Economics of Climate Change

HS 232

Lecture 2 (3rd January 2025)

The science of climate change (Fundamental Knowledge)

We now have a much clearer picture of the past, present and future climate, which is essential for understanding where we are headed, what can be done, and how we can prepare," said Valerie Masson-Delmotte, Co-Chair of Working Group I.

Book : Climate Change Denial: Heads in the Sand (2011)
Haydn Washington and John Cook

What is climate change ?

- Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer).
- The definition means that climate change is not just about a single hot day or a rainy week—it involves long-term changes in the overall climate patterns of a region or the Earth as a whole.
- These changes could affect average conditions (like average temperatures) or the variability (like the frequency and intensity of extreme weather events).

Example of climate change

- Imagine a coastal city that has an average yearly temperature of 25°C for several decades. If over the next 50 years, the average yearly temperature increases to 27°C, that's an example of climate change.
- Additionally, if this city experiences more frequent and severe hurricanes during this period, that also reflects climate change, as the variability of extreme events has changed.
- Therefore, climate change captures both shifts in long-term averages (like higher temperatures) and changes in patterns of variability (like more frequent droughts or floods).

Climate change Vs climate variation

Summary

- **Climate variation** reflects natural and short-term changes in climate conditions.
- **Climate change** refers to long-term shifts that significantly alter the average climate over an extended period. Both phenomena are important to study, but climate change has more severe and lasting impacts on ecosystems, economies, and societies.

Timescale	Short-term (months to decades)	Long-term (decades to centuries or more)
Duration	Temporary fluctuations	Persistent and gradual shifts
Causes	Natural processes (e.g., ENSO, volcanic)	Human-induced (e.g., emissions) or natural long-term factors
Example	A cold winter due to La Niña	Global warming driven by greenhouse gases

What is the cause of climate change?

- Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (source: MOEF)
  - **Natural Internal Processes**: These are natural variations within the Earth's climate system.
    Example: The El Niño and La Niña phenomena, which cause periodic warming and cooling of the Pacific Ocean, leading to global weather changes.
  - **External Forcing**: These are changes due to external factors that influence the Earth's energy balance.
    Example: Volcanic eruptions releasing large amounts of ash and gases into the atmosphere, temporarily cooling the planet by reflecting sunlight. Another example is changes in solar radiation over thousands of years.

- **Anthropogenic (Human-Induced) Changes**: These are persistent changes caused by human activities.
  Example:
  - Burning fossil fuels (coal, oil, gas) increases greenhouse gases like CO2, trapping heat in the atmosphere and warming the planet.
  - Deforestation reduces the planet's capacity to absorb CO2, exacerbating global warming.
  - Urbanization changes land use, increasing heat retention in cities (urban heat island effect).
- **Combined Example:**
- In recent decades, the warming trend observed globally is primarily attributed to human activities (e.g., greenhouse gas emissions), combined with some natural variability like solar cycles or volcanic activity. However, the dominant driver is anthropogenic emissions, as supported by extensive scientific research.

When did we first hear about Climate Change

- Svante Arrhenius (1859-1927) - a Swedish scientist, was the first to claim in 1896 that **fossil fuel combustion may eventually result in enhanced global warming**. He proposed a relation between atmospheric carbon dioxide concentrations and temperature
- He claimed that human activities will have an impact on natural forces
- But there was no way to prove his claim – a radical claim

1930s …

- Guy Stuart Callendar – British Scientist - linked global warming to CO2 emissions – complied available global data (Europe) – rise in temperature and CO2 emission is linked!
- E.O. Hullbart – American physicist – also made a similar claim
- BUT,
  - these work went largely unnoticed at the time
  - we continued to ignore and focus on economic growth (burning fossil fuel)
- Since the 1930s science improved, made progress is proving that Climate Change is no longer a ‘radical claim’

Why it took time to act?

- Since 1930s to 1980s (50 years) : Nothing happened!
- US National Academy of Sciences wrote in 1979 *" if carbon di oxide continues to increase, there is no reason not to believe that climate change will happen, and these changes will not be negligible".*
- But several challenged the work of National Academy (not necessarily that they challenged the science behind CC but politics and ideology took the centre stage)
- E.g., Conservative scientist William Nierenberg (close ties with President Ronal Reagan – an advocate of free market)
- William Nierenberg claims that the "results of climate change will be negligible as people were highly adaptable and technological innovations which is flourishing under the free market will take care of any impact of climate change" (1983)

Climate Change Denial …1980s

- “The climate has been changing and why should I worry all of a sudden now”
- “Are we 100% sure that climate is changing”
- “Even if it is changing what role I have to play”
- “We do not have enough evidence to prove that all that is claimed is due to climate change”
- “these are natural variability – so BAU can continue

- There were several such questions leading to denial!
- Similar denial were seen during ozone hole, DDT and tobacco smoking!
- Unfortunately, scientists who believes that CC is happening, believed that it is someone else’s job to communicate science to the rest of us!

Skeptic Vs Denial

- Skeptic :
  - A seeker of truth, an inquirer who has not yet arrived at definite conclusions (Oxford English Dictionary)
  - Skepticism helps science to progress, helps in examining assumptions and conclusions
- Denial
  - Refusal to believe something no matter what the evidence
  - Demonstrate willful ignorance and have an unshakeable beliefs
  - Bulverism – a method of argument that avoids the need to prove that someone is wrong
    - “Climate scientists are just wrong; they are wrong because they are too liberal”

Why we need to worry about denial?

- Denial may lead to delays – as we see in the case of climate action
- Denial may lead to severe environmental damage
  - many species may go extinct
  - sea level rise
  - loss of life and livelihoods
- Meagre public response – social movements, public pressure on government to act
- Inequity and injustice – an impact of climate change


Questions?