



Time:

Two 50-minute periods

Summary:

In this lesson, students will learn about the complexities of climate change by examining the human-land-climate interactions in the East African savanna.

Materials:

- Computer with internet access
 - Digital Projector
 - PowerPoint presentation: Introduction to Climate Change in the East African Savanna
- Student handouts and answer sheets:
- Human-Land-Climate System Loop
 - Human-Land-Climate Interactions
 - Savanna Human-Land-Climate System Loop Example
 - Reflection Questions

Introduction to Climate Change in East Africa

Objectives

Students will be able to

- describe human-land-climate interactions in the East African savanna.
- make predictions about how changes in one part of the system could affect the other parts of the system.

Background

There is evidence of climate change in the East African savanna. Average temperatures have been rising and rainfall has been decreasing while also becoming less predictable. Climate change is caused by global factors, such as rises in greenhouse gases, as well as local factors, such as how land is used. People adapt to changes in the local ecosystem in different ways, including how they use the land, which in turn may affect the climate. In the EACLIPSE project, researchers use a systems diagram to model the human-land-climate interactions so they can better understand the relationships and make more accurate predictions.

Vocabulary

Ecosystem
Savanna
Greenhouse gases
Drought
Livestock

Introduction to Climate Change in East Africa

Procedure

Part 1

1. Begin with a brief discussion with students to activate their prior knowledge.

- What do you know about climate change?
- What do you know about savanna ecosystems?
- How do you think climate change might affect a savanna ecosystem?

2. Begin PowerPoint Presentation Part 1.

If you are only teaching Part 1 at this time, you will stop at Slide #18 in the presentation.

Part 1 will serve as an introduction to the science lessons. Discuss with students what they learned from the presentation, and answer any questions they may have.

If you will be teaching the Science Module, go ahead to Lesson 2. You will return to Part 2 of Lesson 1 at the end of the Science Module.

Part 2

3. Pass out copies of the blank version of the savanna human-land-climate diagram to students.

4. Begin PowerPoint Presentation Part 2.

The presentation will give students the background information they need to understand the diagram and to fill in each section as it is explained in the presentation. The completed version of the diagram can be used by the teacher as an answer key or passed out to students after they have completed their diagrams.

5. Pass out copies of the Human-Land-Climate Interactions sheet to students.

Students can use the savanna human-land-climate diagram to predict which parts of the system might be affected by the following changes:

1. Global levels of green house gases cause a rise in temperature
2. More farmers begin to move into the area
3. The grass species that cows prefer stop growing in the savanna
4. People begin to cut down trees to make charcoal to sell

Have students share their predictions and discuss how they predicted what might happen. As they discuss the effects, help them correct their

Notes

Note: This lesson provides the necessary background for all of the other lessons in this unit. The lesson is in two parts. Part 1 introduces climate change in the East African savanna and the EACLIPSE research project. Part 2 goes into greater detail about the effects of climate change on savanna vegetation, livelihoods, and land management.

There are five options for using this curriculum:

1. Teach only Lesson 1

2. Teach Lesson 1 and the Science Module (Lessons 2-5)

Teach Part 1 of Lesson 1 at this time and return to finish Part 2 of the lesson at the end of the science module.

3. Teach Lesson 1 and two lessons of the Social Studies Module (Lessons 6-7)

Teach Part 1 and Part 2 of Lesson 1 at this time, except for the final student activity which you will come back to at the end of Lesson 7.

4. Teach Lesson 1 and the entire Social Studies Module (Lessons 6-8)

Teach Part 1 and Part 2 of Lesson 1 at this time, except for the final student activity which you will come back to at the end of Lesson 7. Then return to Lesson 8 to complete the Social Studies Module.

5. Teach the entire integrated unit (Lessons 1-8)

Teach Part 1 of Lesson 1 at this time, teach the Science Module, then teach Part 2 of Lesson 1, except for the final student activity which you will come back to at the end of Lesson. Then return to Lesson 8 to complete the Social Studies Module.

Introduction to Climate Change in East Africa

predictions as needed. Ask students: is this what you would have predicted before you learned this material? Why or why not? What is different from what you expected?

6. Pass out copies of the Savanna Human-Land-Climate System Loop Example sheet to students. Lead students through a full cycle of the system, using the example of climate change leading to decreased rainfall. The teacher answer key suggests possible outcomes (and can be displayed or passed out at the end of the discussion). At each point in the cycle, have students try to fill in the information themselves (individually, in groups, or in a class discussion). After they have given and discussed their suggestions, provide the answers and have them complete that part of the cycle.

If you are teaching the Social Studies Module, stop here and go to Lesson 6. You will return to finish the student activity at the end of the Social Studies Module.

7. Hand out copies of the Reflection sheet to students.

This can be a class discussion or as a written assignment.

The reflection is intended to help students connect what they have learned to broader understandings about climate change.

Reflection questions:

- How does the environment affect people?
- How do people affect the environment?
- Why is it important to understand the relationships between the different parts of the system?
- How can understanding the human-land-climate system help people make decisions about livelihood systems and land management?

Assessment

- Were students able to predict the effects of changes in the system on the Human-Land-Climate Interactions sheet?
- Were students able to explain human-environment interactions in the Savanna Human-Land-Climate System Loop Example?
- Were students able to explain the relevance of studying climate change in a specific environment in their answers to the Reflection questions?

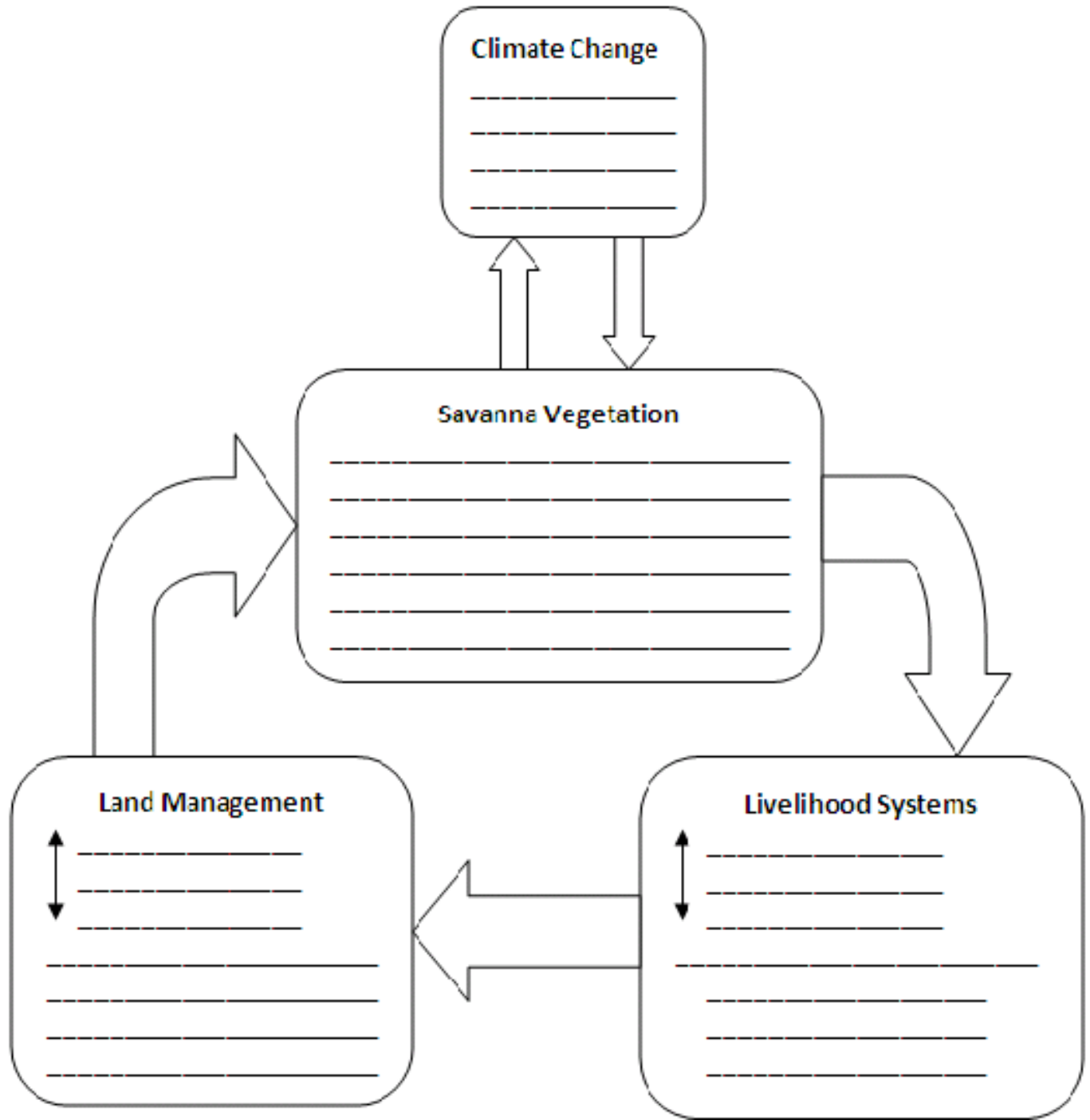
Web Resources

Teachers and students can directly access the project websites:

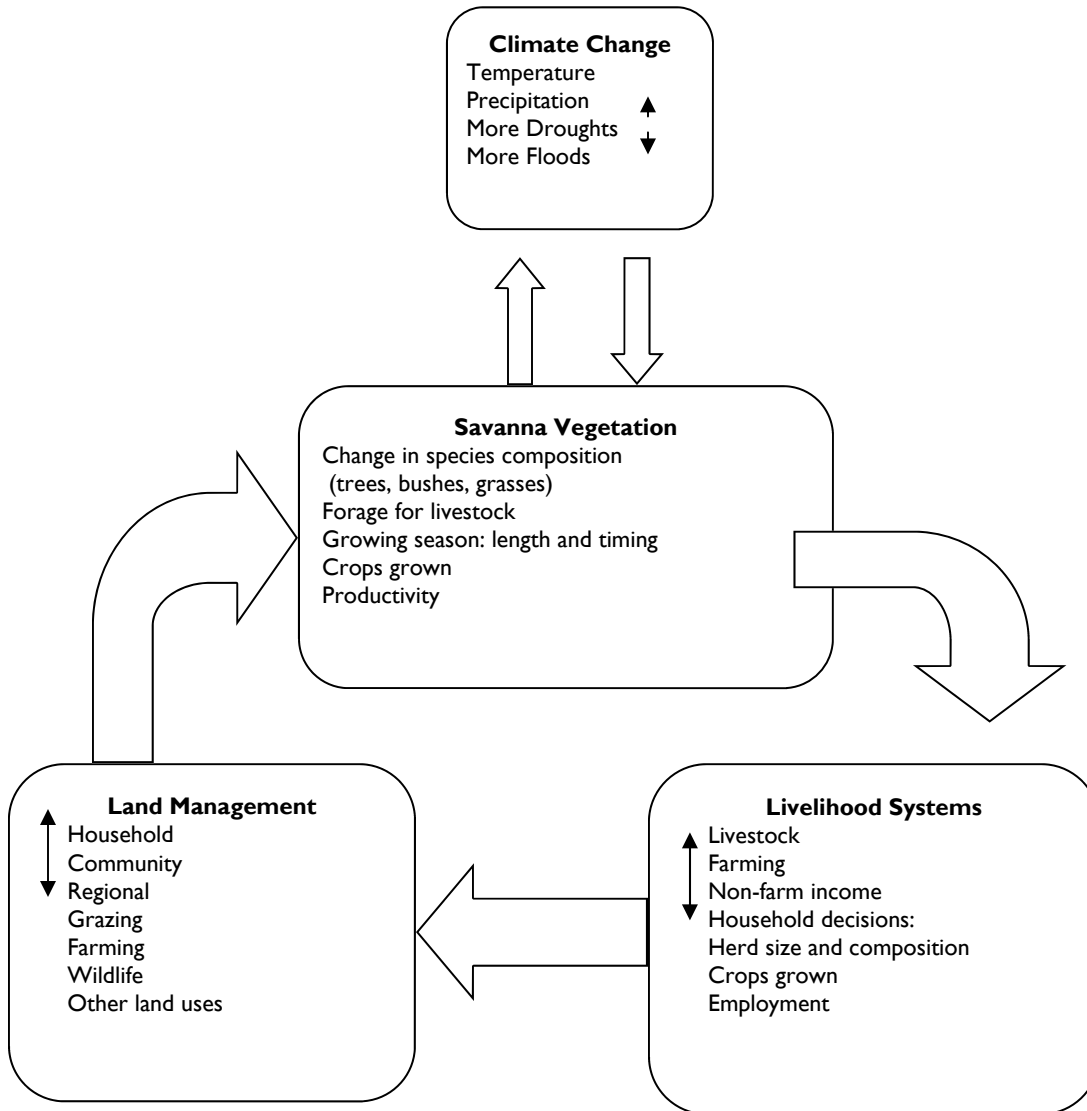
- EACLIPSE (East Africa Climate, People, Livestock & Savanna Ecosystems) www.eaclipse.msu.edu
- CLIP (Climate Land Interaction Project) www.clip.msu.edu
- LUCID (Land-Use Change, Impacts, and Dynamics) www.lucideastafrica.org



The Savanna Human-Land-Climate System Loop



The Savanna Human-Land-Climate System Loop



Human-Land-Climate Interactions

Use your savanna human-land-climate system loop diagram to:

- identify which part of the system has changed
- identify which part of the system will be affected as a result of that change
- predict how it might be affected
- identify the next part of the system that will be affected

1. Global levels of green house gases cause a rise in temperature

Part of system that changed:

This will cause changes in:

Possible changes:

This will cause changes in:

2. More farmers begin to move into the area

Part of system that changed:

This will cause changes in:

Possible changes:

This will cause changes in:

3. The grass species that cattle prefer stop growing in the savanna

Part of system that changed:

This will cause changes in:

Possible changes:

This will cause changes in:

4. People begin to cut down trees to make charcoal to sell

Part of system that changed:

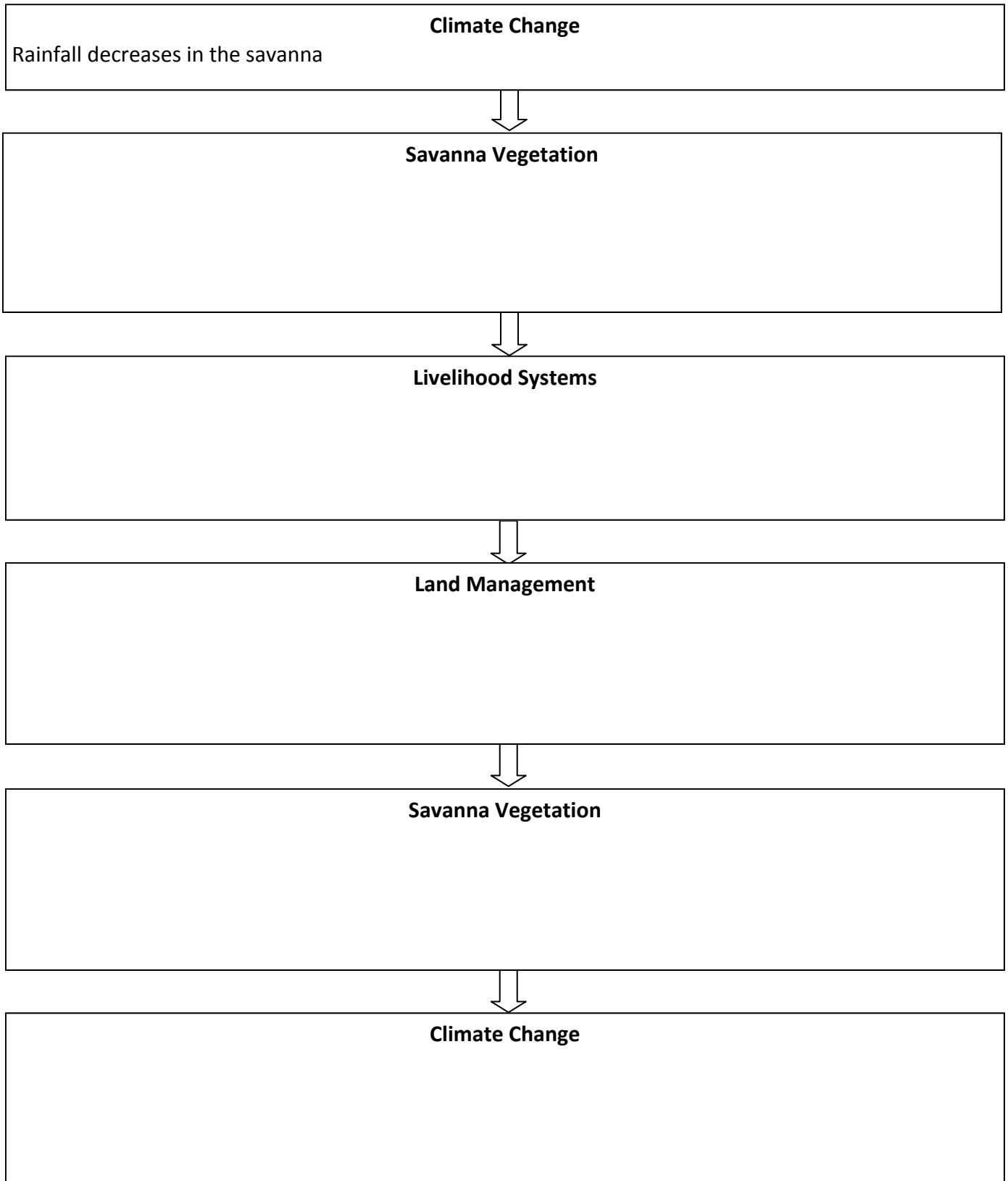
This will cause changes in:

Possible changes:

This will cause changes in:

Savanna Human-Land-Climate System Loop

Take an example all the way around the human-land-climate system loop:



Savanna Human-Land-Climate System Reflection Questions

1. How does the environment affect people?

2. How do people affect the environment?

3. Why is it important to understand the relationships between the different parts of the system?

4. How can understanding the human-land-climate system help people make decisions about livelihood systems and land management?

Human-Land-Climate Interactions

Use your savanna human-land-climate system loop diagram to:

- identify which part of the system has changed
- identify which part of the system will be affected as a result of that change
- predict how it might be affected
- identify the next part of the system that will be affected

1. Global levels of green house gases cause a rise in temperature

Part of system that changed: **climate**

This will cause changes in: savanna vegetation

Possible changes: **Different species composition in the ecosystem (less trees, different bush and grass species, less ground cover)**

This will cause changes in: **Livelihood systems**

2. More farmers begin to move into the area

Part of system that changed: **Livelihood systems**

This will cause changes in: **Land management**

Possible changes: **There will be more farming and less grazing**

This will cause changes in: **Savanna vegetation**

3. The grass species that cattle prefer stop growing in the savanna

Part of system that changed: **Savanna vegetation**

This will cause changes in: **Livelihood systems**

Possible changes: **Herders will need to try other kinds of livestock (goats, sheep, camels), switch to farming, or look for jobs**

This will cause changes in: **Land Management**

4. People begin to cut down trees to make charcoal to sell

Part of system that changed: **Land management**

This will cause changes in: **Savanna vegetation**

Possible changes: **There will be fewer trees to shade the soil, conserve moisture, absorb CO₂ and produce oxygen. Burning wood to make charcoal contributes CO₂ to the environment.**

This will cause changes in: **Climate**

Savanna Human-Land-Climate System Loop

Take an example all the way around the human-land-climate system loop:

