

# **Climate Change and its (large) impact on Caribbean Resources**

Michael Taylor, Caterina Lindman  
and Suzanne Stanley



# Agenda

- Sea Level Rise and other Impacts
- The Actuaries Climate Index



ACTUARIES CLIMATE INDEX  
INDICE ACTUARIEL CLIMATIQUE

- Reducing Climate and Health Risks

Nov 29, 2018



# Kingston, Jamaica

## 2 degrees

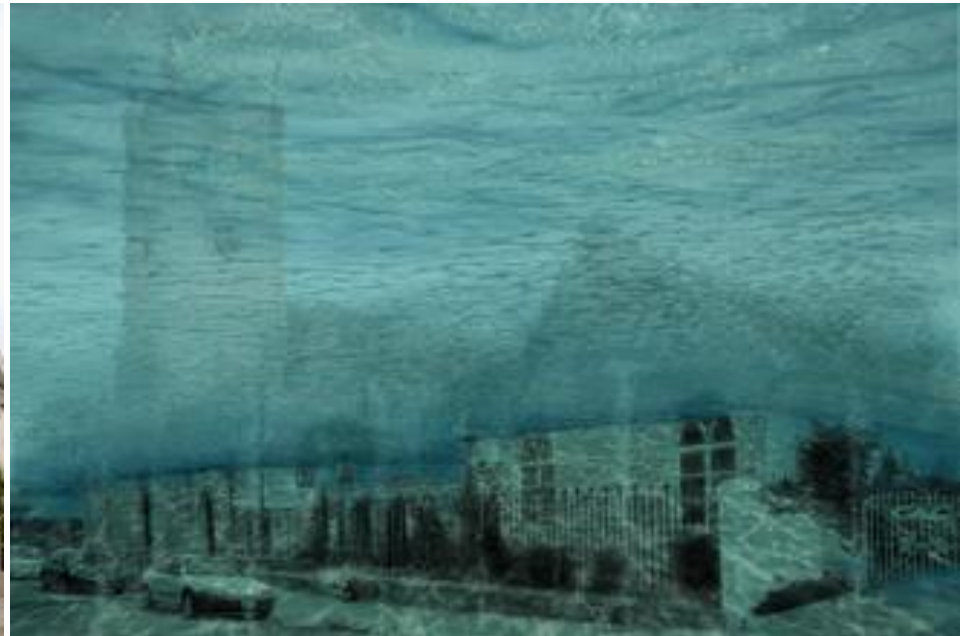
## 4 degrees



Source: Climate Central

# Nassau, Bahamas

2 degrees                      4 degrees



Source: Climate Central

# Georgetown, Guyana

2 degrees                      4 degrees



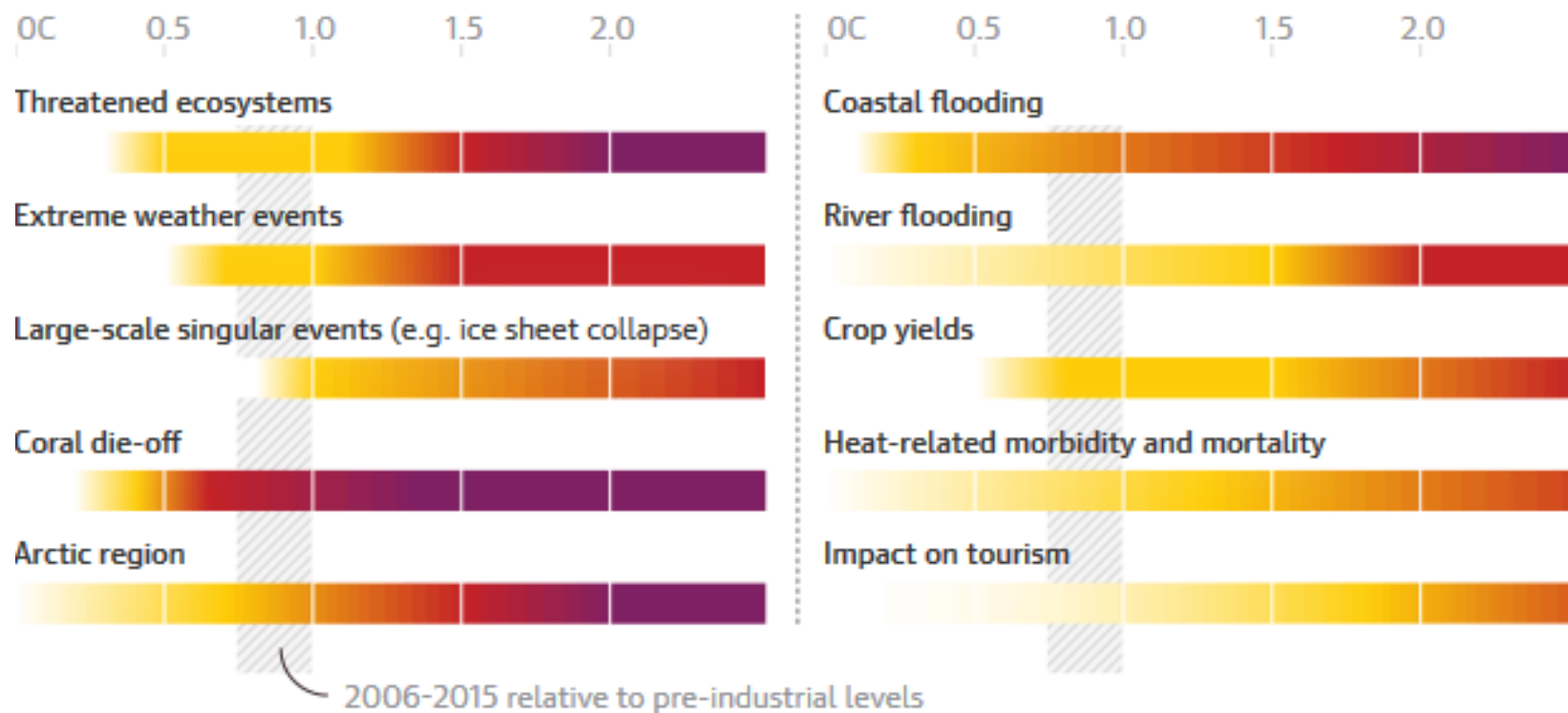
Source: Climate Central



## Key to impacts and risks



## Global mean surface temperature change relative to pre-industrial levels, C



Source: Guardian Reports, IPCC 2018.

# Goals of the Actuaries Climate Index (ACI)

Create an Index that:

- Is actuarial and objective
- easy to understand without being simplistic
- measures changes in climate extremes
- Gives insight
- Promotes the actuarial profession



# The Actuaries Climate Index (ACI)

focuses on the frequency of severe weather

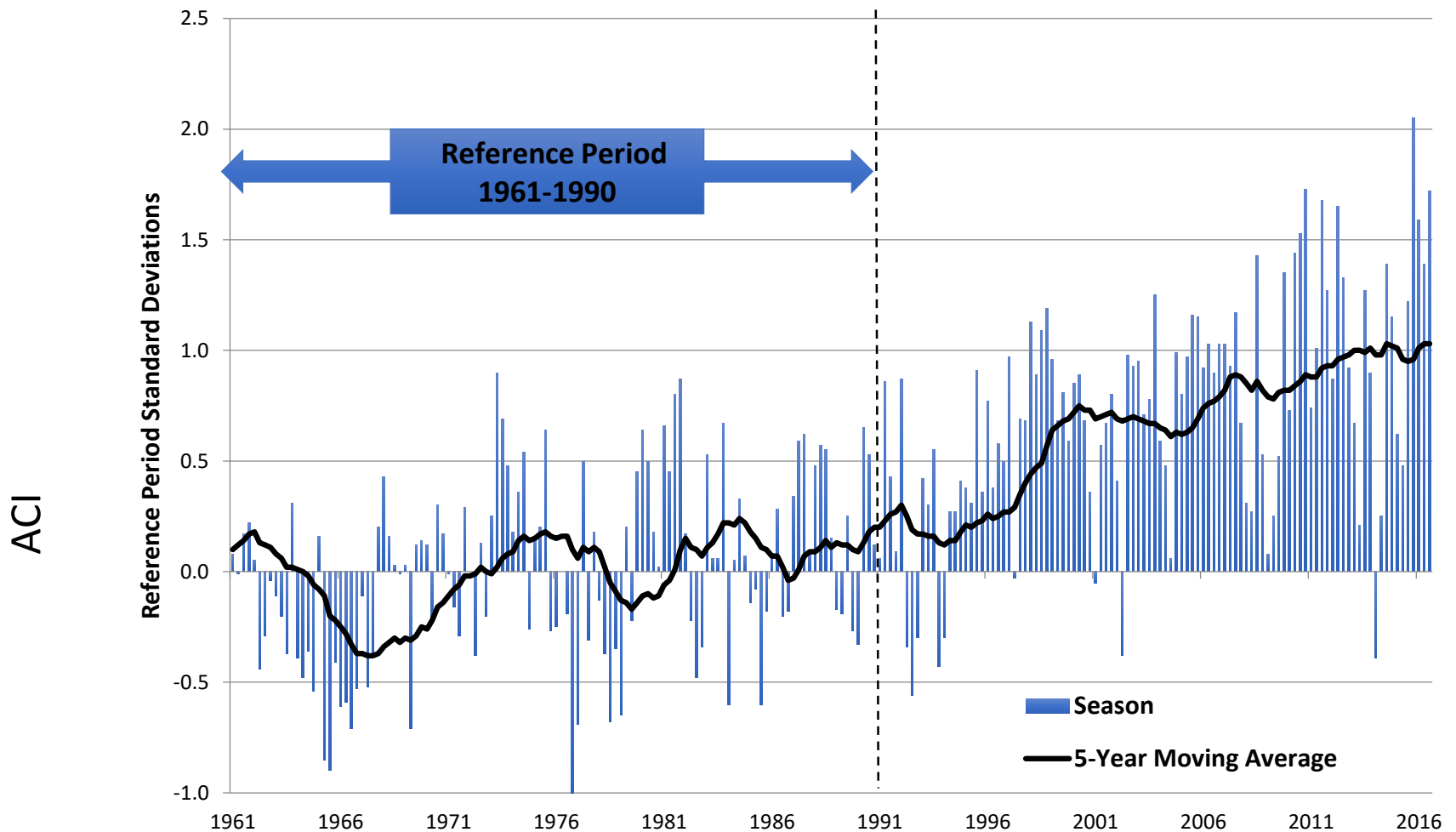
---

- Example: “How often is the temperature in a given month at or above the 90<sup>th</sup> percentile?”
- The 90<sup>th</sup> percentile is based on the 1961-1990 base reference period
- Average of six component sub-indices for hot temperatures, cold temperatures, high precipitation, drought, high wind, and coastal sea level
- $ACI = (\Delta T_H - \Delta T_C + \Delta P + \Delta D + \Delta W + \Delta S) / 6$
- ACI components are of the form:

$$(x - \mu_{\text{ref}}) / \sigma_{\text{ref}}$$



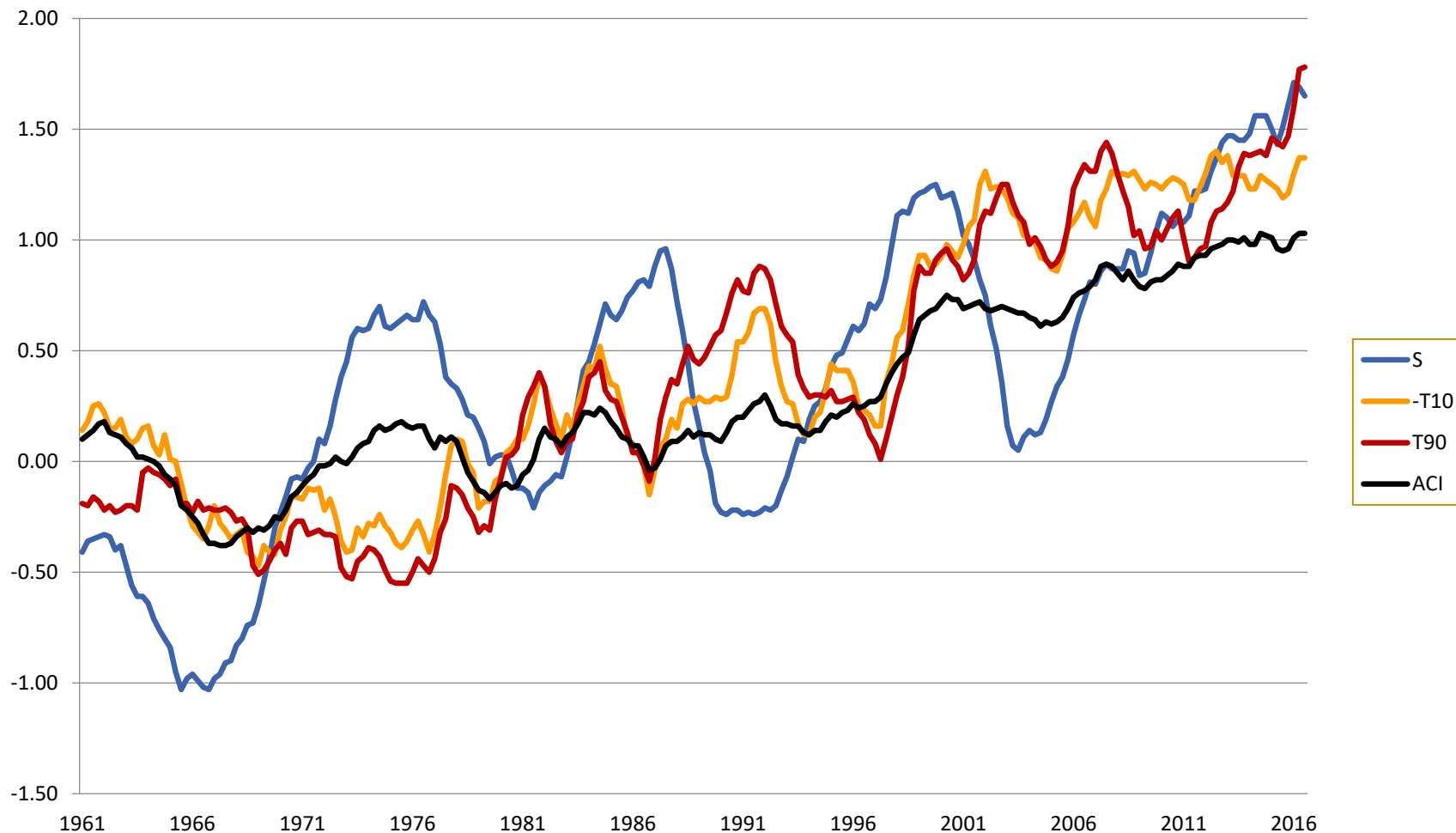
# Actuaries Climate Index™ - USA & Canada



## Components of the ACI

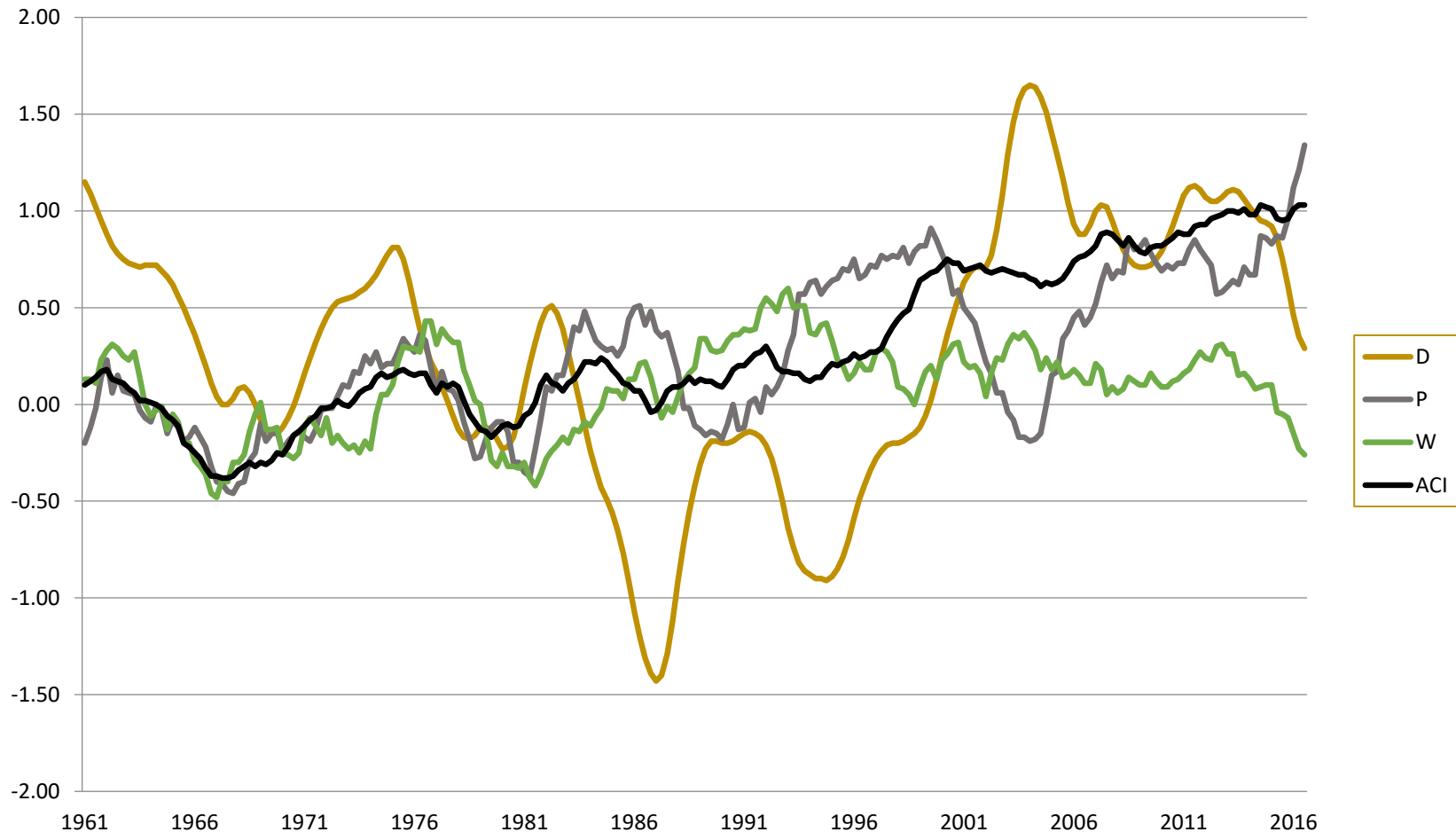
- T90
- -T10
- Sea Level
- Drought
- Wind Power
- Precipitation

## Temperature and Sea Level Components - USA and Canada



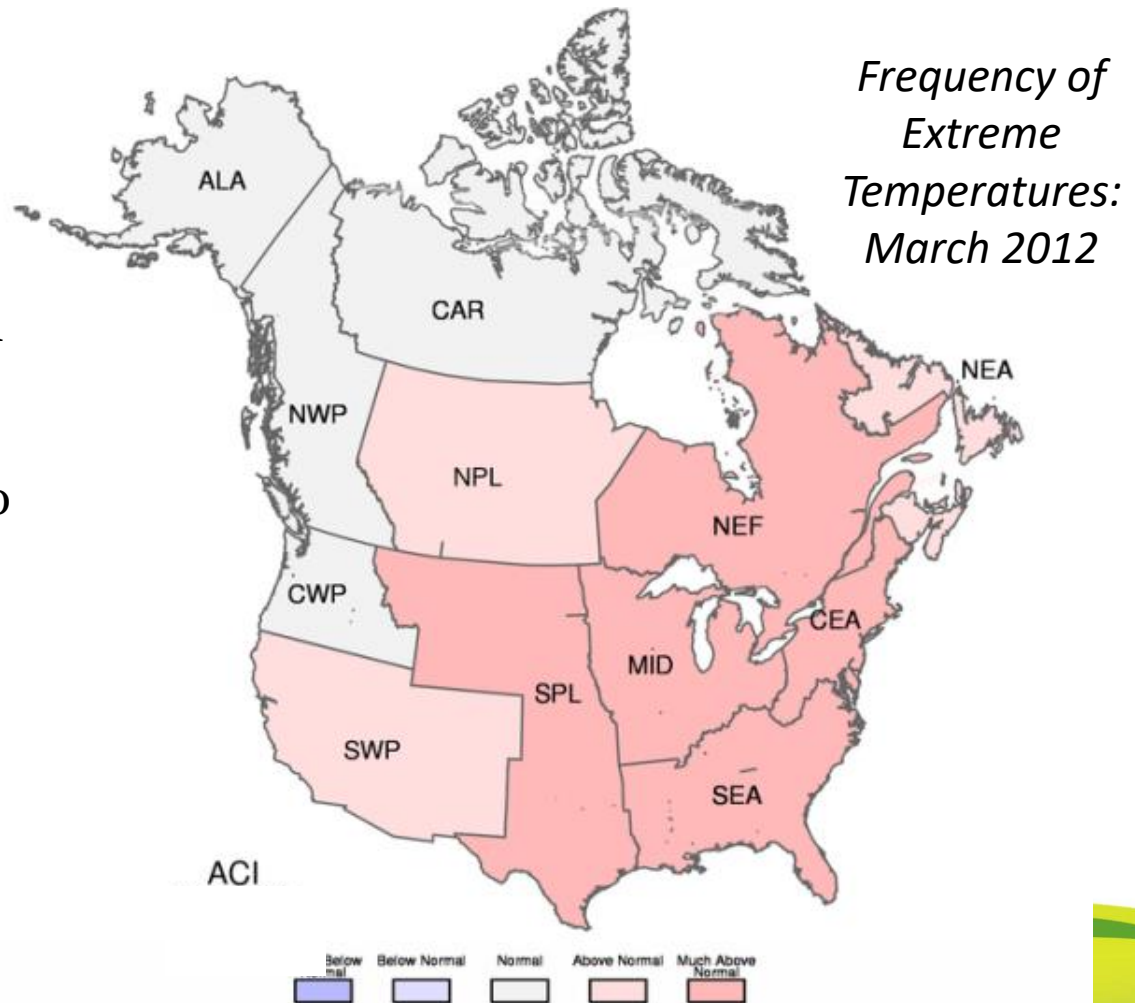
Baseline reference period

## Wind Power, Precipitation, and Drought - USA and Canada



# ACI data is constructed for geographic grids, then summarized to regions, countries, and in total

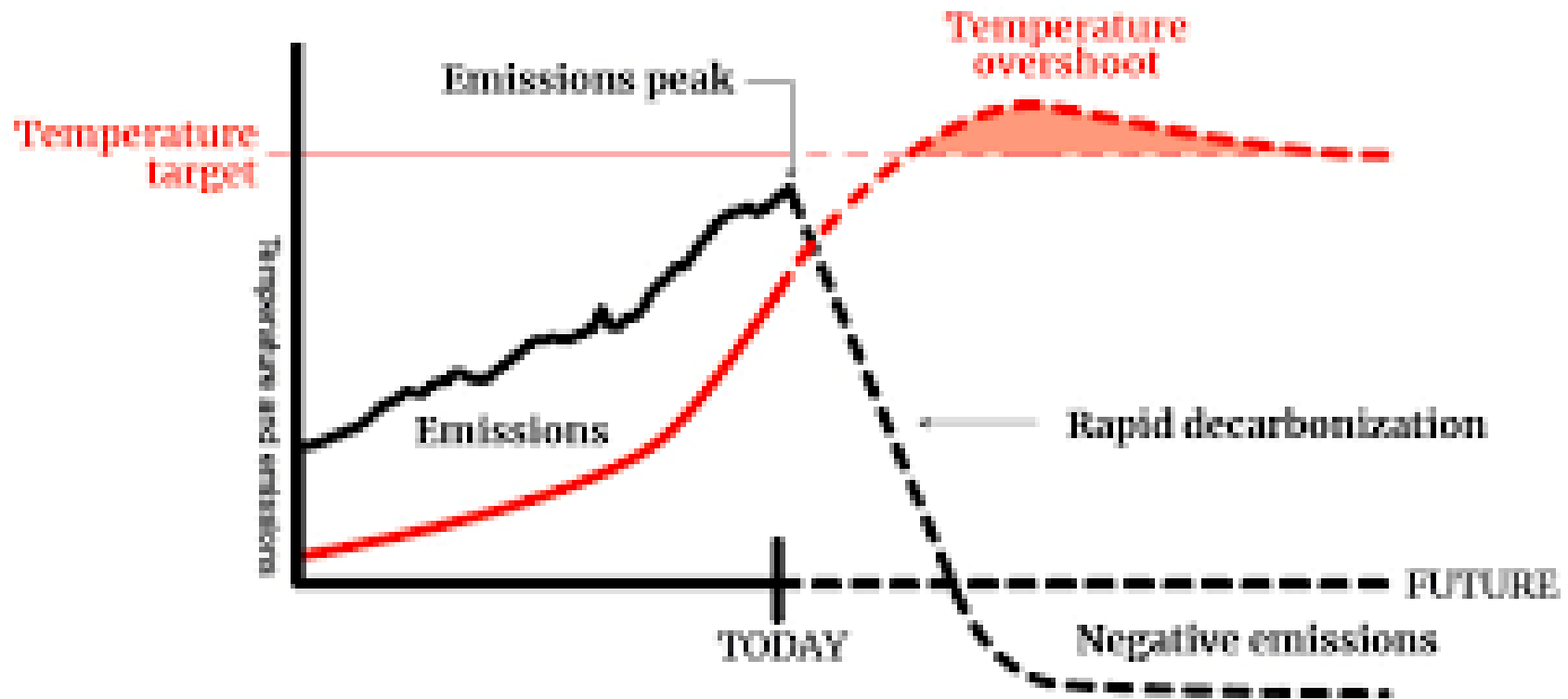
- ACI components are constructed in a uniform  $2.5^\circ$  grid across the USA and Canada
  - 275km by 275km at equator
- Grid components for each climate variable are summarized into indices for 12 natural regions, two countries and U.S. and Canada in total
- Summarized indices are unweighted averages of grid components
  - Each climate change component is equally important





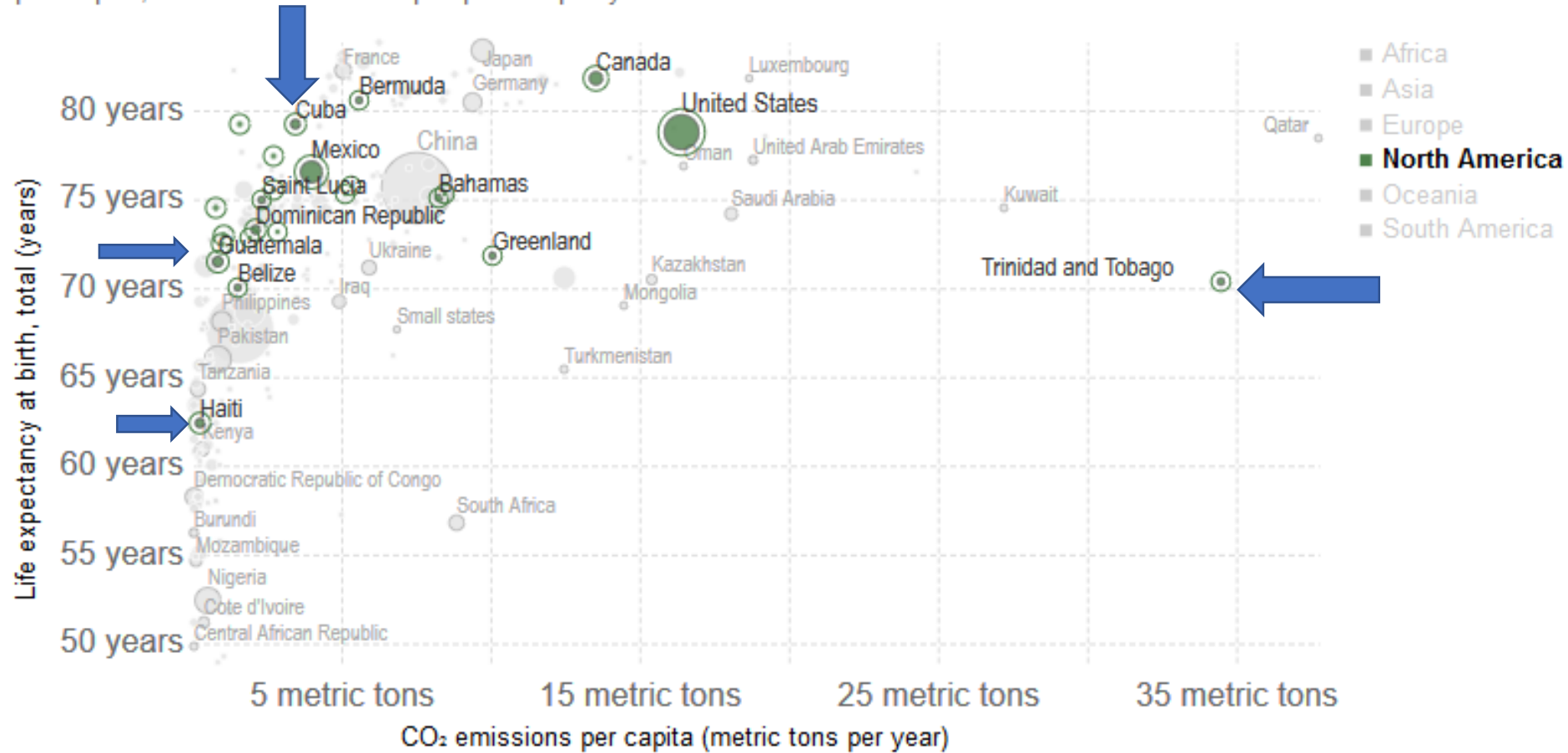
# Reducing Climate and Health Risks

## IPCC 2018 Emissions vs 1.5 degrees Warming



# Life expectancy at birth vs. CO<sub>2</sub> emissions per capita, 2013

Average life expectancy at birth, measured in years across both sexes versus carbon dioxide (CO<sub>2</sub>) emissions per capita, measured in tonnes per person per year.

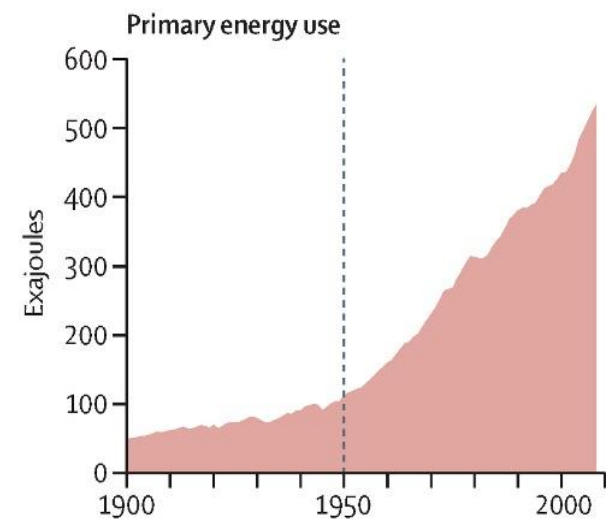
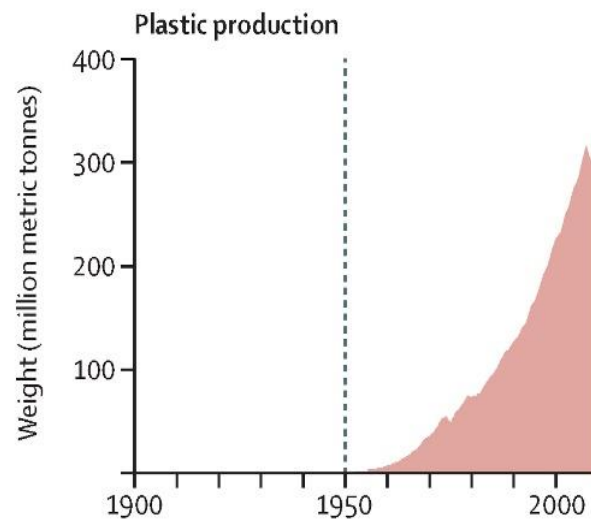
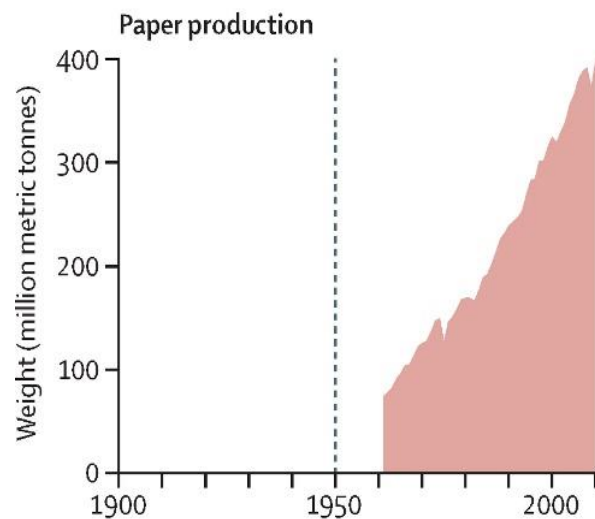
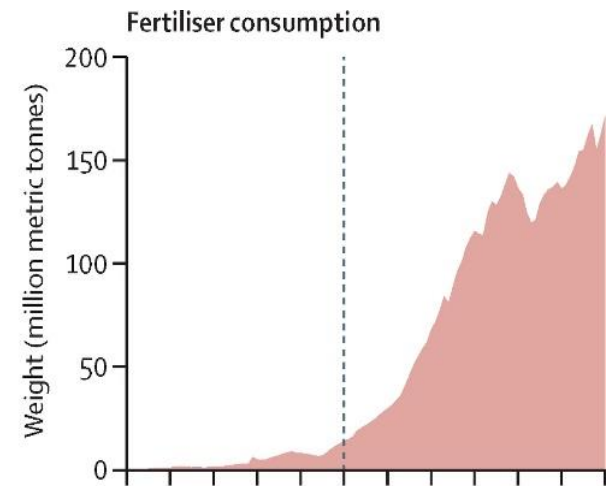
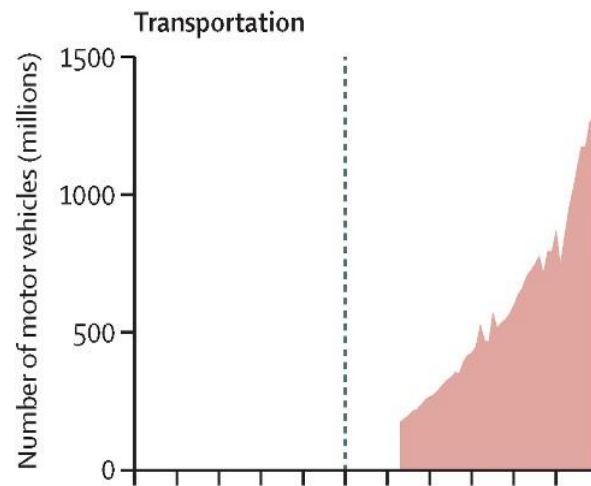
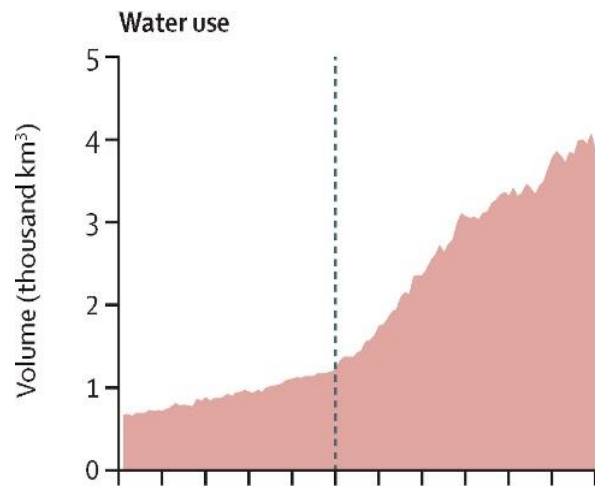


Source: World Bank – WDI

CC BY-SA

# Growth of Population and Resource Use

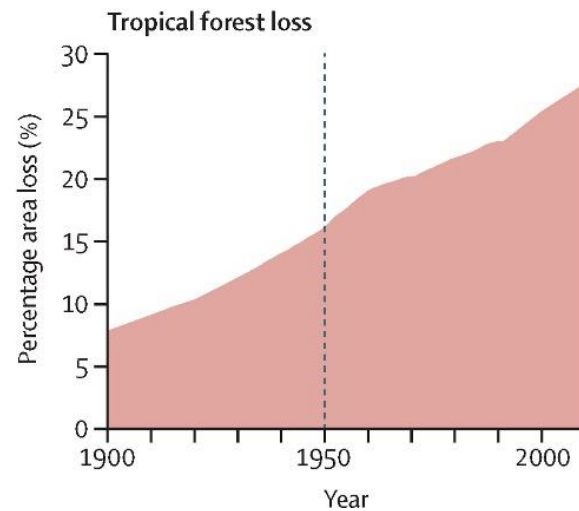
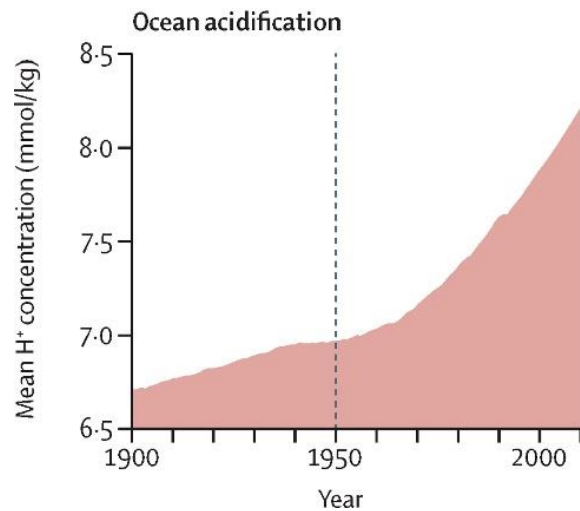
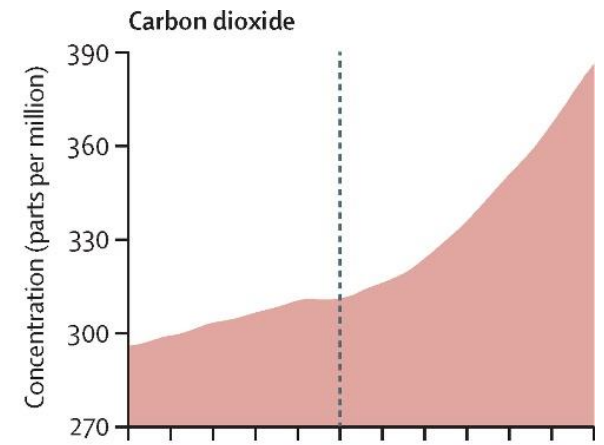
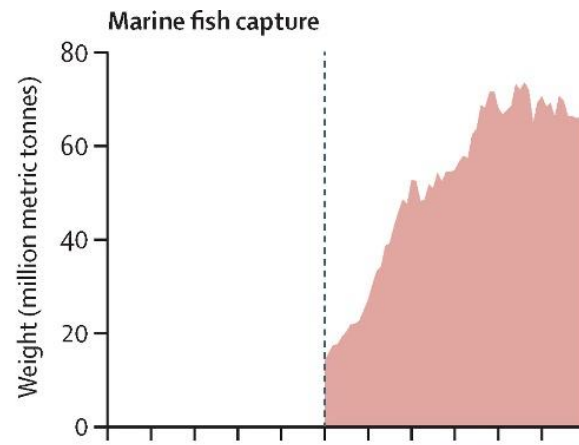
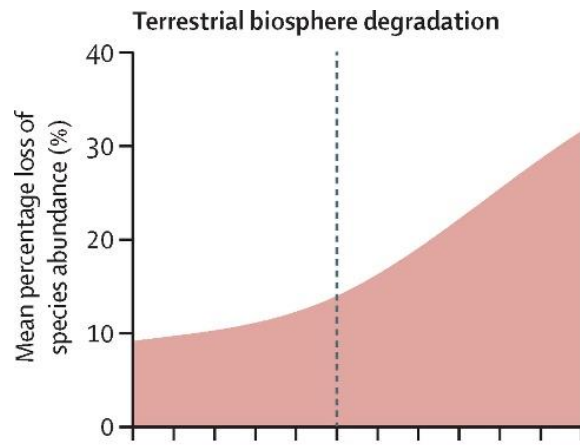




*The Lancet* 2017 390, 2860-2868 DOI: (10.1016/S0140-6736(17)32846-5)

Copyright © 2017 Elsevier Ltd [Terms and Conditions](#)





*The Lancet* 2017 390, 2860-2868 DOI: (10.1016/S0140-6736(17)32846-5)

Copyright © 2017 Elsevier Ltd [Terms and Conditions](#)

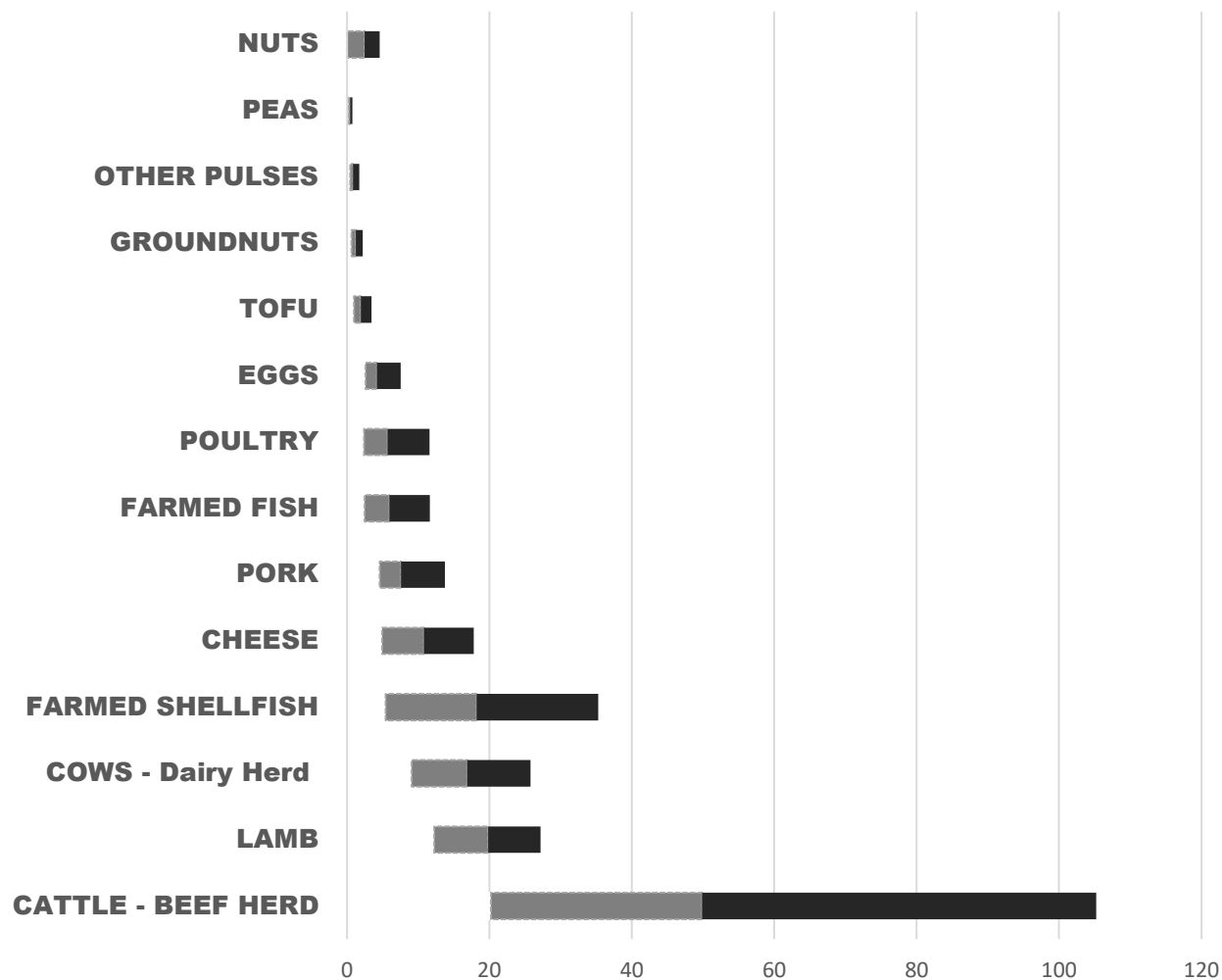




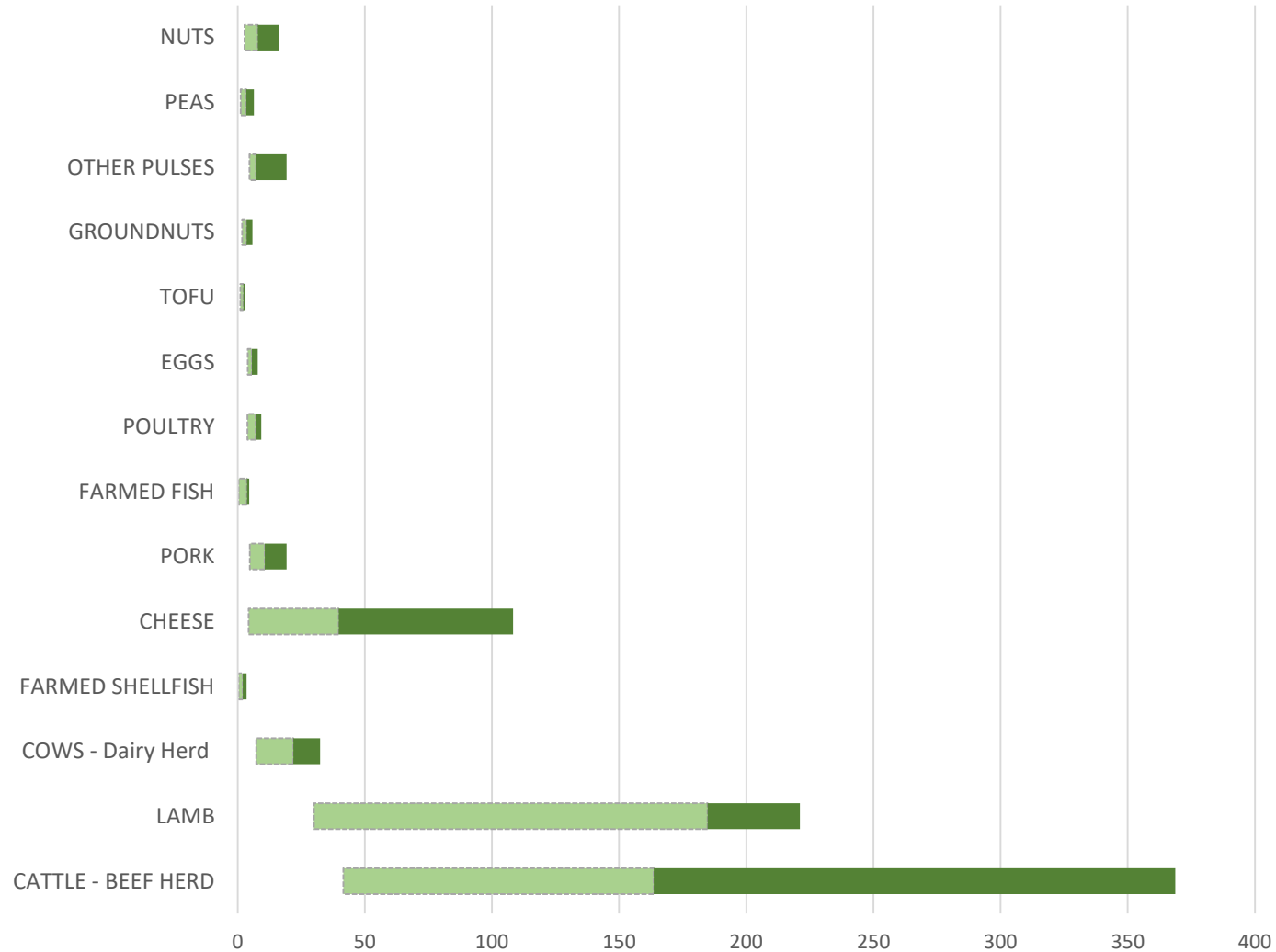
# Oxford Food Study

- A five year study, using Life Cycle Analysis
- Covers 90% of the world's food production
- Measures 5 indicators
  - Greenhouse gas emissions
  - Land use
  - Terrestrial acidification
  - Eutrophication
  - Water Use, weighted by water scarcity

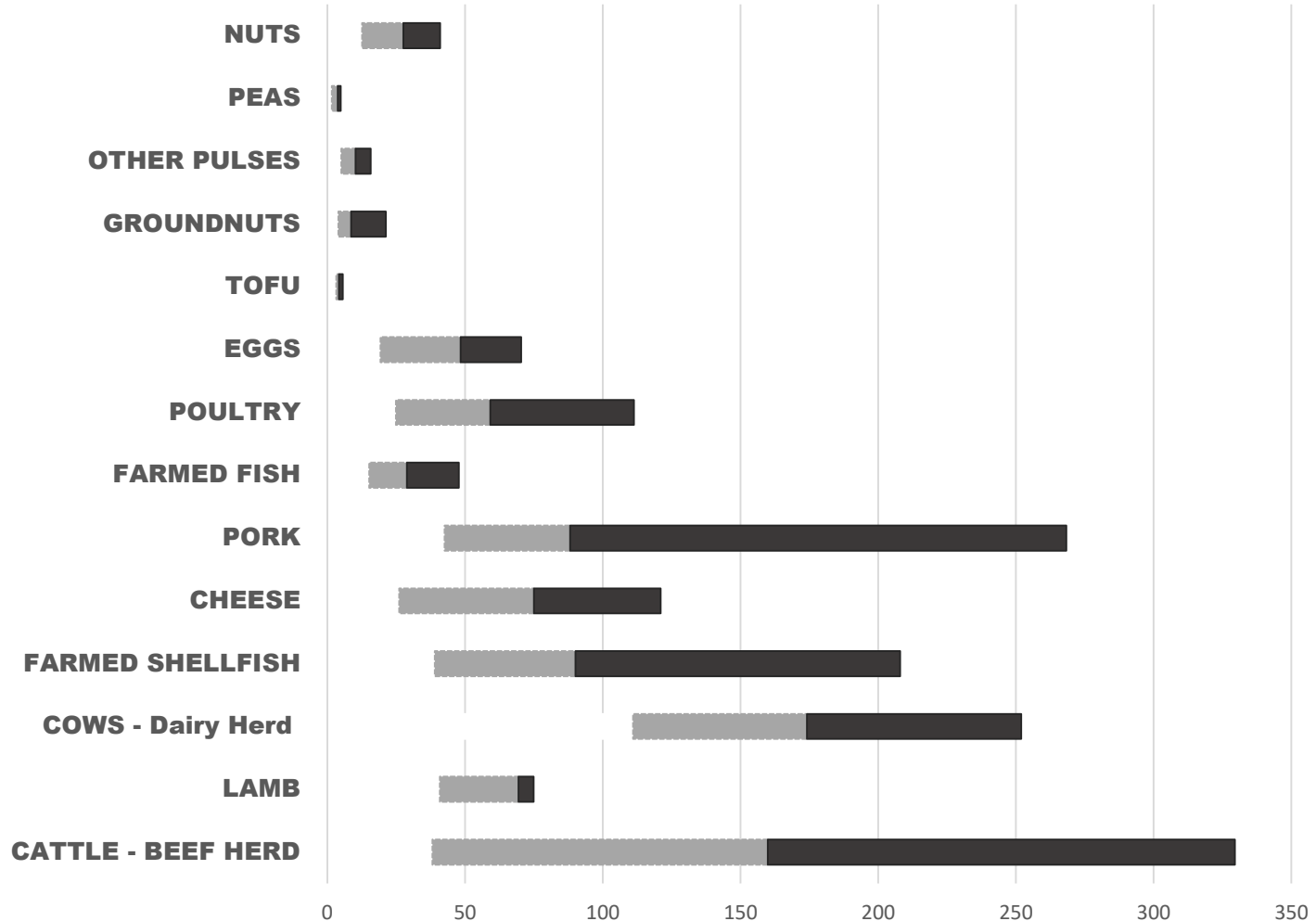
# Greenhouse Gas Emissions per 100 Grams protein



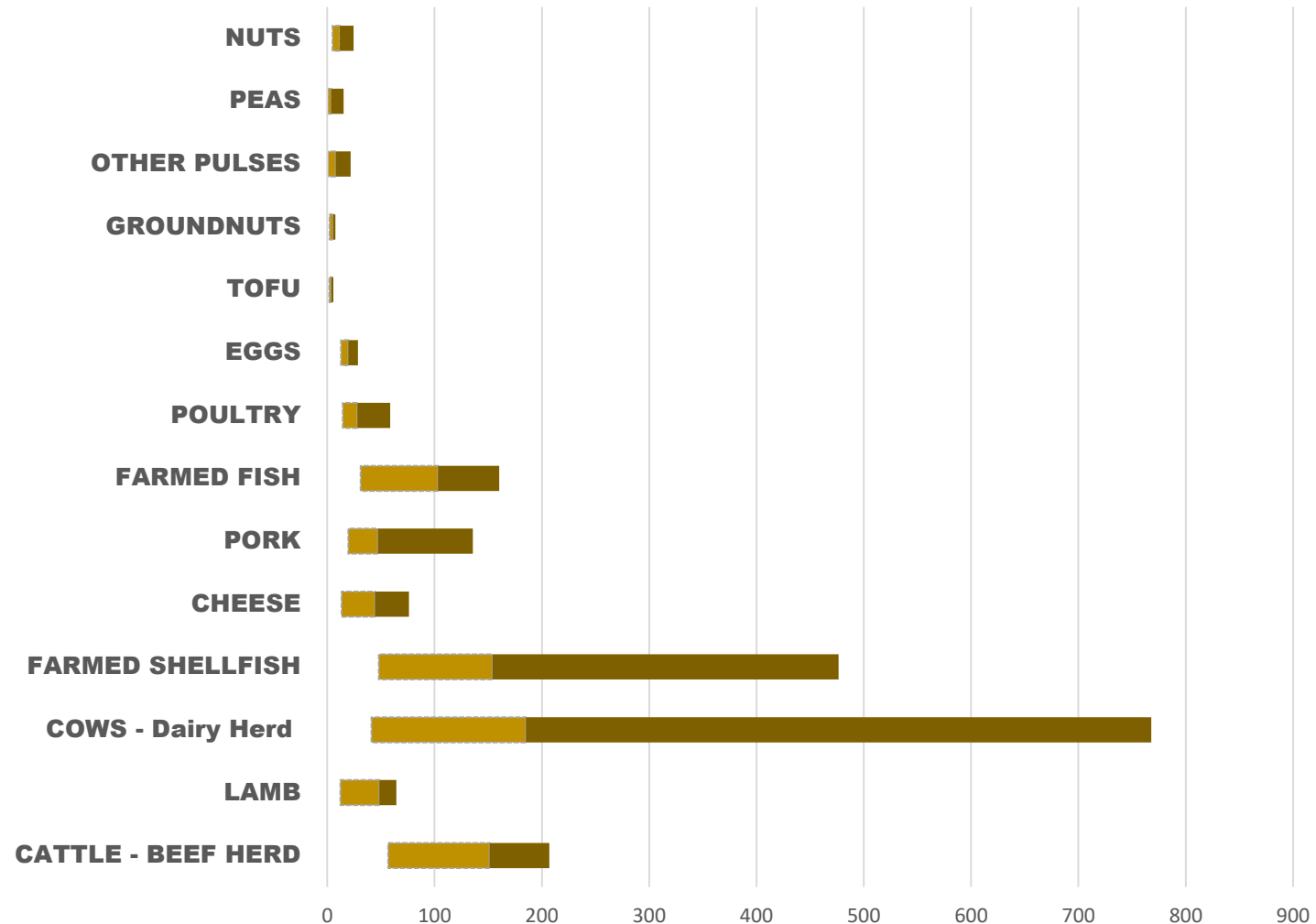
# Land Use per 100 Grams protein



## Acidifying Emissions (SO<sub>2</sub>) per 100 Grams protein

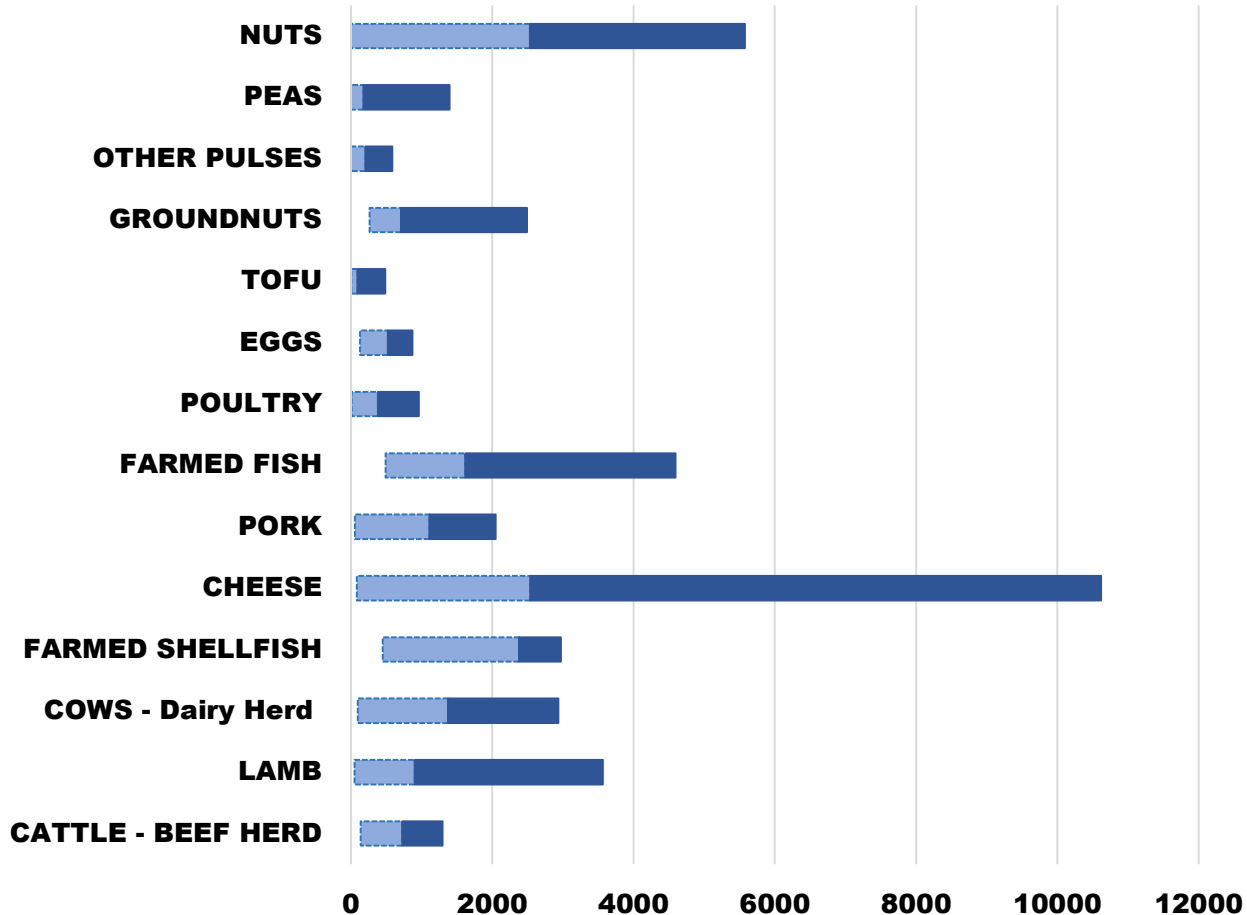


## Eutrophying Emissions (PO4) per 100 Grams protein





# Water Use, weighted by water scarcity per 100 Grams protein



# Conclusions of the Oxford Food Study

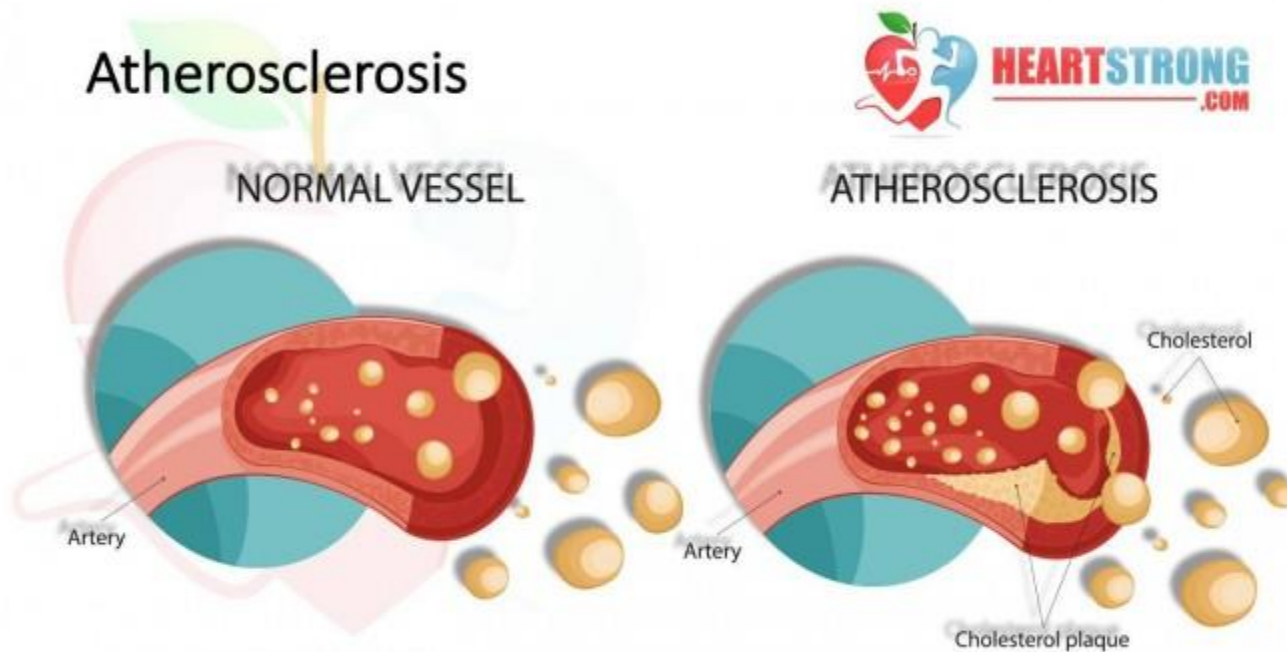
- Animal Agriculture uses 83% of the land, while providing 18% of the calories
- Vegan Diets would:
  - Save 79% of the Land
  - Save about 50% of the emissions
  - Save about 20% of freshwater use

According to the world's largest organization of nutrition professionals, the Academy of Nutrition and Dietetics,

“Vegetarian and vegan diets are healthful, may prevent and treat chronic diseases, and are better for the environment.”



# The #1 killer is atherosclerosis (heart disease)



Copyright © 2017 HeartStrong.com. All Rights Reserved.

3

# Atherosclerotic Risk Factors



1. Genetic (1/500)
2. Degenerative
3. Inflammatory
4. Cigarette smoking
5. Systemic hypertension
6. Diabetes mellitus
7. Overweight
8. Inactivity
9. Stress
10. Cholesterol problem

No

Yes

**Is this factor  
necessary to  
form plaques?**

Copyright © 2017 HeartStrong.com. All Rights Reserved.

5





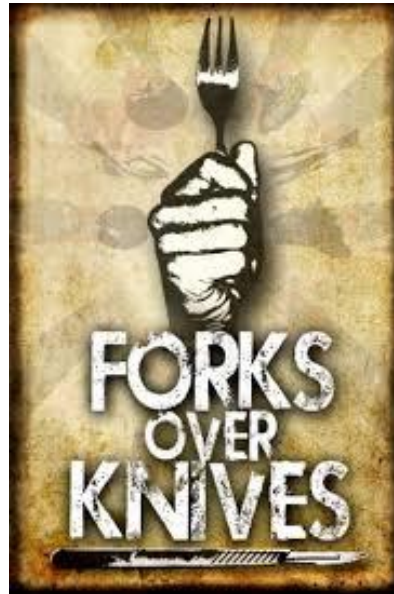
# We have a chance to avoid Climate Breakdown and improve health by

- Eating much less beef
- Eating much less animal products
- Eating less processed foods
- Eating more whole, plant-based foods

# Some Resources for more information



ACTUARIES FOR  
SUSTAINABLE  
HEALTH CARE



[www.Vegan2026.com](http://www.Vegan2026.com)



Dr. Greger's  
**Daily Dozen**