Climate Change and Human Health: Impacts and Adaptation Strategies, *An Interprofessional Series on the Most Complex Issue of our Time*.

Session 1: Overview of an Existential Crisis

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Today's Agenda, Jan 25, 2018

1. Birth of this course, sessions and speakers, terminology
2. SDGs
3. Questions to address
4. Film clip
    1. Discuss "Anthropocene"
5. Key assumptions, principles
6. Brief Hx of Cl Change
7. Thought experiment
8. What is the End Game- in this room, at the end of class…
9. Questions
10. Resources- will be shared w OLLI

Session Topics and Speakers

- January 25th Carol Ziegler, DNP, NP-C (Vanderbilt School of Nursing & Meharry Medical College, Department of Family Medicine): Climate Change- Overview of an Existential Crisis
- February 1st Carol Ziegler, DNP, NP-C: The Impact of Climate Change on Human Health and Conflict
- February 8th Gwen Griffith, DVM (Cumberland River Compact): An Overview of Human and Ecological Adaptation Strategies
- February 15th Sanmi Areola, PhD, (Deputy Director, Metro Nashville Health Department, Director of Environmental Health): Creating Effective Local Policy for Promoting Adaptation and Mitigation- The Nashville Landscape
- February 22nd Professor Mike Vandenbergh, Vanderbilt University School of Law: Climate Beliefs and Climate Mitigation- A way forward

Some terms to be familiar with…

- Adaptation: The UNFCCC defines it as actions taken to help communities and ecosystems cope with changing climate condition.
- Adaptive Capacity- The capacity of a system to adapt if the environment where the system exists is changing.
- Climate Variability - The way climate fluctuates yearly above or below a long-term (30 year) average value.
- Climate change – A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.
- Ecosystem-Based Adaptation - The conservation, sustainable management and restoration of natural ecosystems to help people adapt to climate change.
- **Ecosystem Services**: The total benefits people obtain from ecosystems.
- **Full Cost Accounting**: A method of cost accounting that traces direct costs and allocates indirect costs by collecting and presenting information about the possible environmental, social and economical costs and benefits or advantages – in short, about the "triple bottom line" – for each proposed alternative. It is also known as true-cost accounting (TCA), but, as definitions for "true" and "full" are inherently subjective, experts consider both terms problematical.

- Mainstreaming - The integration of climate change adaptation into related government policies in several sectors.
- **Mitigation** - **Efforts to reduce or prevent emission of greenhouse gases**. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behavior.
- **Precautionary Principle** - If an action or policy has a suspected risk of causing harm to the public, or to the environment, in the absence of scientific consensus (that the action or policy is not harmful), the burden of proof that it is not harmful falls on those taking an action that may or may not be a risk. It implies an emphasis on the need to prevent such adverse effects.
- Resilience - The capacity for a socio-ecological system to: (1) absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and (2) adapt, reorganize, and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.
- Vulnerability - The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

Course Origins

- Climate Change is the Greatest threat to humanity (WHO, 2016)
- How might it impact our patients?
- What are adaptation responses that could improve health span?
- Which of those could also build resilience and mitigate climate change?
- Are there competing agendas? **How can you integrate adaptation-directed values in human and ecological systems in a growth-based economy while simultaneously <u>mitigating</u> <u>carbon</u>?**

Centered on SDGs

Nursing is Ecological

Florence Nightingale

- **Pure fresh air** – "to keep the air he breathes as pure as the external air without chilling him."
- **Pure water** – "well water of a very impure kind is used for domestic purposes. And when epidemic disease shows itself, persons using such water are almost sure to suffer."
- **Effective drainage** – "all the while the sewer maybe nothing but a laboratory from which epidemic disease and ill health is being installed into the house."
- **Cleanliness** – "the greater part of nursing consists in preserving cleanliness."
- **Light** (especially direct sunlight) – "the usefulness of light in treating disease is very important."

- http://www.un.org/sustainabledevelopment/sustainable-development-goals/

- Thriving Lives and Livelihoods
- Sustainable Food Security
- Sustainable Water Security
- Universal Clean Energy
- Healthy and productive ecosystems
- Governance for sustainable societies

Questions to Address for the Course Series

- What is happening to the planet and what is the cause
- What are the consequences for carbon-based life
- What is the current state of intervention and what is most effective
- What actions should be taken (and not taken) from micro to macro scales
- Where might we look for answers

https://www.youtube.com/watch?v=fvgG-pxlobk

Key Assumptions

Available science concludes with 90% certainty that the earth's climate has warmed over the past few decades as a result of greenhouse gas emissions from human activities.

No credible body of climate scientists have found an alternate explanation for the rising global temperature

- Climate change is a major public health threat
  - Greatest threat to humanity (WHO, 2016)
  - Rising Temps, Weather extremes, Rising sea levels
  - Unpredictable patterns/specific impacts
- It will disproportionately impact vulnerable populations in all regions and societies.
  - In the United States, the most vulnerable are those with no or limited access to health services, extremes of age, residing in water- stressed areas and persons already suffering from respiratory and cardiopulmonary disease
  - Globally: Southern Hemisphere, marginalized persons, LMICs
- "Anthropocene" is misleading

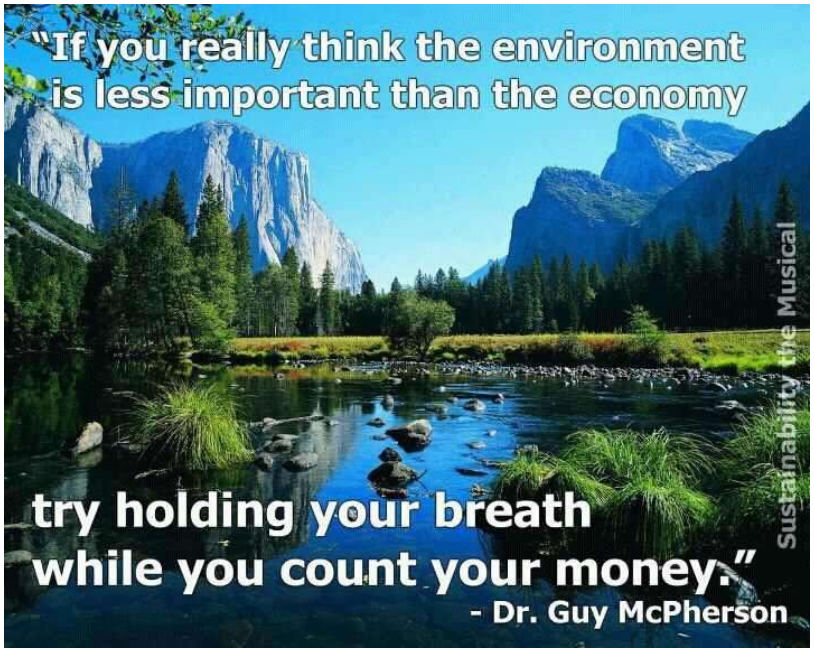
IPAT Equation

- *I = P x A x T*, is an equation that expresses the idea that environmental impact (I) is the product of three factors: population (P), affluence (A) and technology (T).

Earth's Carrying capacity

- Growing population, rising material expectations and diminishing ecological capacity.
- If everyone on earth consumes at the same rate as the average person in India= 15 billion
- If everyone on earth consumes at the same rate as the average person in US= 1.5 billion
- Currently at 7.5 billion
- 9 billion by 2050
- We need 5 Earths by 2050.
  - 100 million climate refugees
- Caloric needs: 2200-3000 Kcal/day
- US citizen uses 186,000 Kcal/day (1998), mostly oil and coal (McKibben, **1998**)
- Waste 1 million pounds of material product per year

- Transformative Education
- Interdisciplinary Collaboration
- Transformative Design



Primary Impacts: Climactic Environmental Exposures

Human Health

- Disasters
  - Hurricanes
  - Tornadoes
  - Drought/Floods
  - Coastal and Inland Flooding
- Extreme Temperature fluctuations
  - Heat and Cold-related morbidity and mortality
- Rising sea levels

Displacement, Trauma, Death

Ecological

- Biodiversity
- Forests
- Glaciers
- River flows
- Sea level, temp and pH
- Coastal zones
- Soil health
- Nitrogen/phosphorous cycles

Rockstrom, 2009

Secondary Impacts: Disruptions to ecosystems

Human Health

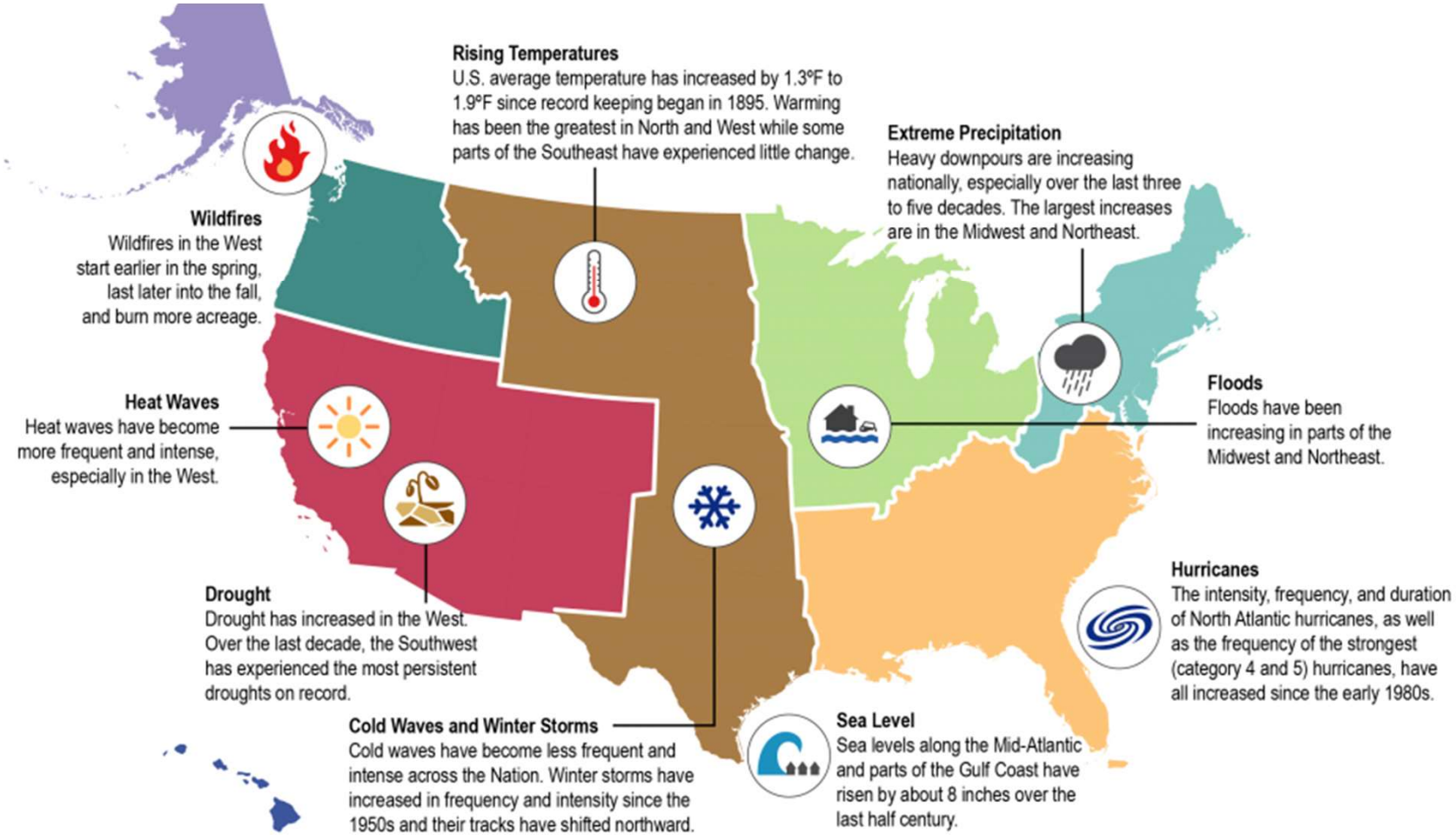
- Vector-borne illness
  - Malaria
  - Dengue
  - Zika
  - Lyme
  - Parasites
- Allergies
  - Contact, Plant, Respiratory, Insect
- Fires
  - Smoke exposure
  - Burns
  - Homelessness/gentrification
- Pollution
  - CVD, Resp illness

Ecological

- Ecological changes
- Crop yields/Diversity/Quality
- Water quality and availability
- Insect/vectors populations and mobility/range
- Air quality- forest fires, etc.

Tertiary Impacts: Social and Economic Disruptions

- Famine, Hunger
  - Agriculture, fisheries, forests
  - Movement of subsidies to fuel
- Migration and population
- Conflict/Ill health
- Mental Health
  - Stress
  - Trauma
  - Mental health disorders
  - Role of 'nature' in mental health
  - Existential Distress: *Solastalgia*
  - Importance of place in children
- Infrastructure and property loss
- Lowered '*productivity*'
- Resource- related conflicts
- Human displacement

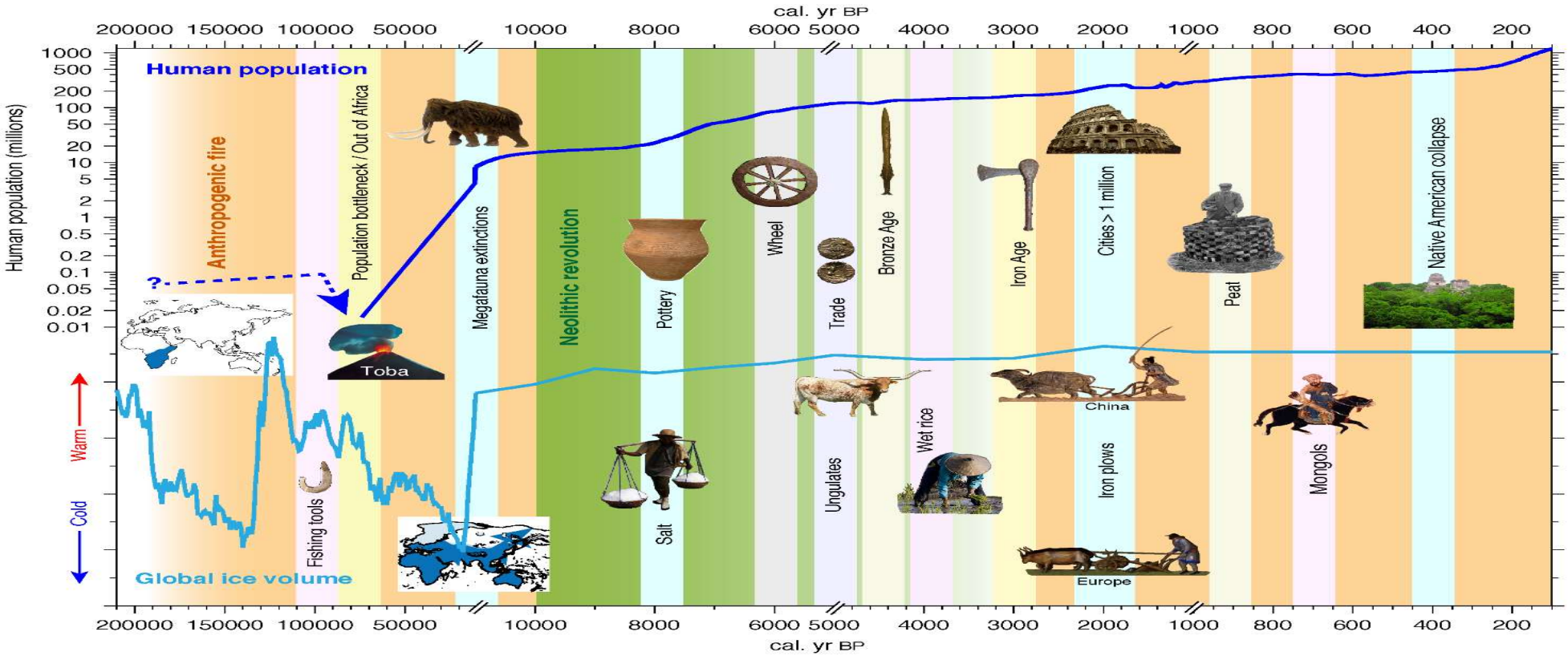


https://health2016.globalchange.gov/climate-change-and-human-health

Threats- Horizon scan

- Water
  - Flooding/sea level rise
  - Salinization of aquafers and groundwater systems/networks
  - Conflicts over freshwater
  - Flash floods and runoff
  - Pollution-Caffeine, hormones
- Pathogens
  - Tundra thaw
  - Ambient temp
  - Deforestation and ecosystem disruption
- Ambient Temp

Global timeline of human transformation of the terrestrial biosphere



Ellis EC, Fuller DQ, Kaplan JO, Lutters WG. Dating the Anthropocene: Towards an empirical global history of human transformation of the terrestrial biosphere. Elem Sci Anth. 2013;1:18.

What makes us human?

Justice, Adaptation, Mitigation

What drives migration drives development

Michael Pollan- “Cooked”, 4 part series

OHCHR: Human Rights and Climate Change

- **To mitigate climate change and to prevent its negative human rights impacts**
- **To ensure that all persons have the necessary capacity to adapt to climate change**
- **To ensure accountability and effective remedy for human rights harms caused by climate change**
- **To mobilize maximum available resources for sustainable, human rights-based development**
- **International cooperation**
- **To ensure equity in climate action**
- **To guarantee that everyone enjoys the benefits of science and its applications**
- **To protect human rights from business harms**
- **To guarantee equality and non-discrimination**
- **To ensure meaningful and informed participation**

Thought Experiment…Missing Bicycles…

1. Jack steals Jill's bicycle
2. Jack is part of an unacquainted group of strangers, each of which, acting independently, takes one part of Jill's bike, resulting in the bike's disappearance.
3. Jack takes one part from each of a large number of bikes, one of which belongs to Jill.
4. Jack and Jill live on different continents, and the loss of Jill's bike is the consequence of a causal chain that begins with Jack ordering a used bike at a shop.
5. Jack lives many centuries before Jill, and consumes materials that are essential to bike manufacturing; as a result, it will not be possible for Jill to have a bicycle
6. Acting independently, Jack and a large number of unacquainted people set in motion a chain of events that causes a large number of future people who will live in another part of the world, from ever having bikes

Dale Jameison, Reason in a Dark Time

7 Policy Priorities

- Integrate Adaptation and Development
- Protect, encourage and increase terrestrial carbon sinks
- Adopt full-cost energy accounting
- Raise price of GHG emitting to reflect true cost
- Force technology adoption and diffusion
- Increase research in renewable energy and carbon sequestration
- Plan for the Anthropocene

- Goal: **Discourage, Limit, Phase out the use of coal**

- Policy must
  - **Rationally allocate people**
  - **Rationally allocate resources**
    - Impact people's right to health, housing, water, food
  - **Different level of responsibility in different countries for climate change**

Dale Jameison, from Reason in a Dark Time, 2014

Climate Mitigation: Symbiotically uniting caring with the biophysical agenda

Adaptation

Mitigation

Emission Reduction/Abatement
- Carbon Tax
- Fertility Rate Reduction

Carbon Sequestration
- Increase Carbon Sinks

Technology

Value/Culture shift

Policy
- **Carbon Tax**
- **Full Cost Accounting**
- **Environmental Personhood**
- **Ecosystem Services**

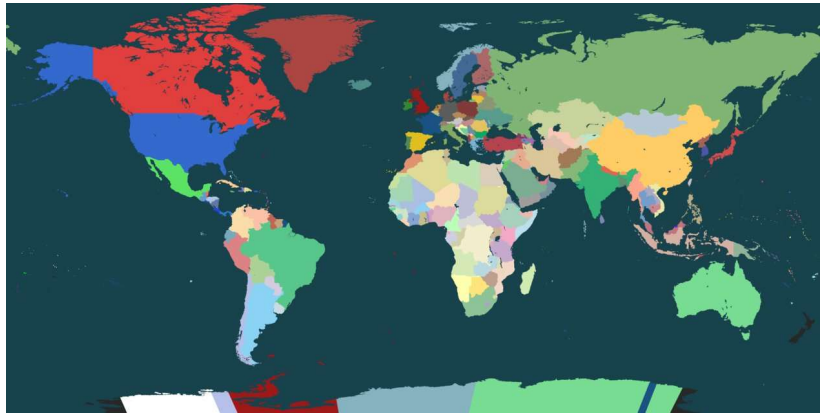
Policy is SLOW
Kenny Ausubel:"Reimagine life on earth to honor the web of life, each other and future generations'

Value indigenous knowledge systems

Policy Targets: IPCC

- https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf
- Work towards international cooperation and accountability across sectors and borders

- **Carbon Tax**
- **End fossil fuel subsidies**
- **Invest in renewables**
- **Leave fossil fuels in ground**
- **Full Cost Accounting**
- **Environmental Personhood**
- **Ecosystem Services**

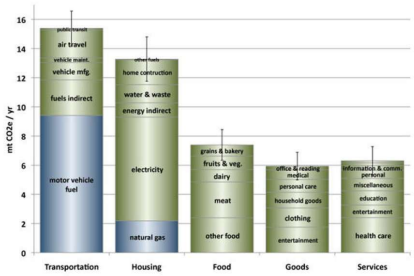


Your Role in Resilience, Adaptation, Mitigation

- 1) **Engage in and inform the policy debate to promote mitigation and adaptation strategies.**
- 2) Contribute to the sentinel evidence on the ground of the impact of climate change.
- 3) Improve capacity to deal with public health emergencies and mass casualty/trauma/climactic events.
- 4) Understand the impact of climate change in your community and industry
- Change the way we think and what we value

Personal change for mitigation

- Personal lifestyle
  - Diet
  - Transportation
  - Consumption patterns
- Zero waste
- Values
- Integrate this into work, spread message
- Be informed
- Foster accountability
  - Think big tobacco, fast food
- Stress health impacts



Consume differently
- What we buy
- What we eat
- Our power

Vote

End fossil fuel subsidies

Invest in renewables

Leave fossil fuels in ground

Carbon tax - Carbontax.org

Local activism

https://www3.epa.gov/carbon-footprint-calculator/

Excerpt from “Interview with a Fungus”…

Diane Brooks Pleninger, 2004

- “With the advantage of hindsight, I think we can summarise it as a failed experiment in individualism. The idea of the individual—and there is no fungal equivalent—arose during a period of rapid change in human society. In the abstract, individualism looked defensible, even appealing. The ideal individual was to be educated and enlightened, someone we'd all like to know. However, as a practical matter, the culture of enlightened individualism reformed itself after a brief period into a cult of personal freedom. Over the next several centuries, unbridled personal freedom and chance distributions of natural resources led to the creation of certain wealthy and isolated colonies of humans. Their prosperity excited envy and the rest of the world did what they could to emulate them. Large populations of humans moved from a very simple experience of the natural world to the expectation of a lifestyle similar to what the exploiters were enjoying. This clamour for plenitude put enormous stress on the biosphere.”

http://www.economist.com/node/2187789

Earth Has Lungs…

- http://phenomena.nationalgeographic.com/2016/03/09/the-earth-has-lungs-watch-them-breathe/

Bibliography

Ziegler CC, Morelli V, Fawibe O. Climate Change and Underserved Communities. *Prim Care.* In press. (March 2017 pub date)

Butler, Colin. (Editor). (2016). *Climate Change and Global Health*. Boston, MA: CABI International.

IPCC Report on Climate Change: May be found at http://www.ipcc.ch/

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.1535 pp., Cambridge University Press, Cambridge, UK and New York, NY. doi:10.1017/CBO9781107415324| Detail

IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. 1132 pp., Cambridge University Press, Cambridge, UK and New York, NY. URL | Detail

Jamieson, Dale. 2014. *Reason in a Dark Time*. Oxford University Press. NY.

McKibben, Bill. 1998. A Special Moment in History. The fate of our planet will be determined in the next few decades, through our technological, lifestyle, and population choices. *The Atlantic,* May 1998 issue.

Noah S. Diffenbaugh, Deepti Singh, Justin S. Mankin, Daniel E. Horton, Daniel L. Swain, Danielle Touma, Allison Charland, Yunjie Liu, Matz Haugen, Michael Tsiang, and Bala Rajaratnam. Quantifying the influence of global warming on unprecedented extreme climate events. PNAS 2017 114 (19) 4881-4886;

Patz, J.A., Gibbs, H.K., Foley, J.A. et al. EcoHealth (2007) 4: 397.

Wackernagel, M., Kitzes, J., Moran, D., Goldfinger, S. & Thomas, M. (2006). The Ecological Footprint of cities and regions: comparing resource availability with resource demand, *Environment and Urbanization, 18* (1) 112.

Bibliography cont'd

Burke, M., Craxton, M., et al. 2016. Opportunities for advances in climate change economics *Science*, *352*, 6283, pp. 292-293

Elrick-Barr, C. E., B. L. Preston, D. C. Thomsen, and T. F. Smith. 2014. Toward a new conceptualization of household adaptive capacity to climate change: applying a risk governance lens. Ecology and Society 19(4): 12

Griggs, D, et al. 2013. Sustainable development goals for people and planet. *Nature, 495,* 305-307.

Munang, R., Thiaw, I., et al. 2013. The role of ecosystem services in climate change adaptation and disaster risk reduction. *Current Opinion in Environmental Sustainability*, *5*, (1) 47-52

Rockstrom, J., et al. 2009. A safe operating space for humanity. *Nature, 461*, 472-475.

Sandifer, P.A., Sutton-Grier, A., Ward, B. 2013. Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*, *12*, 1-15.

Simon Caney, *Climate change, intergenerational equity and the social discount rate*, POLITICS, PHILOSOPHY & ECONOMICS (2014).

Sutherland, W., et al. 2016. A horizon scan of global conservation issues for 2016. *Trends in Ecology and Evolution, 31* (1), 44-53.

The Paris Agreement Summary- may be found at: https://sustainabledevelopment.un.org/frameworks

Brondizio, E., Francois-Michel, L. 2016. Environmental governance for all. *Science 352,* 6291, 1272-1273