Not exactly zero-carbon:

Siting strongly affects a renewable energy system's **carbon footprint**.

Let's make renewable energy siting actually lead to deep decarbonization.

How?

To identify and pick installation sites, first:

1. Maximize lifetime electricity generation

- Site in areas that experience **high natural resource availability**
- Consider environmental variables that can cause **wear and tear**
- Plan for **easy access** and **timely maintenance**

2. Minimize carbon loss from original land

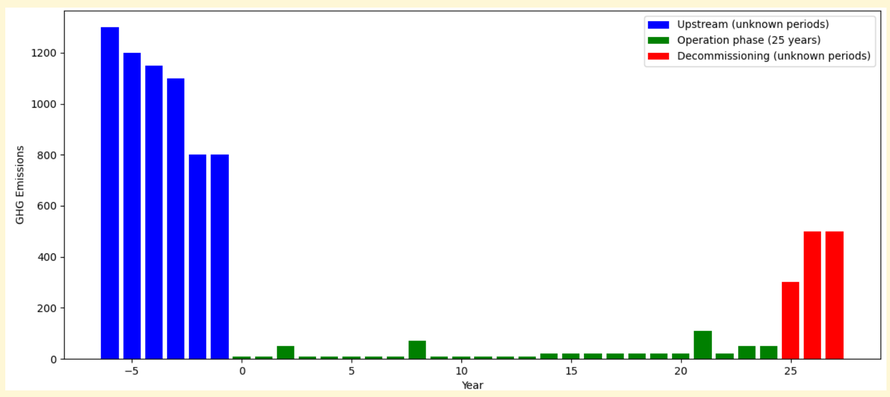
- Carbon can be lost from **removing biomass** and **disrupting soils**
- Identify potential sites with **lower carbon stocks** in plants & soils
- Consider **brownfields** and already developed land areas
- **Minimize disturbance** of original biomass as much as possible

3. Perform geospatial life cycle assessment

- Assess **multiple site-specific scenarios** using parametric geospatial life cycle assessment (LCA)
- Conduct **sensitivity analyses** to identify influential factors and opportunities for greenhouse gas (GHG) emissions improvements
- Choose installation sites that show the **lowest carbon footprints**

Why it matters

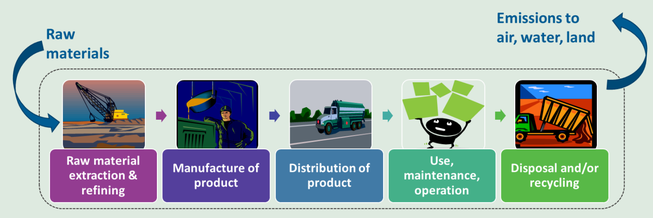
*We have the opportunity to **maximize the climate change mitigation benefits** of renewable energy in how we choose the next installation sites.* This is important for renewable energy as its life cycle greenhouse gas emissions primarily occur during raw material extraction & manufacturing.



This causes a pulse of emissions that **first exacerbates climate change** and that must be balanced out by minimizing its carbon footprint relative to other energy sources.

Background

1. Renewable energy systems have **non-zero carbon footprints** due to greenhouse gas (GHG) emissions caused throughout their **life cycles**:



2. When we calculate energy system carbon footprints, we **scale** their GHG emissions to **the average kWh generated**:

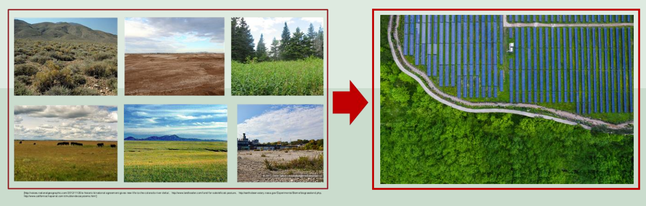
Cumulative GHG emissions throughout the life cycle

$$\frac{x\ CO_2eq}{\#\ kWh}$$

Scaled to the amount of electricity generated during the lifetime

… so the carbon footprint **pivots** on the lifetime total electricity generated.

3. We also must include GHGs from direct land use change:



Acknowledgements:

National Science Foundation (NSF) award #2316124 (CAREER: Geospatial life cycle climate change impacts of solar and ocean renewable energy systems)

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