Day 1 Notes (Obtained from Climate Change: Carbon Capture and Storage Course by the University of Edinburgh)

- The Paris Climate Change Agreement has 2 long term goals:
    - Limit global average temperatures
    - Achieve neutral balance for carbon into atmosphere

1) What is the carbon budget?

A concept used in climate change politics to help set greenhouse gas emissions reduction targets in a fair and effective way. It is the largest amount of carbon dioxide that can be released into the atmosphere while still limiting global warming to a specific temperature.

2) Why does the 1.5- or 2-degree matter?

We are already at about 1.2 degrees Celsius. If we don't drastically cut emissions soon, we will exceed the 1.5 target by the early 2030s. It is important to limit global warming to 1.5 degrees to prevent the worst climate impacts. Reduce the number of extreme weather events. If it exceeds the target of 1.5 degrees the risk increases sharply, we will have increased heatwaves, faster and more irreversible sea level rise and a huge decline in crop yields.

3) How fast is the budget being used?

The current global emissions are about 40 gigatons per year. The remaining carbon budget is about 235 gigatons. At this rate the 1.5 carbon budget will be used up in 6 to 7 years if emissions stay constant. To not overshoot the 1.5-degree target, emissions must fall by 45% by 2030.

4) What is being done to shift away from fossil fuels?

- Increase clean energy investment
- Shifting away from fossil fuels by decreasing investments in coal and oil.
- Support developing countries by funding about 80-100 billion dollars by 2030.
- Develop clean technologies like hydrogen fuel and carbon capture

Research

- Climate scientist say there is only a fixed amount of carbon which the world can emit to support global warming below a certain temperature limit. It is known as the carbon budget.
- More carbon, temperature increases above target
- Less carbon, temperature to stay below target
- For 2 degree carbon budget, 2,900 gigaton of carbon dioxide.
- Already used up about 73% percent of this budget since 1870 and only have 27% left.
- That is less that a third left of the budget

Once 100% of the budget is used emissions to the atmosphere should go to zero. How should this be achieved?

- Many environmental organizations in the western world are advocating, that let's not use to fossil fuels and keep them in the ground.

But is this really feasible and ethical?

- Fossil fuels consist of coal, fuel and natural gases and provide over 80% of the worlds primary energy as in 2014
- 1.2 billion people do not have access to electricity today about 16% of the worlds population
- 38% of the worlds population do not have access to clean cooking facilities.

Accordingly, 2/3 of the development of carbon capture and storage technology will need to happen in developing countries by 2050

Towards net zero carbon emissions

- Investments in clean energy has increased by a significant 40% since 2020.
- Consideration like energy security, especially for countries relying on imported fuels and the pursuit of clean energy jobs have contributed to this upward trajectory.

IEA's NetZero Roadmap

- The IEA presents 3 climate scenarios – not predictions – that depends on policy decisions and climate uncertainties.
- All scenarios show rising temperatures until at least 2030.
- Delay in climate change makes it harder to reach net zero targets later.

Three scenarios to compare:

1) STEPS: State Policies Scenario

- Based on current laws and policies already in place
- Global temperatures rises:
    - +1.9 degrees by 2050
    - +2.4 degrees by 2100
- Fossil fuel use peaks by 2030 but still remains 73% of total energy by 2030
- Electricity becomes cleaner boyut changes too slow
- This scenario shows what will happen with existing plans

2) APS – Announced Pledges Scenario

- Assume that all countries keep their climate promises, including net zero goals
- Global temperatures rises:
    - +1.7 degrees by 2100, but still rises after that because CO2 emissions aren't fully zero.
- Fossil fuel demand drops but electricity use rises to 41% by 2050
- Electric transport and heating adoption speed up.
- Energy efficiency improves and total consumption peaks in late 2020s

3) NZE – Net zero emissions by 2050 scenario

- The main goal is to limit global warming to +1.4 degrees by 2100
- The target is to reach zero carbon emissions by 2050
- No temperature overshoot in this scenario

Key changes in the energy system

- Fossil fuel drops to 62% by 2030
- Electricity and energy use rises to >50% of total energy by 2050
- Mobility and heating needs rapid electrification

Core technologies enabling NZE

CCUS (carbon capture, utilization, and storage)

- Capture CO2 from sources
- Stores and reuses it safely

Green hydrogen and renewable and clean energy usage

Algae Carbon Capture – my project link:

- Acts as a bio based CCUS
- Removes Co2 and converts it into biomass
- Supports water purification alongside water purification