

Unit 1

Thermodynamics in Earth's Systems

How can we slow the flow of energy on Earth
to protect vulnerable coastal communities?

STUDENT WORKBOOK

SAMPLE



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Name: _____

Date: _____

Initial Model

Question 1 Where do you think the water is coming from to cause sea level rise all around the world?

Question 2 How do you think the water that causes sea level rise gets to the ocean?

Question 3 Draw a model that explains why the sea level is rising all around the world.

Make sure your model includes:

- different components (parts), including ocean water
- lines, arrows, or other symbols to show relationships between different components
- a key that shows what any colors or symbols mean

Question 4 Draw a model to show what you think is happening at the *particle level* to cause the sea level to rise. Make sure your model shows any changes or flows of matter (particles) and energy.

Question 5 Explain why you included the components in your models that you did.

SAMPLE

Name: _____

Date: _____

Transcript: Biloxi-Chitimacha-Choctaw

We are about 60 miles south of New Orleans on the Louisiana Gulf Coast. We are about the last piece of land before you get to the Gulf of Mexico. Since 1950 we've had about a 98% land loss. The island is eroding away, and within a couple more years they won't have nothing left. If we have a major storm and the road gets knocked out that's it. At the peak of our tribe probably somewhere in the neighborhood between 300 and 350, now we probably have like 75 people living here, we have like 25 homes. Starting in 2000 we've had repeat blows of hurricanes. In 2002 we had Lily and Isadore, 2005 we had Katrina and Rita, 2008 we had Gustav and Ike, 2012, eleven-twelve, we had hurricane Lee.

When a hurricane comes most of the island is covered. If it tops the levee the houses that are on the ground will get flooded. On any given southeast wind day the road, the one road in and out of this community, will be flooded. So people can't go to work, people can't go to school, emergency vehicles can't come in and out. The resettlement is takin' the community from over here, in uh, an environmentally unsound area, to move them to a sound area where we don't have to worry too much about the hurricanes or high tide or anything.

The point of the resettlement is to not only bring the island residents into safety but all the other community members that left, back together, so we can have that cohesive tribe again and have that continuity from generation to generation. And that's the reason why we wanted a big enough piece of land to where everybody can come and enjoy the new community and say that we live on the island again. We're planning on a culture center, and a museum, and uh planning on having a little store, like, like a little store, a church.

We're looking to have low energy using homes so doing the best building codes we can use. We're looking at solar, we're looking at horizontal and vertical turbines. We planned what we want to do in the new community so that we can have what we have over here, but when you're going to leave from here your sister is going to be next to you, the nephews and nieces are going to be next to you, everybody's going to be there together.

The water is our life and our death so the bayou, whereas this bayou brought life and brought food, and allowed for transportation and ways of life, it also brought our death. We live by the water, we die by the water, our ancestors knew how to balance that, and I think the closer we get back to our ancestors the more we can bring that back. Our people are used to moving and adapting, so we're hopeful that we can take what we've learned here, and the roots we set here, and bring those and grow deeper roots and more roots in the northern part of the parish.

Congratulations to the Isle De Jean Charles Band of Biloxi Chitimacha-Choctaw tribe. The first place winner of the 2017 Gulf Guardian Award in the environmental justice cultural diversity category.

Name: _____

Date: _____

Transcript: Rising Sea Levels in Sierra Leone

My country is beautiful with breathtaking mountain ranges, deep valleys, and low-lying coastal areas. But over the last 15 years, I have witnessed the escalating trails of destruction left in the wake of floods, rising sea, landslides, and more. We have always experienced moderate temperatures, heavy rain falls, and high humidity, and we used to have two equally marked seasons - dry and rainy.

When I was young the rainy season kept us cool enough to play football and the rains nourished agricultural production where indigenous crops thrived. But as climate change has intensified, more frequent and prolonged dry spells have threatened our food security. Due to rising sea levels, flooding now occurs here yearly and is far more severe. Floods contaminate our drinking waters, spreading sickness, and disease. People living in disaster prone areas are constantly worrying about their homes being destroyed. Mudslides that damage buildings and infrastructure are now common. In 2017 nearly 1,000 people were killed and over 3,000 were displaced in our overcrowded capital, Freetown. Least developed countries face the largest damages from climate change proportionally to the size of our economies, and face financial losses of hundreds of billions each year.

The impact of climate injustice severely affects people's lives. We urgently need nations across the world, particularly the richest nations whose heavy emissions have caused this damage to take leadership and provide dedicated financial support to address the far reaching loss and damage caused by climate change.

SAMPLE

Name: _____

Date: _____

Transcript: Rufisque

In Senegal, the ocean is encroaching 1.6m a year. Rufisque is one of the most affected areas. There is a huge change here. Before we were born, there used to be a port and neighborhoods here. Our mothers tell us there were trees at the back. Many houses were destroyed by the encroachment of the sea. This is reality because we have always lived by the encroachment of the sea. As proof, where we are, much of the neighborhood is in the sea. There were mosques, football fields. But as you can see, the sea is now right next to us. So, we can say that it is an impact of the encroachment of the sea.

This is a reality that we have been living since the 1980s. As a state employee of this department, and in many subdivision programs led by the city and the state, plots were reserved for those who lived near the sea, because they were already suffering from coastal erosion. In Senegal, 52% live in coastal areas. As elsewhere, the coastal areas are a source of livelihood. Appropriate and concerted responses must be implemented in order to tackle the challenges faced by coastal populations.

SAMPLE

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Date: _____

Data Analysis

Possible Cause	How does this phenomenon cause increased temperatures?	TIMESCALE OF CHANGE Did it change at the right time to cause recent temperature increases? Explain.	PROPORTION OF CHANGE Did it change in the right way (direction/rate) to cause recent temperature increases? Explain.
Orbital changes (Milankovitch cycles)			
Volcanic activity			
Solar activity			
Carbon dioxide			

Complete the argument: I think _____ is the most likely cause of current temperature increases/polar ice melt/sea level rise, because the data show

Explain how changes you saw in the data tell you the most likely cause. Use space on the back if needed.