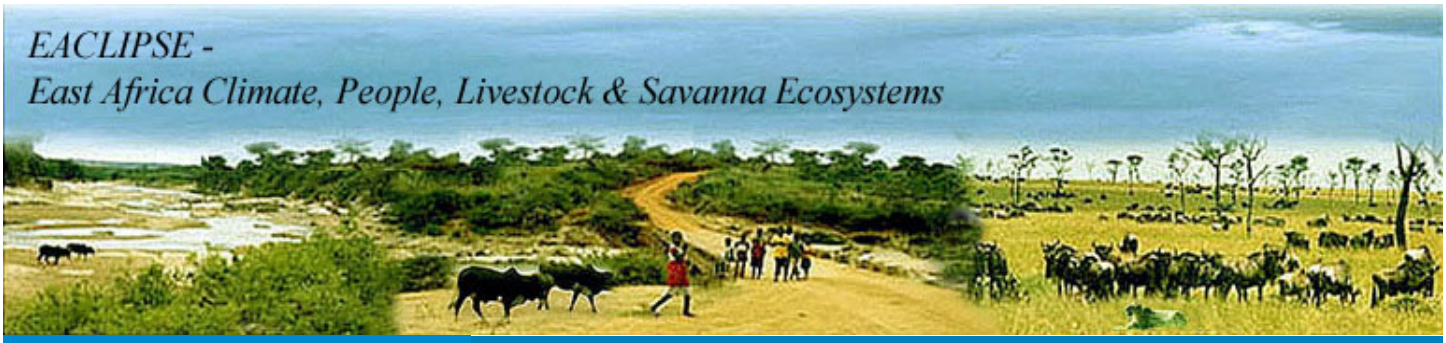

Adapting to Climate Change in the East African Savanna

Time:
Two to three 50-minute lessons

Summary:
In this lesson, students will examine how people might adapt to climate change in the East African savanna.

Materials:
Water scarcity role play materials
- Blank name tags
- Large circles of blue construction paper
- Role play scenario cards

Student handout
- Adapting to Climate Change

Objectives

Students will be able to
- identify factors that affect people's ability to adapt to climate change
- discuss strategies people use to adapt to climate change in the savanna

Background

Researching how people adapt to climate change is an important piece of understanding the savanna human-land-climate system. In the EACLIPSE project, researchers are collecting data on how people living in the East African savanna are adapting to changes in their local environment. People may adapt by changing their livelihoods, how they manage their land, or where they choose to live. As we saw in the previous lesson, how people adapt is affected by environmental, social-cultural, political, and economic factors. In this lesson, students will participate in a role play to better understand water scarcity in the savanna and they will examine strategies people may use to adapt to climate change.

Vocabulary

Adaptation
Scarcity

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Procedure

1. Activate students' prior knowledge with a brief discussion:
According to the research for the EACLIPSE project, the savanna is projected to get higher temperatures and less rainfall.

- What are the consequences of these changes to the savanna ecosystem?
- How do these changes affect the people who live there?

In this lesson, we will look at how people may adapt to these changes.

2. Do the Water Scarcity Role Play

Prepare ahead of time:

1. Label enough name tags for every student—half will say "herder" and half will say "farmer".

2. Make tokens to represent access to water (e.g. large circles of blue construction paper).

3. Half of your class will be herders and half will be farmers. Have enough water tokens so that you have ***less than*** *one for every 5 herders and* ***less than*** *one for every 2 farmers. For example, if you have 30 students, 15 will be herders, so you will need 2 water symbols for the herders; 15 will be farmers so you will need 7 water symbols for the farmers, giving you a total of 9 water tokens for 30 students.*

4. Print out the Role Play Scenario Cards and cut them apart. (They can be glued to index cards to make them more durable.)

Begin the role play:

Imagine you live in the East African savanna. Some of you are farmers and some of you are herders. Because of the rise in temperature and the decreased rainfall, water is becoming scarce.

Assign half of the class to be herders (give them each a "herder" name tag).

Assign half of the class to be farmers (give them each a "farmer" name tag).

Spread the water tokens around the classroom or on the ground in an open area (preferable).

Tell the farmers that at most 2 farmers can share a water source without it drying up.

Tell the herders that at most 5 herders can share a water source.

Tell students that for the role play, farmers and herders cannot share a water source.

Have students try to go to the water sources and make sure everybody gets access to water (there won't be enough water tokens). *Before sending students to look for water sources, establish safety guidelines: walk to water sources; no physical contact with other students; remind students that this is a role play—not a game that anyone will win.*

When they have finished, find out how many herders got to water, how many farmers got to water, and how many were left without water. Make sure that no farmers and herders are sharing water sources.

Ask students why they think you can have more herders at a water source (crops require more rainfall that livestock and will need to be in places with more water).

If farmers got to water sources first, there will be many herders without water. Have farmers raise their hands. Have herders raise their hands.

Have students look at how many herders got water and how many farmers got water. Ask students if there is a way to get more people access to water. If the farmers (2) leave that water source, more herders (5) can take their place. (This is not an accurate numeric representation, but shows how agriculture requires land with greater rainfall than grazing.) Have students try to get as many people as possible to water sources.

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For each student that is not at a water source, hand them a scenario card (some are for farmers, some for herders) and have them read it out loud to the class and follow the instructions on the card. If there are still cards left, but no more students without water, tell one (or more) group(s) that due to a drought, their water source dried up. If you run out of herder cards, adapt a farmer card, and vice versa. If you run out of cards altogether, challenge the class to come up with another adaptation to let them join a group by using less water or to leave the savanna.

3. After completing the role play, have each group (farmers and herders) discuss what they could do to adapt to the shortage of water in the savanna and share their ideas with the class.

Extension: As a follow-up to this activity, students can play an interactive online game that models long-term herder and farmer land-use interactions, available from the CLIP project website at http://clip.robotastronaut.com.

4. Review what students learned in previous lessons.

Ask students to remember the effects of climate change in the savanna human-land-climate system. Prompt them by asking questions about the different kinds of changes listed below, for instance, what kind of changes will there be in the vegetation? As they give answers, provide them the additional information in each section.

Changes in vegetation: Less palatable grasses for livestock, more drought-resistant species, possible bush encroachment (drought-resistant, unpalatable bushes taking over where grassland used to be), less ground cover, more fragile soil, less ability to recover from drought, could possibly lead to desertification.

Changes in livelihood: Herders may have smaller herds, less income, may need to add other economic activities, may change to farming, may share resources with other family members, may look for jobs in the area or elsewhere. Farmers may have to diversify, may try different crops, may look for jobs to supplement income. People may begin small businesses or engage in trade. People may look for work in the tourist industry, as drivers, guides, working in hotels and restaurants, providing cultural tours, or making crafts for tourists.

Changes in land use: Herding patterns may change, may need greater area for livestock to graze, may increase farming, switch to different crops, farm in different areas, convert new land to farmland (removing vegetation). People may cut firewood to sell and to make charcoal.

Grazing, herd size and composition: Herders may require greater areas, may change herd composition (more drought-resistant species such as goats, sheep, and camels— perhaps more destructive to ecosystem), may have smaller herds.

Migration: People may begin to leave the area when they are unable to make a living farming or herding, and cannot find other sources of income.

Crop choice: Farmers may choose more drought-resistant species like sorghum or millet, may move maize production to areas with greater rainfall. Farmers may plant higher-value crops to try to make more money on less land.

Social-cultural effects: traditionally nomadic herders may lose traditional lifestyle and settle in farming and urban communities. Families may invest more in educating their children in the hope that they will get jobs outside of herding and farming. Population may change due to migration.

5. Do the Adapting to Climate Change student activity.

Tell students: People make decisions about how they will adapt to environmental change. Their decisions are limited by social-cultural, political, and economic factors. You are going to look as some scenarios of how people may adapt to climate change. For each scenario, you will choose the one you think is most likely, and then list one obstacle (social-cultural, political, or economic) you think they might face if they make that change.

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Have students complete the Adapting to Climate Change in the East African Savanna sheet.

Discuss their answers and the obstacles they anticipated.

6. Using the possible obstacles they identified, make a list on the board of factors that affect people's ability to adapt. These could include:

Social-cultural:

- What do people consider important?
- What do they know how to do?
- What level of education do they have?

Economic:

- How much money do people have to invest in new opportunities?
- What access do they have to different resources?
- Are loans available?
- Are there jobs in the area?

Political:

- What options are supported by government policy?
- Do people have control over the land they use?
- Who makes decisions about land use?

7. Share the EACLIPSE research questions related to livelihoods with the class:

How are people adapting their livelihood systems in response to climate change?

- How do herders and farmers adapt to drought and climate change?
- Is there a difference in how people of different social or economic status adapt?
- What makes people more vulnerable or more able to cope with drought?

8. Discuss the EACLIPSE Research:

Researchers are finding this information by interviewing people, having them draw maps of their community, and gathering information on the different levels of social and economic status in their society in order to get a clear idea of the kinds of resources people have, and how people with different levels of access to resources will be able to adapt to climate change.

According to the EACLIPSE data collected so far, here are some of the drought coping strategies they have found:

Herders communicate with one another and coordinate where different clans will graze depending on what areas of the savanna have better vegetation for grazing during a particular season.

Herders sell off livestock for cash and decrease the size of their herds. When they have money, they tend to increase the size of the herd again.

Herders change the composition of their herds, increasing the number of animals that are drought-tolerant, such as goats, sheep, and camels.

Some farmers have access to water to irrigate higher-value crops, like vegetables, and are able to increase their income that way.

People hunt to supplement their diet.

One or more family members get a job locally or move to a larger city and send money home to help the family. Jobs may include working in the tourist industry, working in the mining industry, or working as a teacher or for a government institution.

People engage in other income-generating activities, such as trading, selling charcoal and firewood, buying and selling gemstones, or starting small businesses (tourist stands, restaurants, hotels, stores).

People who diversify (have many different sources of income) do better. If you have livestock, farmland, and a small business, such as a tourist stand selling animal carvings to tourist, you are likely to do better than if you only have one source of income. If you have several sources of income, one can fail, and you can still get by.

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Families educate some or all of their children in the hope that they will be able to get better jobs and help support the family.

In some instances, the government provides assistance during droughts.

9. Conclusion: Effect of government policies

Adaptations to climate change depend on people's social-cultural background (what is important to them; what they are accustomed to), their access to resources (economics), and the political situation where they live (who controls resources, who makes decisions, how government policies affect them). Government policies can affect how people adapt and whether they are able to continue to live in the savanna ecosystem. In Lesson 8, you will take part in an international stakeholder's conference to discuss policies and make decisions that will affect how people adapt to climate change.

10. Return to Lesson 1 and do the student activity before moving on to Lesson 8 (or to conclude the unit if you do not plan to teach Lesson 8).

Assessment

- Were students able to identify factors that affect people's ability to adapt to climate change?
- Were students able to discuss strategies people use to adapt to climate change in the savanna?

Web Resources

Teachers and students can directly access the project websites:

- EACLIPSE (East Africa Climate, People, Livestock & Savanna Ecosystems) www.eaclipse.msu.edu
- CLIP (Climate Land Interaction Project) www.clip.msu.edu
- LUCID (Land-Use Change, Impacts, and Dynamics) www.lucideastafrica.org

East Africa:
Kenya E-Book www.clip.msu.edu.
Exploring Africa http:/exploringafrica.matrix.msu.edu.

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Adapting to Climate Change in the East African Savanna

How do you predict people will adapt to climate change? Circle the scenario(s) you would find most likely in each case. Make a note of what obstacles people might face in each scenario you choose.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Obstacles
Herding	Herders will continue to herd cattle as they always have	Herders will change to farming	Herders will change where they graze	Herders will change what kinds of animals they have	
Farming	Farmers will plant maize as usual	Farmers will change to other crops	Farmers will farm in new locations	Farmers will leave the savanna	
Livelihood	Livelihoods will stay the same	People will try to earn money from herding and farming combined	People will try to supplement their income with some outside work	People will look for jobs outside of farming and herding	
Number of livestock	Herders will keep the same number of livestock	Herders will get more livestock	Herders will reduce the number of livestock	Herders will get more drought-resistant livestock	
Types of livestock	Herders will keep the same number of cattle, goats, and sheep	Herders will decrease the number of cattle and increase the number of goats and sheep	Herders will try a mix of livestock, adding new drought-resistant species like camels	Herders will replace cattle with drought-resistant livestock like camels	
Migration	People who are in the savanna will stay there	More herders will move into the area	More farmers will move into the area	People will move out of the savanna to look for jobs	

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Water Scarcity Role Play Scenario Cards

Herder You bought livestock that are resistant to drought. Your camels need less water, so you can go to a water source where there are already 5 herders.	Farmer You planted drought resistant crops. Your sorghum and millet need less water, so you can go to a water source where there are already 2 farmers.
Herder You sold part of your herd and used the money to start a small business selling crafts to tourists. Your small herd uses less water, so you can go to a water source where there are already 5 herders.	Farmer You began to grow vegetables on a small irrigated plot of land, but used less cropland overall, while making more money for your family. You can go to a water source where there are already 2 farmers.
Herder You sold your herd and got a job in town as a taxi driver to help support your family. You can go to a water source where there are already 5 herders.	Farmer You moved out of the savanna to an area where you can still grow rain-fed maize. You don't need a water source on the savanna.
Herder You moved to the city where you are working as a security guard, and now you send money home to your family every month. You do not need a water source on the savanna.	Farmer You stopped farming and got a job as a guide in a national park. You can go to a water source where there are already 2 farmers.
Herder You coordinated with other members of your clan where the drought is less bad, and you took your cattle there to graze. You do not need a water source in this area.	Farmer You went into trading, buying and selling household goods and cell phones. You can go to a water source where there are already 2 farmers.

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