

Lab: Climate Change Solutions

(Created by C.Rush from Financial Times simulation "The Climate Game" with background from the EPA)

Background:

Covering about 70 percent of the Earth's surface, the world's oceans have a two-way relationship with weather and climate. The oceans influence the weather on local to global scales, while changes in climate can fundamentally alter many properties of the oceans. As greenhouse gases trap more energy from the sun, the oceans are absorbing more heat, resulting in an increase in sea surface temperatures and rising sea level. Changes in ocean temperatures and currents brought about by climate change will lead to alterations in climate patterns around the world. For example, warmer waters may promote the development of stronger storms in the tropics, which can cause property damage and loss of life. The impacts associated with sea level rise and stronger storm surges are especially relevant to coastal communities. Although the oceans help reduce climate change by storing large amounts of carbon dioxide, increasing levels of dissolved carbon are changing the chemistry of seawater and making it more acidic. Increased ocean acidity makes it more difficult for certain organisms, such as corals and shellfish, to build their skeletons and shells. These effects, in turn, could substantially alter the biodiversity and productivity of ocean ecosystems. Changes in ocean systems generally occur over much longer time periods than in the atmosphere, where storms can form and dissipate in a single day. Interactions between the oceans and atmosphere occur slowly over many months to years, and so does the movement of water within the oceans, including the mixing of deep and shallow waters. Thus, trends can persist for decades, centuries, or longer. For this reason, even if greenhouse gas emissions were stabilized tomorrow, it would take many more years—decades to centuries—for the oceans to adjust to changes in the atmosphere and the climate that have already occurred. (EPA, 2022)



Prelab Questions:

1. How does rising atmospheric temperature affect our oceans?
2. How does rising CO₂ levels affect our oceans?
3. Why will the effects of climate change on our oceans be felt for many decades into the future?

Play!

Play the simulation at <https://ig.ft.com/climate-game>. This game uses data from the International Energy Agency in 2022. You will make choices to mitigate the effects of climate change and keep warming to no more than 1.5 degrees Celsius. To do this, you need to cut energy-related carbon dioxide emissions to net zero by 2050. As reference, energy-related CO₂ emissions reached a record 36 billion tonnes in 2021. You must also deal with other greenhouse gases, and protect people and nature, for the planet to remain habitable.

The Choices You Make...

4. Which adviser did you choose and why?
5. What is the first award you won?
6. What is the first Climate Tipping Point to occur?

7. While this focus is on CO₂, CH₄ accounts for one-third of warming. Did you choose to deal with it now or later?

8. At the end of each round, assess your progress by recording your data in the table below.

(Helpful hint: read the remaining questions so you don't miss anything along the way)

	Change in CO ₂ emissions	Remaining CO ₂ decreases needed to reach net zero	Effort Points Spent	Effort Points Remaining
Round One (2022-2025)				
Round Two (2026-2030)				
Final Summary (2022-2050)				

9. What is the second Climate Tipping Point to occur?

10. In round three, which distribution of electricity sources (renewables/nuclear/fossils fuels) did you choose? Why?

11. What is the third Climate Tipping Point to occur?

End Game Analysis Questions

12. With your decisions, how much warming will take place by 2100?

13. Did you meet the goal of zero net CO₂ emissions?

14. Which awards did you win by the end of the game?

15. How many effort points did you *recover* from your choices?

16. How do effort points relate to real life? (What might they represent? Multiple answers are OK)

17. Of all the decisions you made, which one(s) do you feel are most obtainable?

18. Of all the decisions you made, which one(s) do you feel are least obtainable?

19. What do you think is the largest obstacle to achieving zero net CO₂ emissions?

20. What did you learn in this lab?