



Lecture 2: Global climate change, overview

2.1: The elephant in the room: What is GCC?

- Why is global climate change (GCC) the elephant in the room when talking about sustainable energy systems?
- GCC is **planet-wide climate** change caused by increased levels of atmospheric carbon and other greenhouse gases (GHGs) that, in turn, are caused by human activity.

2.2: What is the evidence of GCC?

- There is a **substantial trove** of evidence suggesting both that GCC is happening and that increased emissions of GHGs are the cause.
 - **GHG levels, atmospheric and ocean temperatures, loss of snowfall, glaciers and polar ice, changing weather patterns, increased extreme weather, ocean acidification, and shifting ecosystems and species.**
- Recent analysis of huge amounts of data show that parts of the US have already warmed more than the **2°C limit** proposed in the Paris accords.
 - And **New England is a warming hotspot.**

2.3: What are the cause(s) of GCC?

- Elevated, and still rising, levels of **GHGs** are the cause of GCC. 97% of scientists agree.

2.4: Paradigms, change, revolutions and transitions

- **No one likes change.**
- Our society was built by a series of **technical revolutions.**
- Societies **resist change** because of **inertia** (entrenched interests), **fear** of unintended consequences, **uncertainty** and because **institutions** work against it.
- Today, the globe needs a **paradigm shift**: an a low-carbon energy transition.

2.5: Decarbonization and the energy trilemma

- No energy sources are **carbon-free**, but many are **low-carbon**. We need to **decarbonize.**
 - **Embodied** and **life-cycle** carbon costs must be considered.
- On the whole, the **global community favors decarbonization.**
 - The US is a '**mixed marriage**' divided along **partisan** lines.
- Successful energy transitions must consider the **energy trilemma**: environmental sustainability, energy security and energy equity.
- Today, we've **barely begun to transition the US energy system.**