Class Session #3
8 October 2019
Copyright: Ronald B. Mitchell, 2019

# Intro videos

### [General overview](http://video.nationalgeographic.com/video/way-forward-climate)

### [Kiribati video](http://www.youtube.com/watch?v=qvKEWqOXd1U)

# What are the likely impacts of climate change?

## Some impacts already “on their way”

## Other impacts depend on mitigation actions we take

## Categories of impacts

### Which of these is most likely to get you to take action?

### Water

### Ecosystems

### Food

### Coasts

### Health

## Major environmental changes due to climate change

### Temperature increases: 2009 USGCRP Report: “U.S. average temperature has risen more than 2°F over the past 50 years and is projected to rise more in the future” (28)

#### Poles will get hit worst in terms of temperature

#### “Warming greatest over land and at most high northern latitudes and least over Southern Ocean and parts of the North Atlantic Ocean, continuing recent observed trends” IPCC Summary

#### If thermohaline circulation shuts down, Europe may well be colder due to absence of the Gulf Stream

## Precipitation changes

### More floods, More droughts, less snow

#### 2009 USGCRP: “Precipitation has increased an average of about 5 percent over the past 50 years” (30) and “the amount of rain falling in the heaviest downpours has increased approximately 20 percent on average in the past century” (32)

#### Change in frequency and intensity of rain rather than average rain

### Hurricanes and other extreme weather events. See IPCC Report on Extreme Events:

#### <http://www.youtube.com/watch?v=VIGeHzuwFSQ&list=PL11970AA1CB21A33C&index=1>

#### <http://ipcc-wg2.gov/SREX/images/uploads/IPCC_SREX_slide_deck.pdf>

### “There is *high confidence* that by mid-century, annual river runoff and water availability are projected to increase at high latitudes (and in some tropical wet areas) and decrease in some dry regions in the mid-latitudes and tropics. There is also *high confidence* that many semi-arid areas (e.g. Mediterranean Basin, western United States, southern Africa and north-eastern Brazil) will suffer a decrease in water resources due to climate change” (IPCC Summary)

### Sea level rise

#### 2009 USGCRP report: “After at least 2,000 years of little change, sea level rose by roughly 8 inches over the past century. Satellite data available over the past 15 years show sea level rising at a rate roughly double the rate observed over the past century.” (18)

#### Thermal expansion PLUS melting land-based ice (Greenland and Antarctica)

#### IPCC caution: “Because understanding of some important effects driving sea level rise is too limited, this report does not assess the likelihood, nor provide a best estimate or an upper bound for sea level rise.” (2007 Summary for Policy-makers, p. 7) But basically 1/5th to 1/2 meter (6 to 18 inches)

#### Affects on marine species and those (polar bears) that depend on them

### Ocean warming and acidification

#### Major impacts on species - coral reefs especially

#### Major impacts on people who depend on ocean

### Possibility of abrupt climate change

## You will experience these impacts personally

## Impacts vary by region

## Impacts vary by sector

# Who and what gets harmed? What determines how bad it will be?

## Non-human impacts

### Many plants and animals will not be able to adapt or mutate quickly enough

### Plants can’t “migrate” fast enough

### Animals can migrate but their ecosystem partners (their predators and prey) are unlikely to migrate at same speed, upsetting ecosystem balances

### Ocean acidification

### Examples

#### Forest degradation due to pests, precip, and temp

#### Invasive species changes

#### Coral reef bleaching

#### Habitat change and loss

#### Species and biodiversity loss

#### Killing off some species while making better niches for others, particularly disease vectors

## Climate outputs: how does climate system respond to human-induced changes? Different output “types”

### Size

### Speed

### Temporal profile

### Salient scope

### Groups of these create “classes” of impacts: soft, rough, hard, and crash landing (Gardiner)

### Examples…

### Shelter and location

#### Impacts on low-lying islands, cities, and coastal communities

#### People displacement -- crucial to acute conflict scenarios

#### Land erosion

#### Infrastructure damage

#### Need to redesign whole cities (New Orleans is Exhibit A)

### Stresses on food and water resources

#### Changes in availability/quality of water and at different times of year as well as the need for it

#### Changes in crop ability to grow and yields

### Health

#### Increases in disease

#### Heat stroke, etc.

#### Decreased air quality

#### Effects of extreme weather events

#### Burden falls more heavily on children, elderly and poor

#### “The incidence and geographical range of climate-sensitive infectious diseases— such as malaria, dengue fever, and tick-borne diseases—will increase” (NOAA, Climate Literacy: The Essential Principles of Climate Sciences, March 2009).

### War and conflict

#### Resource wars

#### Displacement wars

#### Immigration as people try to get away from areas hit worst

#### Climate refugees and conflict that arises from that short of war

## Exposure: is person likely to experience a given impact (e.g., no impact on salt-water intrusion or SLR in Switzerland or Austria; Tahiti not losing glacial water sources)

### “Small islands, where there is high exposure of population and infrastructure to projected climate change impacts” (IPCC Summary, p. 9)

### “Asian and African megadeltas, due to large populations and high exposure to sea level rise, storm surges and river flooding.” (IPCC Summary, p. 9)

## Vulnerability: if exposed ***and person does nothing***, how “large” is harm? Are people privileged or marginalized?

### “Vulnerability is greater for those who have few resources and few choices” (USGCRP, 100)

## Adaptive capacity: what financial, technical, cultural, and other resources does the person have to do something that reduces their exposure (move villages away from the ocean and hence reduce exposure to SLR) or their vulnerability (build a seawall to protect a village; add air conditioning).

### “Adaptive capacity is intimately connected to social and economic development but is unevenly distributed across and within societies” (IPCC Summary, 15).

### “Africa, because of low adaptive capacity” (IPCC Summary, p. 9)

## Resilience: how capable is the person to absorb such damage as they can’t avoid, and adapt to the new status quo

## Ultimate harm experienced