

Unit 4. Conventional scientific approaches

Reading assignments

Date	Reading	Discussion/ presentations
Thursday, Mar. 3	Hansen, Climate Threat to the Planet (www.agu.org/webcast/fm08/presentations/bjerknes/)	Climate modeling
Tuesday, Feb. 22	Gordon, Engineering the Climate (Forward, 1-19, and 38-44)	Conservation of matter
Thursday, Feb. 24	Brown, ch. 5, Shifting to Renewable Energy	Conservation of energy

Learning objectives and assessments

1. Be familiar with basics of anthropogenic climate change (Hansen).
 - a) Describe how Hempel might respond to Hansen's statement "Global warming has implications for energy policy and intergenerational justice. The propriety of scientists discussing these implications is self-evident."
 - b) State the current concentration of CO₂ in the atmosphere (~390 ppm) and its rate of increase; for comparison, state typical rates of increase in the geological record.
 - c) State the magnitude (W/m²) of radiative forcing due to CO₂ doubling; for comparison, state the magnitude of forcing due to the 11-year solar cycle.
 - d) Explain how the fast-feedback climate sensitivity factor of "3/4°C per watt" is equivalent to "3°C for 2×CO₂".
 - e) Describe Hansen's Faustian Bargain.
 - f) Describe the "snowball" and "runaway" climate scenarios.
 - g) Describe Hansen's distinction between climate tipping level vs point of no return.
 - h) Explain why controlling CO₂ emissions from burning coal is more important and more feasible than from burning oil, according to Hansen.
 - i) Describe components of Hansen's vision of intergenerational conflict.
 - j) Explain Hansen's distinction between "soft" vs "extreme" geoengineering.
2. Be familiar with ideas behind climate engineering/geoengineering (Gordon).
 - a) Define climate engineering and the various acronyms associated with it (SRM, CDR, AC, CRM).
 - b) Explain why stratospheric injection is an SRM strategy.
 - c) Describe considerations likely to figure importantly into the eventual definition of a "climate emergency", according to the report.
3. Be familiar with Plan B strategies for shifting to renewable energy (Brown ch. 5).
 - a) Explain why wind is Plan B's centerpiece technology for the energy economy.
 - b) Describe reasons Brown disfavors nuclear and biofuel power as part of Plan B.
 - c) Explain the difference between electricity generation and thermal energy generation, and give examples of renewable technologies associated with each.

4. Be familiar with calculations relevant to energy and climate change (lecture).
 - a) Carry out climate modeling calculations based on radiative steady state.
 - b) Predict CO₂ emission amounts from given sources using emission factors.
 - c) Carry out thermochemical calculations for combustion reactions.
 - d) Carry out maximum efficiency calculations for power generators.