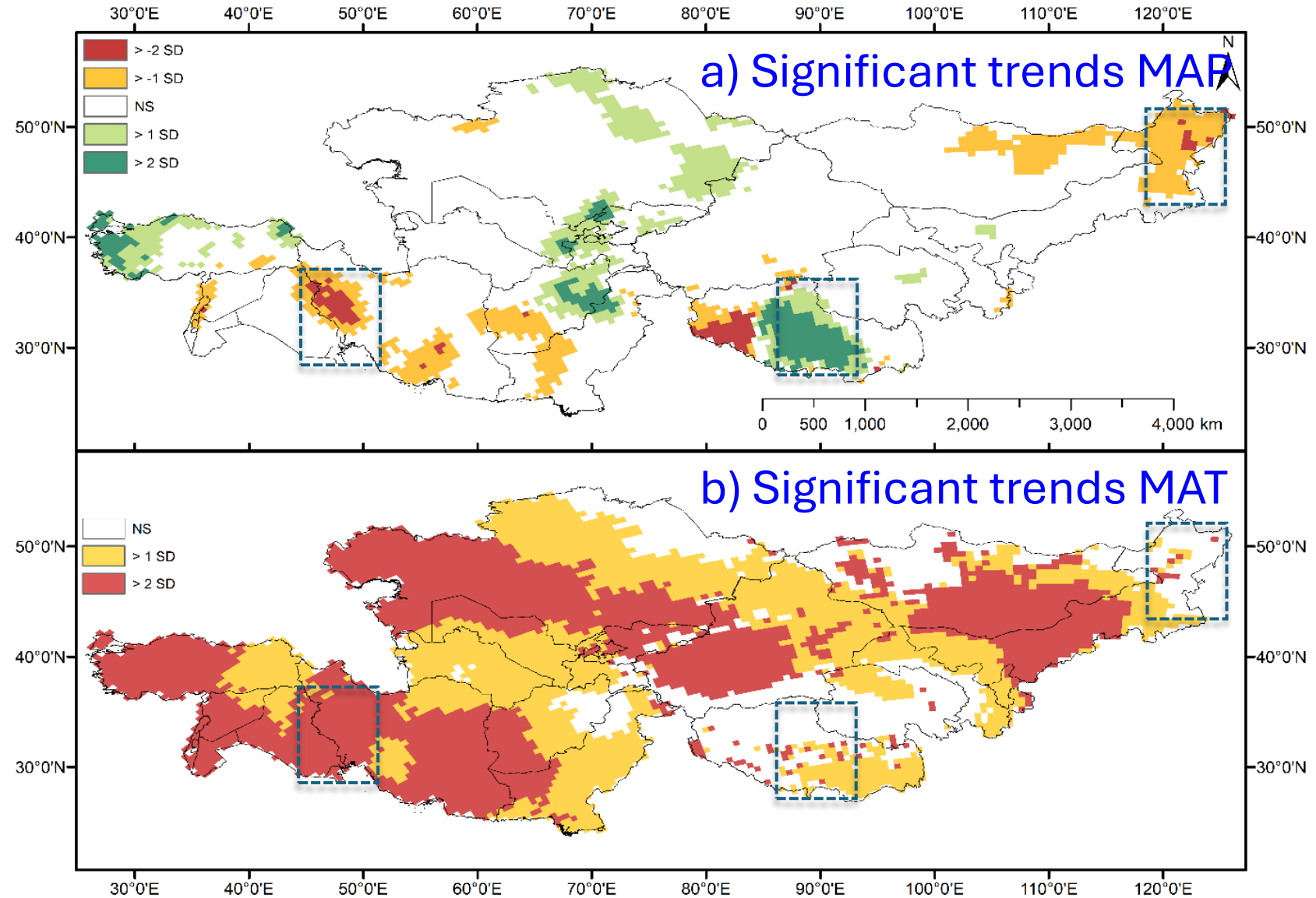


- Precipitation increases *very likely* in high latitudes
- Decreases *likely* in most subtropical land regions



Climate Change: high spatial variation

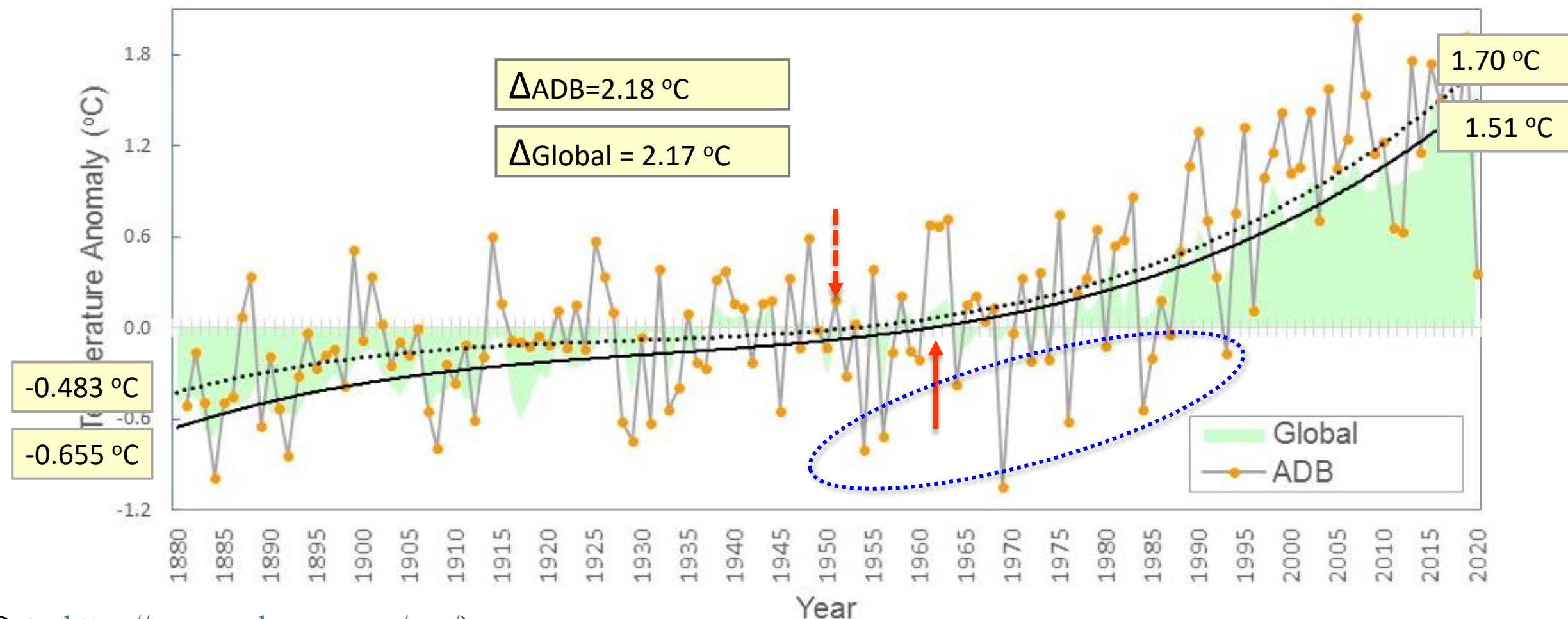
- Long term changes in mean annual precipitation (MAP) and mean annual temperature (MAT) across the Asian Drylands Belt (**ADB**)
- Spatial Variability: not homogeneous and with hotspots



Climate Change: high interannual variation

(Extremes are often related to different physical processes than those that govern long-term means!)

Change in anomalies of land surface air temperature (°C) for global land and ADB region during 1880-2000



(Data: <https://www.ncdc.noaa.gov/cag/>).

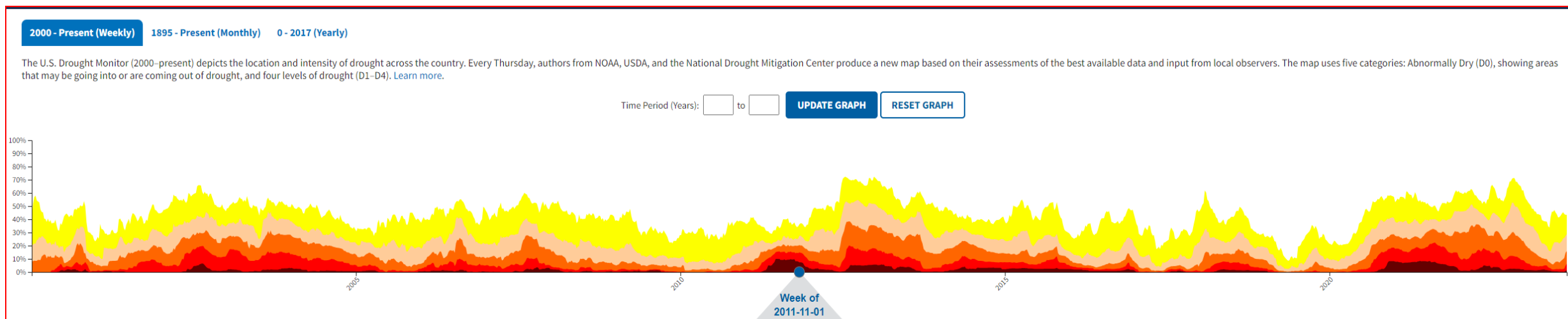


Climate Change: more extreme events

- Heatwaves
- Drought
- Frosts in springs/falls
- Extreme precipitation
- Dzuds (extreme cold winter)
- ...



<https://www.nationalgeographic.com/photography/article/extreme-winter-mongolia-dzud-environment-science>



[https://www.drought.gov/historical-](https://www.drought.gov/historical-information)

information. State: 22, Country: US, USDM: 2011-11-01



Climate Change: Full of Surprises



**Festivalgoers were told to shelter in place
in the Black Rock Desert and conserve
food, water and fuel**

Bloomberg the Company & Its Products | Bloomberg

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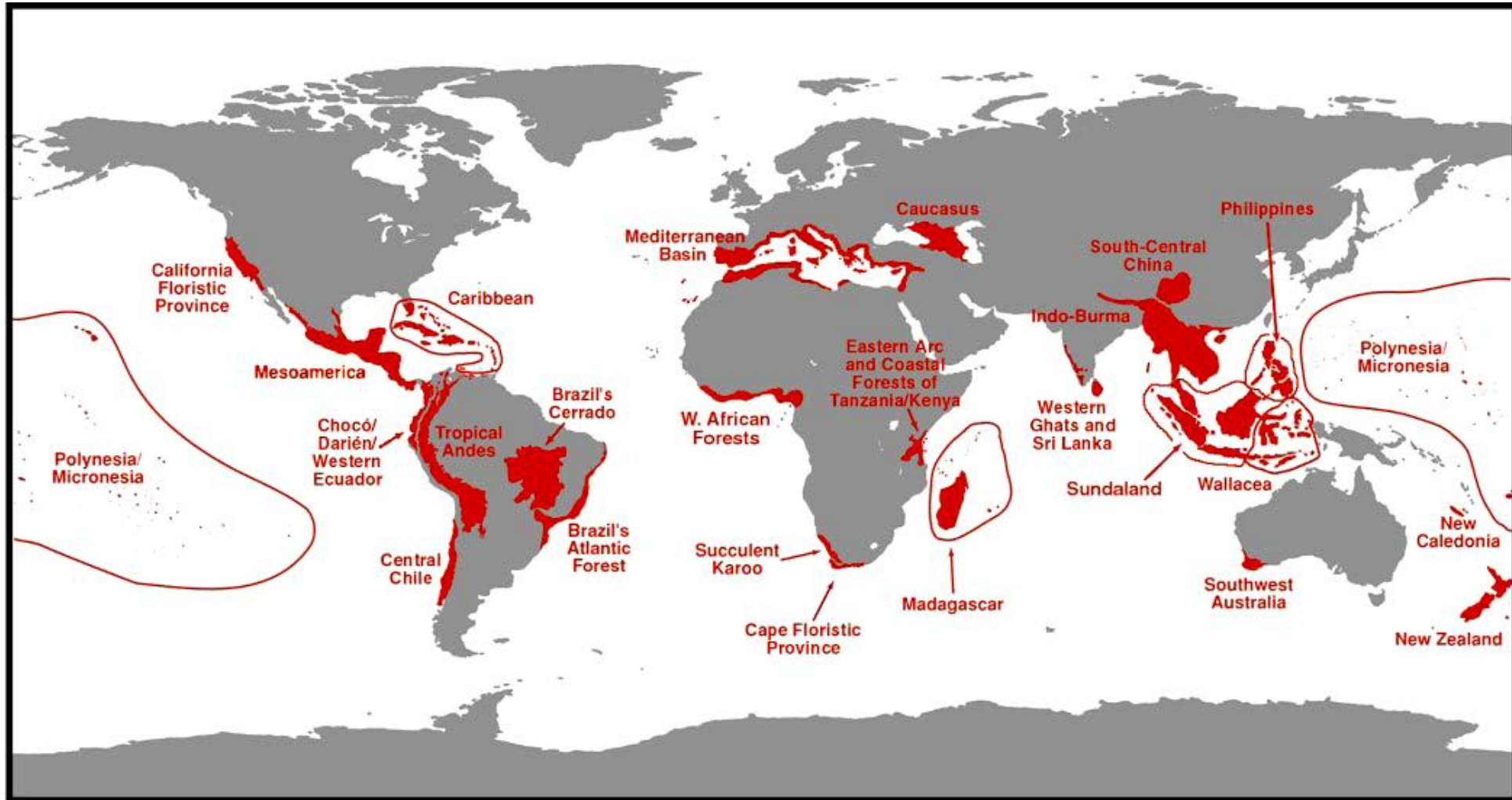
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Gift this article



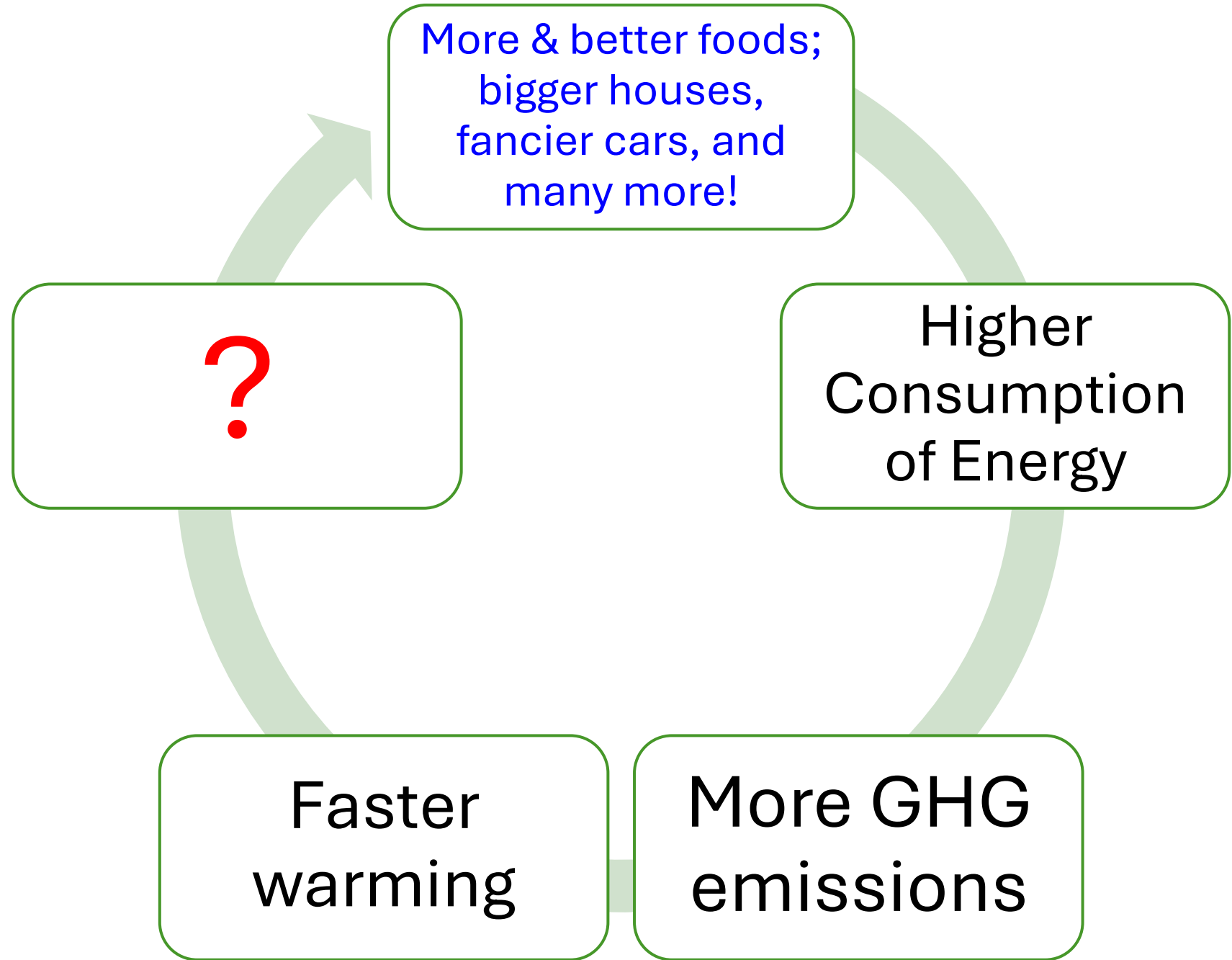
Indirect Impact: The 25 hotspots, most in coastal areas that will be hit first by the rising seas





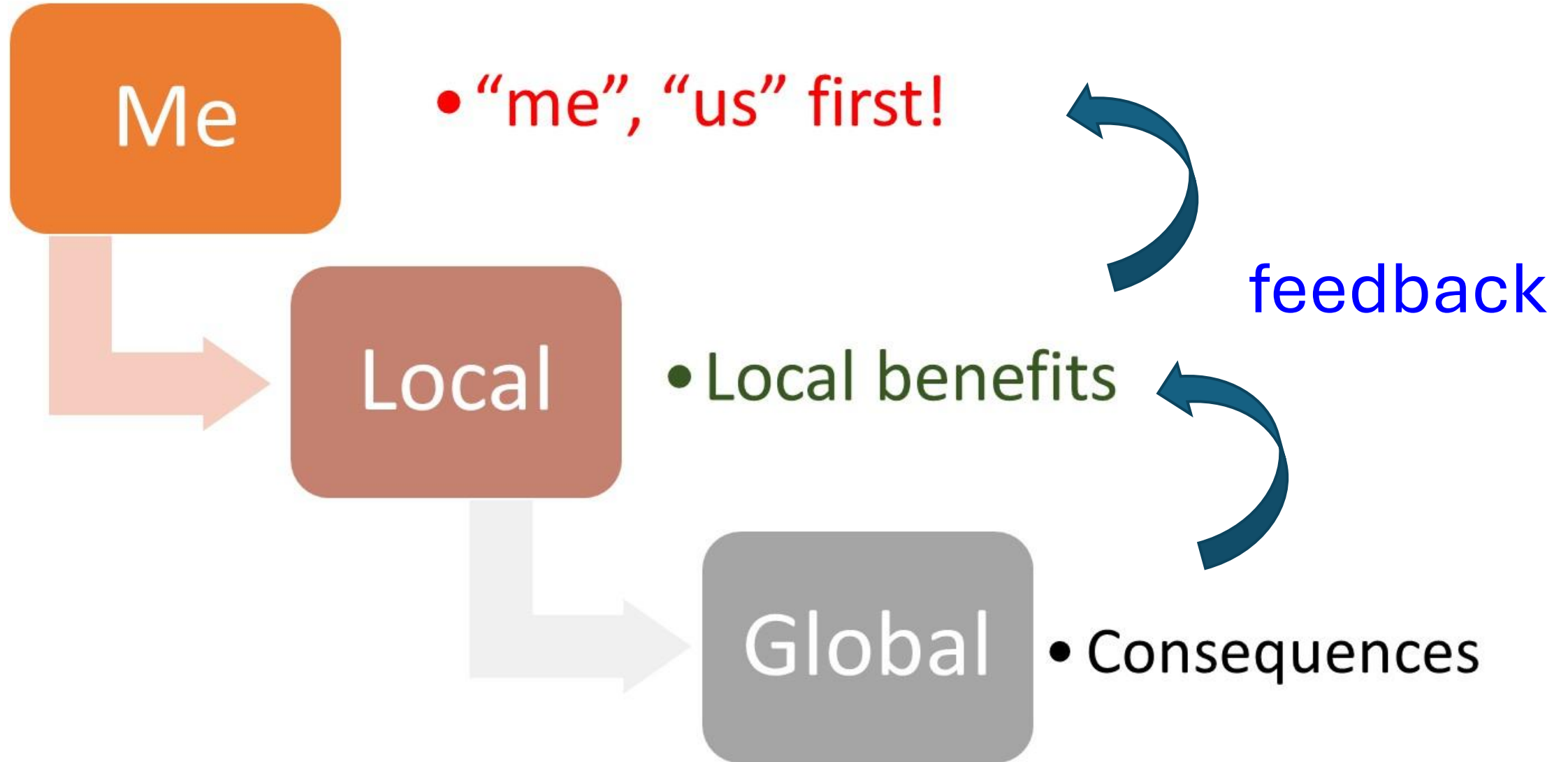
Human Nature

- A positive feedback
- System collapses, eventually





Human Nature: A dangerous loop



What happens in one place can have effects elsewhere around the world!

Coronavirus concerns: Shelves emptied of face masks, sanitizer

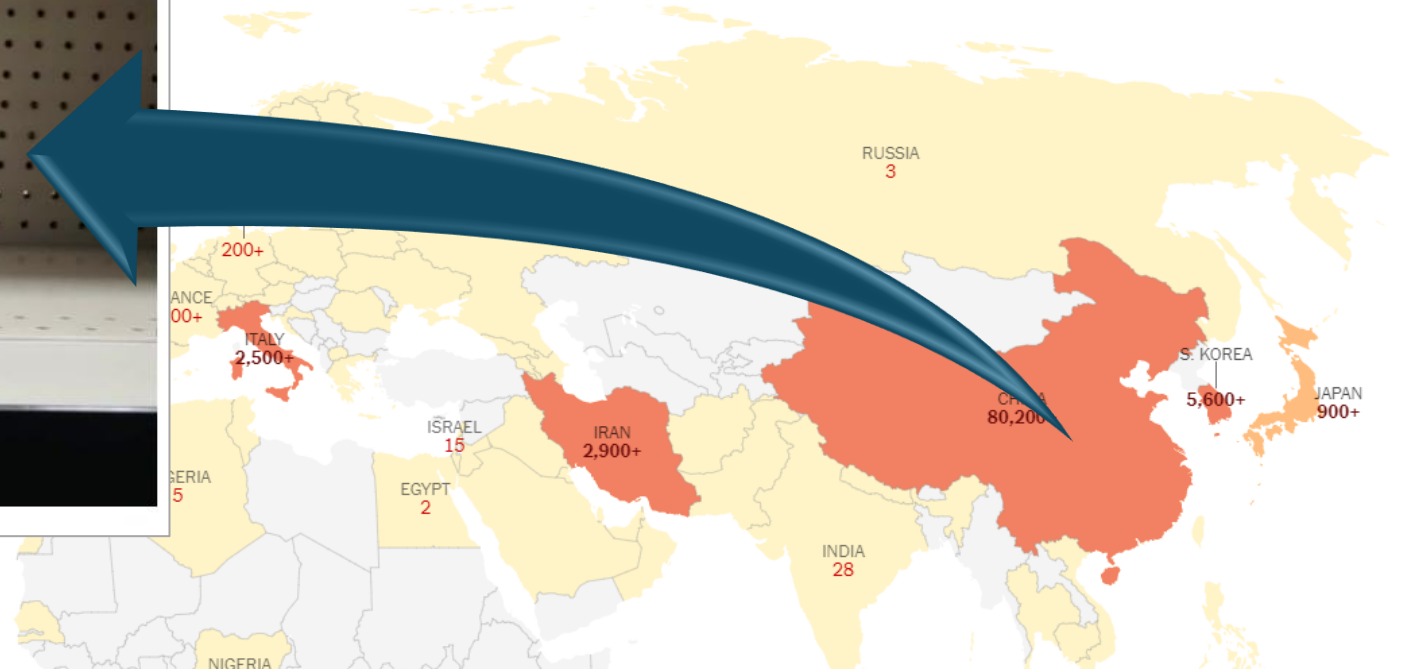


- Not mentioning the tumbling stock market!
- Global health is our health!

The New York Times

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Travel, but be careful At-risk groups avoid travel Avoid all non-essential travel





Take-home-messages

- 1) The major changes in global climate include rising temperatures and altered precipitation patterns at local, regional, and global scales.
- 2) These changes have both direct and indirect impacts on natural ecosystems and human societies.
- 3) Of particular concern are the potential positive feedbacks that could accelerate climate change.



Oct 8: Major Consequences of Climate Change (continued)

- Quiz #3
- Specific case examples