Climate Engineering Teaching Module
Lesson 4: Model U.N.

Grade Level: 6-12

Estimated Time for Activity: 100 minutes

Learning Outcomes and NGSS

	Content Knowledge	**Skills**
Expected Learning outcome	Socio-economic-political issues are very important to climate science and geoengineering decisions Climate change is a complex issue with no single answer. How could climate engineering fit into the overall landscape of ways to address climate change.	Students will practice applying their knowledge about climate change and climate engineering to formulate and defend the positions of their (fictional) countries. Students will practice the skill of negotiation under complex situations.
NGSS	**MS-ESS3-4 Earth and Human Activity**. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. **HS-ESS3-1 Earth and Human Activity**. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. **HS-ESS3-5.** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. **HS-ETS1-1 Engineering Design** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ETS1-3 Engineering Design**. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.	

Materials:

Printed copies of each country's information (which includes the public information and the classified information, fold to hide the classified information from other groups) – one per group member; printed copies of the document that contains all public information – one for everyone in the class; six blank pieces of paper and a marker to make placards for each group to place at their groups table;

name tags for everyone in the class which includes their country and their role. Copies of Worksheet #1 (one per group), of Worksheet #2 (multiple per group), and of Worksheet #3 (one per group).

Key Terms:

United Nations, negotiations, treaties

Background:

A model U.N. activity challenges the students to consider the social, economic, and political issues that arise regarding the deployment of climate engineering. In this version, the students roleplay as delegates from several countries taking part in a United Nations summit. These countries have various amounts of wealth, fossil fuel resources, renewable energy sources, and climate engineering technologies at their disposal. Each country also has their own ambitions regarding economic growth in the midst of climate change. The task at hand is to decide whether to deploy climate engineering technologies and to create treaties throughout the summit.

Activity – Model UN:

Background Statement (to be read to class)

The year is 2030. Climate change has been getting steadily worse, and nations around the world are feeling its effects. The Secretary General of the United Nations has called a summit to discuss whether the world should start a trial run of climate engineering. Representatives from six nations have traveled to the U.N. to begin negotiations. If they agree that deployment should start, it will begin in 2035, which is around the time global average temperature will be 1.5°C (nearly 3°F) warmer than in the preindustrial era.

Premise and Lesson Mechanics (first paragraph to be read to class)

The class should be divided into six groups (it may be desirable to keep groups similar to previous lessons). Each group is assigned a nation: Angosia, Durhan, Florin, Tanoa, Molvania, and Guilder. Each country will be given two paragraphs. The first paragraph is public information: the official reasons why they are coming to the U.N. summit and what they hope to accomplish. The second paragraph is "classified" information: this contains their hidden motivations for the summit. The "classified" information should not be shared with other groups.

To save time in class, it might be efficient to give each group their two paragraphs, as well as the public information paragraphs for all groups, to read for homework. Then they can come to the negotiations the next day, spend a few minutes planning within their groups, and will be ready to go. The negotiations are set to begin with an address to the U.N. by Tanoa. This can be flexible – another nation can make an address, or you can skip the addresses altogether.

Tips for Teachers:

1. Clarify the purpose of the U.N. and its Secretary General. Note that this summit is to decide whether to deploy climate engineering, and a decision will be made only if all countries agree. However, intermediate treaties will be created and could be carried out regardless of the final decision on climate engineering.

2. Clarify to students that they are role playing as representatives of their assigned country, even if their assigned positions/beliefs differ from their personal beliefs.
3. Refrain students from talking negatively about other countries.
4. Do not assign Tanoa to poor/disadvantaged students.
5. There is a lot of written text in this assignment. Prepare videos or audio recordings of the text being read aloud to help accommodate all students.
6. Collaborate with Social Studies teachers either to develop the lesson or host the lesson in their classrooms.
7. Feel free to have students change roles throughout the activity such that all students actively participate.

Prior to Negotiations:

- Read the background statement to the class
- Read the first paragraph of the "premise and lesson mechanics" section to the class.
- Hand out worksheets and public and private information
- [optional] Explain to Tanoa that they will need to make a short (1-2 minute) statement to the U.N. at the beginning of the negotiations. If they need guidance, you could keep it along the lines of an existential threat to the great nation of Tanoa that wasn't their fault, and they want to know what the other nations are going to do about it to take responsibility for their actions.

Scaffolding Ideas:

1. To further student preparation, have each student circle two of the most important secret facts from their country's private information. Then, compare with the rest of their group and agree together.
2. Using the public information, discuss within their groups which countries they view as potential allies or potential conflicts (Worksheet 1).
3. Within their group, discuss what bargaining/negotiating chips they have to drive negotiations and develop treaties. Examples - resources, money, pledging support (Worksheet 1).
4. Based on your country's information (both public and classified) decide whether climate engineering should be deployed and why. Frame this in terms of advantages or disadvantages for your country. If information that you need is not stated, you are encouraged to be creative and come up with that information yourselves. You may also decide whether the public information about you that is provided to other countries is truthful (Worksheet 1).
5. Define roles prior to initial negotiations (Worksheet 1).
    - President (1): Stays at the group's table and manages the diplomats, writing treaties, and science advisors
    - Diplomats (2-4): Engage in negotiations with delegates from other countries. This includes both diplomats that go to other tables, as well as one diplomat that stays at their table to receive other delegations.
    - Treaty Writer (1): Works with the President to collect information from their Diplomats and Diplomats from other countries to create written treaties. Treaties must be signed by each countries' President, treaty writer, and participating diplomats.
    - Science Advisor (1): Works with the President and Diplomats to assert relevant climate science and climate engineering knowledge into the ongoing negotiations.

Negotiations:
Negotiations will involve group members moving around to other groups and attempting to negotiate their positions. (It is very helpful to have name tags to identify countries and roles and group placards to identify the countries' tables.) At approximately 10-to-15-minute intervals, the instructor will provide news briefs to the U.N. ambassadors. These news briefs are designed to disrupt and sometimes change the course of the negotiations.

When the negotiation begins, diplomats, treaty writers, and science advisors will need to move around the room and discuss with other countries to persuade them to give you what you want. You may have to promise things in return. This process will be based on consensus decision making - unless everyone agrees on a course of action, nothing happens. You may develop multiple treaties with different countries (Worksheet 2). You should determine whether you want your treaty agreements to be verbal or in writing. If you want to break a treaty that is in writing, you will need a new treaty that says this. Treaties serve as additional positive outcomes from the U.N. summit, in addition to decisions being made on the implementation of climate engineering.

After each news brief, the countries should decide on new courses of action (Worksheet 3).

When the negotiations conclude, there should be a wrap-up discussion where the students talk about how their negotiations went, what information they learned in class that helped them, what sorts of arguments they made (e.g., ethics, identity politics), and what they learned.

Sample 100-minute lesson:

1. Read the background statement to the class, the first paragraph of the "premise and lesson mechanics", and other instruction (10 minutes)
2. Have one member of each group read their country's Public Information (10 min)
3. Plan your negotiations - Define individual roles within each group and define the group's goals (Worksheet 1, 15 min)
4. Introductory address to the U.N. by Tanoa (5 minutes)
5. Negotiations (15 minutes)
6. News brief (Each group fills out Worksheet 3)
7. Negotiations (10 minutes)
8. News brief (Each group fills out Worksheet 3)
9. Negotiations (10 minutes)
10. News brief (Each group fills out Worksheet 3)
11. Final negotiations (10 minutes)
12. Class discussion and wrap-up (15 minutes)

For each negotiation period, it may be useful to display a timer.

News briefs

1. Angosia's capital city is hit by a hurricane that caused widespread power outages and water shortages. Scientists conclude that this would not have happened in the absence of climate

change. The government of Angosia claims that fossil fuels are to blame and demands compensation from Florin because of its long history of fossil fuel use.

2. The Center for a Stronger Economy (a free-market think tank) in Guilder releases a statement that because of new manufacturing techniques developed by Guilder, Tanoa can be kept habitable and thriving for at least another 50 years.
3. Impatient with the slow pace of the negotiations, the Secretary of Energy of Durhan (who is not at the UN this week) announces that Molvania has been secretly helping them develop climate engineering technology. Durhan plans to deploy climate engineering in 2040, which he calls "A Durhanese Solution to a global problem", with or without support from the UN.
   (Note for instructor: This News Brief illustrates the difficulty of forming a consensus and that there is a possibility of a rogue actor implementing geoengineering. The students may be prompted to consider sanctions for Durhan, or, on the other hand Durhan can use this information as a threat in order to gain negotiating power.)

Questions to guide discussions at the end

1. Did you reach a final decision on climate engineering deployment? Did you reach any decisions?
2. How did your negotiations go? What happened? What were some treaties that you came up with?
3. Were there any common themes that came up?
4. How important were natural science and engineering in your discussions?
5. What did you learn?
6. Does this give you any ideas about things you can do to address climate change?

Additional discussion (optional): Do you think this is how actual U.N. negotiations work? Can use real-world examples of successes (the Montreal Protocol) and failures (most of the COP meetings). However, the recent COP27 (November 2022) did reach an agreement whereby a "Loss and Damage" fund will distribute monies to vulnerable nations.
Explore other role playing lessons and activities that delve into climate negotiations and carbon goals:
https://www.climateinteractive.org/
https://cmi.princeton.edu/resources/stabilization-wedges/the-wedges-game/

Worksheet #1: Planning your Negotiations

Country name: _____

Team members and roles:

President _____

Treaty Writer _____

Diplomats _____

_____

Science Advisor _____

Other(s) _____

Does your country want climate engineering? _____

What do you want from other countries?

_____

_____

_____

_____

_____

What might you be willing to give other countries?

_____

_____

_____

_____

_____

Which countries will you negotiate with first? _____

Worksheet #2: Treaties

Whereas, the following countries have entered into an agreement:

_____

_____

Whereas, the participating parties resolve to (state the general purpose of the treaty)

_____

_____

_____

Whereas, these principles shall be carried out via (include the details of the treaty here)

_____

_____

_____

_____

_____

_____

Signed (Name, Country, and Role (must include at least two Presidents' signatures))

Name _____ Country _____ Role _____

Name _____ Country _____ Role _____

Name _____ Country _____ Role _____

Name _____ Country _____ Role _____

Name _____ Country _____ Role _____

Name _____ Country _____ Role _____

Worksheet #3: News Briefs

Brief #1

What news brief did you just hear? _____

Do you believe that it's true/accurate? _____

How does this change your negotiations? _____

_____

_____

Who will you negotiate with next? _____

Brief #2

What news brief did you just hear? _____

Do you believe that it's true/accurate? _____

How does this change your negotiations? _____

_____

_____

Who will you negotiate with next? _____

Brief #3

What news brief did you just hear? _____

Do you believe that it's true/accurate? _____

How does this change your negotiations? _____

_____

_____

Who will you negotiate with next? _____

All Public Information

Angosia is a rising world power, largely because they have used fossil fuels to rapidly expand energy production. They are suffering from the effects of climate change but have repeatedly stated that economic growth is their highest priority, and through economic growth they will become more resilient to environmental changes. Thus far, climate change has been rather mild in Angosia, so their policy has worked. Angosia has recently invested in infrastructure projects at home and in Durhan as a way of building up protections against climate change. Angosia has made no public statement on climate engineering, preferring to "wait and see".

Durhan is one of the poorest countries in the world. They are suffering from climate change, and as a poor nation, there is not a lot they can do about it. All of the other rich nations got rich through use of fossil fuels, and Durhan believes it has the right to become wealthy quickly by doing the same. Durhan has great fossil fuel resources but doesn't have the infrastructure to mine them. Durhan believes that climate engineering is necessary to rapidly reduce the effects of climate change in their country, but they are distrustful of other rich nations deploying it, because those nations have a long history of exploiting Durhan.

A long-time world power, **Florin** is one of the wealthiest nations in the world. It is also the heaviest user of fossil fuels in the world and thus is one of the most responsible for climate change. Although renewable energy has been on the rise in Florin, the nation's energy consumption is so great that it needs fossil fuels to maintain its citizens' quality of life. Florin is publicly opposed to climate engineering because it will cause winners and losers among the nations of the world, and the poorest nations are already having a hard enough time with climate change.

Tanoa is a small island state that has some wealth due to tourism and being a refueling port for trans-oceanic shipping. Tanoa sits at sea level, and due to sea level rise and worsening waves from storms, the island will be uninhabitable within 20 years. Tanoa views climate engineering as the only way of rapidly reducing climate change and saving their nation.

Molvania is rich with fossil fuels, and its economy would collapse without them. As a country in the far North, Molvania's government has long been saying that Molvania is too cold, and it will benefit from climate change due to more shipping lanes, more areas for growing food, and more jobs for mining because less ground is frozen. Molvania is arriving at the negotiations in the middle of an unprecedented heat wave that has killed at least 50 people. Molvania opposes climate engineering, arguing that we need to spend more time understanding its benefits and risks.

Guilder is a world superpower. Guilder gained much of its wealth from fossil fuels and is suffering from climate change like the rest of the world. The nation has made it their mission to lead the world in renewable energy and has already become nearly carbon neutral. Guilder is opposed to climate engineering on moral grounds and prefers more "natural" solutions that actually address the problem of climate change.

Angosia

Public Information:
Angosia is a rising world power, largely because they have used fossil fuels to rapidly expand energy production. They are suffering from the effects of climate change but have repeatedly stated that economic growth is their highest priority, and through economic growth they will become more resilient to environmental changes. Thus far, climate change has been rather mild in Angosia, so their policy has worked. Angosia has recently invested in infrastructure projects at home and in Durhan as a way of building up protections against climate change. Angosia has made no public statement on climate engineering, preferring to "wait and see".

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Classified Information:
Angosia is developing its own renewable energy technologies but is about ten years behind Guilder (who is already leading the way in renewable energy). If they delay a switch away from fossil fuels, they can become a superpower in renewable energy, which will grow their economy. Angosia has recently invested a lot of money in Durhan. They claim it is to improve the lives of the Durhanese, but it's actually to gain access to Durhan's large fossil fuel reserves. An immediate switch over to green energy would mean those investments were wasted. Angosia is in favor of climate engineering, because they see it as a way to reduce climate change and also buy more time to develop their renewable energy technologies. They do not want to take the political risk of being the first to develop and deploy climate engineering, but they will support other countries who want to do it.

Durhan

Public information:
Durhan is one of the poorest countries in the world. They are suffering from climate change, and as a poor nation, there is not a lot they can do about it. All of the other rich nations got rich through use of fossil fuels, and Durhan believes it has the right to become wealthy quickly by doing the same. Durhan has great fossil fuel resources but doesn't have the infrastructure to mine them. Durhan believes that climate engineering is necessary to rapidly reduce the effects of climate change in their country, but they are distrustful of other rich nations deploying it, because those nations have a long history of exploiting Durhan.

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Classified information:
The Durhan government has not been doing a good job to address climate change and increase wealth in their nation, and the Durhanese people are frustrated, so the government is desperate. Angosia has recently spent a great deal of money and resources in Durhan to improve quality of life for the citizens and to help develop fossil fuel resources (giving a portion of the proceeds to the Durhan government), and the government is worried it is losing control of its own country. Durhan desperately wants a home-grown solution to improving wealth and quality of life for its citizens, which would help them reduce the influence of Angosia. The Durhan government believes that a rapid switch to renewable energy would solve all of their problems. Durhan is secretly developing their own expertise in climate engineering with Molvania's help in exchange for some of their fossil fuel resources. They think that climate engineering would be a rapid way of reducing climate change effects in Durhan, buying them time to implement their plans for more renewable energy.

Florin

Public information:
A long-time world power, Florin is one of the wealthiest nations in the world. It is also the heaviest user of fossil fuels in the world and thus is one of the most responsible for climate change. Although renewable energy has been on the rise in Florin, the nation's energy consumption is so great that it needs fossil fuels to maintain its citizens' quality of life. Florin is publicly opposed to climate engineering because it will cause winners and losers among the nations of the world, and the poorest nations are already having a hard enough time with climate change.

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Classified information:
Although Florin has long been a world power, it is losing its innovative edge and is being rapidly passed up by other nations, especially Angosia and Guilder. This problem is made worse by climate change, which is causing more and more damage in Florin. Florin wants to continue using fossil fuels because they are the surest way to maintain its wealth. However, Florin's fossil fuel reserves have been drying up, and they have had to rely more on imports from Molvania, with which they have a strained relationship. Florin needs a solution that will allow it to maintain economic strength, and they are open to all options. Florin is secretly in favor of climate engineering because it will allow them to keep climate change down while continuing to use fossil fuels, at least in the short term. But, they don't want to be the first ones to deploy climate engineering.

Tanoa

Public information:
Tanoa is a small island state that has some wealth due to tourism and being a refueling port for trans-oceanic shipping. Tanoa sits at sea level, and due to sea level rise and worsening waves from storms, the island will be uninhabitable within 20 years. Tanoa views climate engineering as the only way of rapidly reducing climate change and saving their nation.

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Classified information:
Although Tanoa has come to the table for a climate negotiation, they understand that nothing can be done to reverse sea level rise in such a short time period. They will have to abandon their island, and the Tanoan government believes that the rich nations which have caused climate change should pay Tanoa compensation for losing their homes. Tanoa and Guilder have negotiated privately: if Guilder can convince the world to rapidly switch over to renewable energy, Guilder will pay Tanoa the compensation they want. Tanoa doesn’t actually care about climate engineering one way or the other but will use it as a bargaining chip in negotiations if they need to.

Molvania

Public information:
Molvania is rich with fossil fuels, and its economy would collapse without them. As a country in the far North, Molvania's government has long been saying that Molvania is too cold, and it will benefit from climate change due to more shipping lanes, more areas for growing food, and more jobs for mining because less ground is frozen. Molvania is arriving at the negotiations in the middle of an unprecedented heat wave that has killed at least 50 people. Molvania opposes climate engineering, arguing that we need to spend more time understanding its benefits and risks.

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Classified information:
Molvania is suffering the effects of climate change like many other nations, including extreme heat waves and more droughts/floods. The Molvania government needs a solution to climate change that does not negatively impact the economy and does not reveal that Molvania has been lying to its citizens about the benefits of climate change. A rapid switch from fossil fuels to renewable energy would crash the Molvanian economy. In recent years, Molvania has been exporting fossil fuels to Florin and plans to use that relationship to influence Florin to vote for increased fossil fuels. Molvania has a complicated opinion about climate engineering. On the one hand, it would make the planet colder, which would reverse all of the "benefits" of climate change. On the other hand, it would allow the world to continue using fossil fuels, which would benefit Molvania's economy. The Molvanian government is hoping that another nation proposes using climate engineering so that they can publicly oppose it but secretly support it. This is why Molvania is secretly funding climate engineering research in Durhan.

Guilder

Public information:
Guilder is a world superpower. Guilder gained much of its wealth from fossil fuels and is suffering from climate change like the rest of the world. The nation has made it their mission to lead the world in renewable energy and has already become nearly carbon neutral. Guilder is opposed to climate engineering on moral grounds and prefers more “natural” solutions that actually address the problem of climate change.

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Classified information:
Guilder is leading renewable energy because they and their allies are suffering from climate change, so switching away from fossil fuels is the right thing to do. But also, as the main marketer of renewable energy technologies, Guilder will make a lot of money if the world switches away from fossil fuels. Guilder has staked its future on the success of renewable energy, and if the world doesn’t completely switch over to renewable energy within the next 10 years, Guilder will likely plunge into a recession. Tanoa and Guilder have privately agreed that if the world rapidly switches over to renewable energy, Guilder will pay Tanoa compensation for damages caused by climate change. In reality, Guilder cannot afford to pay Tanoa everything that they want, and will thus need other nations to chip in. Climate engineering would delay the need to rapidly move toward renewable energy, which is why Guilder is opposed to it.